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by

Alexandria Posada

December 2018

ASSOCIATIONS AMONG PERCEIVED STRESS, STRESS COPING, AND EATING BEHAVIORS

A Dissertation Presented to the
Faculty of the College of Education
University of Houston

In Partial Fulfillment
of the Requirements for the Degree

Doctor of Philosophy

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Acknowledgement

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Abstract

Background: Given the combined high prevalence of overweight and obesity (27%) among college students in the United States, particularly women, there is a need to study the risk factors associated with overweight and obesity in this population. Although some biological, psychological, social, and environmental factors have been investigated, limited research has examined perceived stress, coping, sweet intake, and emotional eating among racially/ethnically diverse college women. **Purpose:** The present cross-sectional study's research aims were: 1) to investigate the relationship between perceived stress and sweet intake, 2) to examine the relationship between perceived stress and emotional eating; and 3) to determine if coping strategies moderated these relationships. The following hypotheses were proposed: 1) higher levels of perceived stress would be associated with greater sweet intake; 2) higher levels of perceived stress would be associated with increased emotional eating; and 3) the relationships among perceived stress, sweets intake and emotional eating would be moderated by avoidant coping. That is, a stronger relationship between perceived stress and sweet intake and emotional eating would be observed among students with a higher use of avoidant coping. **Methods:** The sample consisted of 572 racially/ethnically diverse (30% Hispanic, 29% Asian, and 11% African American) undergraduate college women. Participants completed an online demographic survey and measures of dietary intake, emotional eating, perceived stress, and stress coping. **Results:** Confirmatory factor analysis was used to examine the factor structure of all latent constructs before study hypotheses were tested. Structural equation modeling indicated that perceived stress factors and avoidant coping did not significantly predict sweet intake. However, perceived stress factors such as perceived helplessness (β

= .39, p = .005) and lack of stress self-efficacy (β = -.12, p = .002) were significantly associated with emotional eating. Furthermore, avoidant coping was significantly associated with emotional eating (β = .27, p < .001). Further, avoidant coping was not a significant moderator of the relationships among perceived stress, sweet intake, and emotional eating. **Conclusion:** Higher levels of perceived helplessness and avoidant coping were related to greater engagement in emotional eating in undergraduate women. Conversely, reporting less stress self-efficacy (i.e., more stress) was related to less engagement in emotional eating. Future research interventions should focus on reducing feelings of perceived helplessness and encouraging alternative coping styles which could lead to a reduction of emotional eating behaviors in undergraduate women.

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Chapter I

Introduction

Obesity is a major public health concern in the United States. More than two-thirds of all adults (≥ 20 years old) in the United States are overweight or obese (Ogden, Carroll, Kit, & Flegal, 2014). Obesity is also a health problem among college students. According to Sira and Pawlak (2010), the combined prevalence of overweight and obesity among college students is 32%. This is of great concern given the risk factors associated with adult obesity which include heart disease, type 2 diabetes, reproductive issues, and even certain types of cancer (National Heart, Lung and Blood Institute, 2013). Obesity also creates economic costs to the individual and society. Studies have documented an association between obesity and higher loss of work productivity, absenteeism, disability, and increased medical costs (Finkelstien, DiBonaventura, Burgess, & Hale, 2010). It is estimated, with adjustments for inflation, that the lifetime societal cost, per person, was $92,235 higher for a person with obesity compared to an individual without obesity (Kasman, Hammond, Werman, Mack-Crane, & McKinnon, 2015). If youth and young adults with obesity were to remain obese as adults, the financial impact on society would easily exceed billions of dollars.

Individuals are at increased risk for weight gain during the transition from adolescence to beginning college in early adulthood. Anecdotal statements claim that during the first year of college, students gain about 15 pounds during the first year of college, referred to as the "Freshman 15" (Graham & Jones, 2002). However, research indicates that weight gain is typically around three to five pounds in the first year of college (Gropper, Simmons, Connell, & Ulrich, 2012). Specific factors that contribute to

obesity during the college years have been identified, including: 1) easy access to cafeterias serving high fat and high sugar foods); 2) patterns of late-night snacking; and 3) the lack of time designated for physical activity (Greaney et al., 2009). All of this coupled with numerous academic and social stressors associated with beginning college such as heavy course demands, burgeoning independence, and new social relationships all can lead to increases in stress level for college students. Furthermore, women, in general, are especially more likely to have difficulty losing excess weight and subsequently maintaining a healthy weight compared to men (Bohgal & Langford, 2014; Williams, Wood, Collins, & Callister, 2015). Women also report higher levels of stress (Broughman, Zail, Mendoza, & Miller, 2009), and harmful effects due to these stressors (i.e., physical and emotional symptoms) leading to further weight gain (Chaplin, Hong, Bergquist, & Sinha, 2008). Thus, there is a need to study the interplay of obesity risk factors in college-aged populations, especially women, for the prevention and treatment of obesity in this population.

Research has indicated several modifiable risk factors for obesity among college students including perceived stress level (Nelson, Lust, Story, & Ehlinger, 2008), dietary intake (Nelson, Story, Larson, Neumark-Sztainer, & Lytle, 2008), and eating behaviors (i.e., eating style: restrained, external, emotional; Lazarevich, Irigoyen Camacho, del Consuelo Velázquez-Alva, & Zepeda-Zepeda, 2016). Overall the research indicates that perceived stress is related to both increased consumption of unhealthy foods and higher levels of engagement in emotional eating behaviors (i.e., eating more or less due to emotions) in adults, including college students. Stress coping might be influencing the relationship between perceived stress and eating behaviors. However, the role of stress

coping strategies, including avoidant coping, in moderating the relationship between perceived stress and eating behaviors is unknown, particularly among minority women. Most of the studies investigating the relationship between perceived stress and eating have focused on Caucasian females (Bennett et al., 2013; Errisuriz et al., 2016; Habhab et al., 2009; Kandiah et al., 2006; Oliver & Wardle, 1999; Torres & Nowson, 2007; Wilson et al., 2015). Furthermore, there is limited research regarding the relationship among perceived stress, stress coping, and eating behaviors (sweet intake and emotional eating) in a racially/ethnically diverse sample of college women. To address the gap in the literature, the current cross-sectional study focused on investigating the associations among perceived stress, stress coping, and eating behaviors (i.e., sweet intake and emotional eating) in a racially/ethnically diverse sample of college women.

Chapter II

Literature Review

This chapter provides a background for the relationships between perceived stress, stress coping and eating behaviors. First, this review examines the prevalence of perceived stress among college students, including women. Second, the next sections discuss perceived stress and its relationship with eating behaviors (e.g., dietary intake and emotional eating). Third, the following section explores stress coping and its relationship with eating behaviors (i.e., dietary intake and emotional eating). The final section outlines the current cross-sectional study's rationale and hypotheses.

Prevalence and Contributing Factors of Perceived Stress among College Students

According to Lazarus and Folkman (1984), stress can either be the stimulus (i.e., a stressor) or a response (i.e., physiological arousal and negative affect). Researchers have conceptualized stress as the interworking between the person and their appraisal of their environment and whether or not one has the resources to effectively cope with the resulting feelings of stress (Lazarus & Folkman, 1984). In the transition to adulthood, college students experience many stressors such as living away from home, creating new friendships, increased academic demands, issues with time management, and burgeoning independence (Hurst, Baranik, & Daniel, 2012).

According to the American College Health Association's (ACHA) National College Health Assessment Spring 2008 report (2009), 34% of all college students (men and women) reported feelings of stress which impacted their academic performance. More women reported being affected by stress (38%) compared to men (28%). More

current studies (Beiter et al., 2015), identified the top sources of college students' stress which included academics, being successful, post-graduation plans, finances, sleep, and social relationships (friends and family).

Perceived Stress and Eating Behaviors

The relationship between perceived stress and eating behaviors is well-documented. When under stress, individuals, including college students, tend to eat unhealthier foods (Errisuriz, Pasch, & Perry, 2016; Habhab, Sheldon, & Loeb, 2009; Kandiah, Yake, Jones, & Meyer, 2006; Oliver & Wardle, 1999; Torres & Nowson, 2007) and tend to engage in more emotional eating behaviors (Bennett et al., 2013; Nguyen-Rodriguez et al., 2009; Wilson et al., 2015).

Dietary intake. Research shows that the food we consume can directly affect our health. Unhealthy eating habits (i.e., diets lower in fruits and vegetables; higher in sweets and high-fat foods) can lead to obesity (Guo, Warden, Paeratakul, & Bray, 2004), cardiovascular disease (Kant, 2004), type 2 diabetes (Hu et al., 2001), and even at an increased risk of mortality (Murphy et al., 1996). According to the U.S. Department of Health and Human Services and U.S. Department of Agriculture's (USDA; 2015) Dietary Guidelines, the majority of Americans are exceeding the recommendations for added sugars (Ervin & Ogden, 2013). The general recommendation is to limit added sugars/sweets to no more than 10% of one's daily calories (USDA, 2015). Conversely, eating a healthier and more balanced diet of fruits, vegetables, whole grains, low in saturated fat, and low in sodium has been associated with improved health outcomes such as decreases in blood pressure (Sacks et al., 2001), a reduced risk of diabetes (Gittlesohn et al., 1998), a reduced risk of adiposity (Tande et al., 2010), and a reduced risk of

mortality (Michels & Wolk, 2002). Thus, since research supports that assumption that unhealthy eating can lead to poorer health outcomes (Guo et al., 2004), and the obesogenic food environments of college (Greaney et al., 2009), it is important to study the factors associated with unhealthy eating among specific population such as college students.

Dietary intake and perceived stress among college students. Stress has been associated with a greater intake of more nutrient dense, more palatable foods, and more snack type foods that are typically considered unhealthy (i.e., junk food, chips, sweet snacks, high-fat foods) in predominately female and Caucasian samples (Errisuriz et al., 2016; Habhab et al., 2009; Kandiah et al., 2006; Oliver & Wardle, 1999; Torres & Nowson, 2007). In a sample primarily comprised of female (60%), mostly Caucasian (52.6%), and on average healthy weight college students (M_{BMI} = 23.0, SD_{BMI} = 3.3), Errisuriz and colleagues (2016) found that after controlling for race, gender, and BMI, greater perceived stress was significantly associated with increased consumption of unhealthy foods and beverages. specifically: soda (β = .09, $p < 05$), energy drinks (β = .14, $p < .01$), and fast food (β = .09, $p < 05$). Additionally, results indicated that there was a significant moderating effect of perceived stress management on the association between perceived stress and sweet snack consumption (β = -.10, $p < .05$). Perceived stress was significantly positively associated with sweet snack consumption among those who reported low perceived stress management (β = .09, $p = .04$); this relationship was not significant among those with high perceived stress management ($p > .05$). Thus, these findings indicate that among those with low levels of perceived stress management, stress was positively related to increased amounts of sweet snack consumption.

Similarly, Kandiah and colleagues (2006) found, among their all-female and primarily white (92%) college-aged population that stress affects food consumption. For the majority of participants (63%), reported increases in appetite when under stress. This subset of participants *(n* = 139) with increased appetites, indicated that when under stress they tended to consume more sweet foods and mixed dishes (e.g., pizzas, casseroles). Among the total sample, the majority of participants reported eating healthy when not stressed (80%), however, when under stress, few reported eating healthy (33%). Similarly, in a sample of 40 female college students (60% White, 25% Arab American), Habhab and colleagues (2009) found that there was a main effect of stress level on total among of food consumed ($F(1, 36) = 7.30$, $p = .01$, $\eta^2 = .17$) as well as that higher stress was significantly related to increased consumption of sweet snacks ($F(1, 36) = 17.69$, $p = .0001$, $\eta^2 = .33$). Specifically, women in the high-stress condition (i.e., more difficult sudoku puzzle) consumed more food overall, more sweet snacks, and more high-fat snacks than those in the low-stress condition (i.e., easier sudoku puzzle). Additionally, among the high-stress group, sweet snacks were significantly consumed more frequently than salty snacks.

Although perceived stress has been associated with increased unhealthy food consumption, some studies (Pelletier et al., 2016) have not found a significant relationship. In a sample of community college students who were mostly female (67.6%), mostly White (72.6%), Pelletier and colleagues (2016) found that higher stress levels were not associated with increased unhealthy food consumption (i.e., fast food or sweetened beverages). As described further below, differences in Pelletier et al.'s (2016) results, from those previously mentioned which did find a significant relationship, could

be attributed to differences in the measurement of dietary intake (specifically frequent snacking, fast food consumption, and sugar-sweetened beverage consumption), measurement of stress (e.g., Cohen's 4-item Perceived Stress Scale, a contrived 1-item stress question), or not considering stress management abilities. Additionally, Pelletier and colleagues' (2016) sample was from a community college as opposed to a 4-year university. Furthermore, stress in Pelletier et al.'s (2016) study was conceptualized as perceived stress and measured by the 4-item Cohen Perceived Stress scale, which has demonstrated less psychometrically sound properties (i.e., only marginally acceptable Cronbach's alpha estimates) than its 10-item counterpart, Cohen and Williamson's (1988) Perceived Stress Scale-10 (Lee, 2012), which was used in the present study.

Across previously mentioned studies (Errisuriz et al., 2016; Habhab et al., 2009; Kandiah et al., 2006; Pelletier et al., 2016), perceived stress and dietary intake were measured differently. Some studies used categories of food groups (mixed dishes, salty/crunchy foods, sweet foods, creamy foods, and beverages, Kandiah et al., 2006); or frequent snacking, fast food consumption, and sugar-sweetened beverage consumption (Pelletier et al., 2016); or food and beverage categories (soda, diet soda, coffee, energy drinks, pre-packaged salty snack foods, pre-packaged sweet snack foods, frozen meals, and fast food, Errisuriz et al., 2016); or amount consumed of four different types of snacks (salty-low fat, salty-high fat, sweet-low fat, sweet-high fat; Habhab et al., 2009).

As for measuring stress, each study also used a different measure. Kandiah et al. (2006) used a constructed measure of current distress that covered six stressor areas, Pelletier et al. (2016) used Cohen's 4-item Perceived Stress Scale, Errisuriz et al. (2016) used a 1-item question to address perceived stress, and Habhab et al. (2009) randomized

participants into high and low stress conditions, which were manipulated though Sudoku puzzle difficulty.

These studies found that stress was associated with unhealthier eating among primarily female Caucasian samples and not more racially/ethnically diverse samples as the current study. Furthermore, many of the studies did not account for stress coping and its potential moderating association on the relationship between stress and dietary intake. The present study samples from a more diverse population of college women and uses reliable and valid measures of perceived stress and dietary intake. Overall, perceived stress is more likely to be associated with the consumption of highly palatable foods (i.e., typically calorie dense and unhealthy).

Emotional eating. Emotional eating is another construct that has been associated with an increased risk of overweight and obesity (Lazarevich et al., 2016) and linked to perceived stress (Bennett et al., 2013; Nguyen-Rodriguez et al., 2009; Wilson et al., 2015). Emotional eating is one identified eating pattern which can be defined as the behavior of eating (i.e., over or undereating) in response to different emotional states, both positive and negative (e.g., happiness, joy, fear, disappointment, boredom; Bennett et al., 2013; Geliebter & Aversa, 2003). Other patterns such as restrained eating (i.e., restricting intake due to weight concerns) and external eating (i.e., eating due to the nature of the food or seeing other eating) have also been identified but were not of interest to the current study (Van Strien et al., 1986). Research indicates that emotional overeating can contribute to an excessive intake of calories, which in turn, without balanced energy expenditure, can lead to weight gain (Van Strien, Herman, & Verheijden, 2012). One explanation for why emotional eating contributes to weight gain

is that emotional eating may serve as a coping mechanism which may temporarily diminish the negative emotions being experienced (Adam & Epel, 2007; Canetti, Bachar, & Berry, 2002). Although emotional eating specifically under negative emotional situations (e.g., fear, stress, and sadness) has been found in overweight and obese populations, it is also common in normal-weight individuals (Geliebter & Aversa, 2003) as well as in both men and women (Grunberg & Straub, 2000).

Emotional eating and perceived stress. Emotional eating is positively related to higher levels of stress in adolescents and adults, including college students; specifically, individuals reporting higher levels of perceived stress also report greater engagement in emotional eating behaviors (Bennett et al., 2013; Nguyen-Rodriguez et al., 2009; Wilson et al., 2015). Using the 13-item Emotional Eating subscale of the Dutch Eating Behavior Questionnaire (DEBQ), Nguyen-Rodriguez and colleagues (2009) found a significant relationship between perceived stress and emotional eating among a sample of racially/ethnically diverse adolescents *(N* = 666, 75% female, 66% Latino, 30% Asian). Specifically, although mean levels of emotional eating were not significantly different between males and females *(M* = 1.87; t = -0.78, p = .43), gender-stratified analysis revealed that the relationship between perceived stress and emotional eating was significant only for females (β = .19, p < .001). Among males, only confused mood (β = .35, p = .03) was related to engagement in emotional eating behaviors. Similarly, Bennett et al. (2013) found that college women tended to report that feelings of perceived stress contributed to their engagement of emotional eating while men tended to report that feelings of boredom or anxiety is what led them to engage in emotional eating. Bennett et al. (2013) used a qualitative approach by interviewing undergraduates *(N* = 16, 100%

Caucasian, 50% female) about their perceived experiences of stress and what triggered their emotional eating. Qualitative data revealed how periods of perceived stress were related to self-reported experiences of emotional eating (i.e., eating more or less due to emotions).

In a study of college students *(N* = 97, 73% female, 65% Caucasian), Wilson et al. (2015) examined BMI as a moderator of the relationship between emotion eating and perceived stress. Overall, emotional eating was not significantly related ($F(3, 22) = 1.43$, $p > .05$) to stress among males at any BMI based weight status (i.e., healthy weight, overweight, obese). However, among females, emotional eating was significantly related to perceived stress among those who were overweight and obese ($F(3, 67) = 6.03$, $p = .01$).

Together, these studies provide evidence that perceived stress and emotional eating seem to be significantly associated only among women and not men. Furthermore, these findings are supported among primarily female Caucasian college students or more racially/ethnically diverse young adolescents. However, it is important to note that each study used a different measure for emotional eating and perceived stress. Bennett et al. (2013) used a qualitative approach by interviewing undergraduates about their experiences of emotional eating and perceived experiences of stress. Nguyen-Rodriguez et al. (2009) used the DEBQ's 13-item Emotional Eating subscale and a modified version of Cohen et al.'s (1983) 14-item Perceived Stress Scale (PSS). Wilson et al. (2015) used the 25-item self- report Emotional Eating Scale (EES) and Cohen and Williamson's (1988) 10-item Perceived Stress Scale (PSS).

Furthermore, none of the studies considered stress coping as a moderator of the relationship between perceived stress and emotional eating. However, Wilson et al. (2015) tested the relationship between emotional eating and stress coping; results indicated a small negative association (r = -.22, $p < .05$) in that those that reported greater engagement in emotional eating tended to report lower stress coping. The present study sampled from a racially/ethnically diverse population of college women and used a previously reliable and valid measure of emotional eating (i.e., DEBQ) and perceived stress (i.e., PSS-10).

Stress Coping

Researches have conceptualized stress coping as the behavioral and cognitive abilities to negotiate internal and external demands encountered in stressful situations (Lazarus & Folkman, 1984). Internal demands refer to internal processes and perceptions within the self (e.g., one's appraisal of the situation), and external demands to the external environmental situation (e.g., location and object causing the stress response). Furthermore, stress coping is characterized as having two primary functions to: 1) alter the distressed person-environment relationship (i.e., problem-focused coping); and 2) adjust the emotional distress experience (i.e., emotion-focused/cognitive coping). Some research has focused on specific types of coping strategies and responses (Carver, 1997; Crockett et al., 2007; Spoor et al., 2007; Wichianson, Bughi, Unger, Spruijt-Metz, & Nguyen-Rodriguez, 2009). More recently, Doron et al.'s (2014) work has focused on unifying coping research by integrating theories and proposing a hierarchical organization of coping responses (e.g., I have been refusing to believe it has happened)

within coping strategies (e.g., denial coping strategy) within higher order dimensions of coping styles (e.g., avoidant coping style).

Stress coping among college students. Among men and women, including college students, coping responses, strategies, and styles can be differentially related to a variety of both positive and negative health and behavioral outcomes (Broughman et al., 2009; Mahmoud, Staten, Hall, & Lennie, 2012; Spoor, Becker, Van Strien, & Van Heck, 2007; Wichianson et al., 2009). For example, avoidant coping styles and strategies (i.e., engaging in activities other than addressing the stressor) have been linked with adverse health behaviors such as increased drinking behaviors (Hasking, Lyvers, and Carlopio, 2011) and emotional eating (Spoor et al., 2007) as well as negative feelings of anxiety and depression (Crockett et al., 2007). Moreover, emotion-focused coping strategies result in adverse outcomes (Broughman et al., 2009; Wichianson et al., 2009). For example, maladaptive coping strategies (i.e., those that tend to be more emotion-focused that do not directly address the stresso, such as denial and venting) have been connected to negative behaviors and feelings such as night-eating syndrome, an eating disorder where one eats little to nothing during the day followed by increased eating at night (Wichianson et al., 2009) and are related to increased feelings of anxiety, depression, and stress (Mahmoud et al., 2012). Furthermore, other more adaptive coping strategies and styles (i.e., those that tend to be more problem-focused and directly address the stressor, such as positive reframing and using instrumental support) have been found to mitigate the effects of specific types of stress (e.g., acculturative stress) on anxiety and depression symptoms (Crockett et al., 2007).

Regarding gender differences in coping, women, including college students, are more likely to utilize emotion-focused strategies compared to men (Broughman, Zali, Mendoza, & Miller, 2009). Emotion-focused strategies tend to be more maladaptive and related to adverse outcomes. Conversely men, including college students, are more likely to engage in problem-focused strategies compared to women (Broughman et al., 2009). In addition, some studies have suggested that women tend to engage in more self-help (i.e., an adaptive strategy) and self-punishment (i.e., a maladaptive strategy) types of coping strategies compared to college men (Broughman et al., 2009).

Stress Coping as a Moderator between Perceived Stress and Eating Behaviors

Stress coping has not been extensively studied regarding the association between perceived stress and eating behaviors (e.g., dietary intake and emotional eating). Generally, stress coping affects the relationship between perceived stress and dietary intake (Errisuriz et al., 2016) in that those who can better cope do not experience the negative effects of stress on unhealthy eating. No study has investigated whether stress coping moderates the relationship between perceived stress and emotional eating.

Stress coping as a moderator of perceived stress and dietary intake. Limited research has been conducted on the association between perceived stress and dietary intake. Errisuriz and colleagues (2016) indicated that in there sample of undergraduate students (59% female, 51% Caucasian) there was a moderating effect of perceived stress management on the relation between perceived stress and sweet snack consumption. Specifically, perceived stress, as measured by a single question (i.e., how effectively they were able to manage their stress in the past month) ,was positively associated with sweet snack consumption among those who reported low perceived stress management; this

relationship was not significant among those with high perceived stress management. This study provides some support that greater ability to cope with stress might have an ameliorating effect on the relationship between stress and dietary intake. Also, Adam and Epel (2007) suggest that different appraisals of stress (i.e., threat versus challenge) may affect the brain systems activated leading to differential responses to stress in terms of food intake. Therefore, it can be gathered that stress which is deemed more controllable (i.e., able to be coped with), is likely to have a weak relation to the intake of palatable, less healthy food such as sweetened foods (e.g., sweet snacks, desserts). Future studies looking to assess the relationship among dietary intake and perceived stress should seek to use more consistent instrumentation, use larger, more racially/ethnically diverse samples, and consider a using a measure of stress coping.

Stress coping as a moderator of perceived stress and emotional eating. There have been no studies to the author's knowledge that examine the moderating effect of stress coping on the relationship between stress and emotional eating. However, a study of perceived stress, coping, and night eating behaviors, Wichianson et al. (2009) indicated that maladaptive coping strategies mediated the relationship between perceived stress and night eating behaviors. In addition, the authors suggest that adaptive coping strategies seemed to moderate the relationship between perceived stress and night eating behaviors in that those with less adaptive coping strategies were more likely to exhibit night eating behaviors when under stress. Adam and Epel (2007) suggest that different appraisals of stress may lead to differential responses to that stress, thus more threatening stress is more likely to invoke the need for more highly palatable food to mitigate the stress response. It can be gathered one who is unable to cope with the stress might be

more likely to engage in emotional eating (i.e., bouts of increased eating due to emotions) in order to alleviate the stress response experienced compared to someone who is better able to cope with their stress.

Study Rationale and Hypotheses

The literature has revealed several relevant findings. Perceived stress is associated with increased consumption of unhealthier foods such as sweets, and sugar-sweetened beverages in adults, including college women. Perceived stress is also linked to increased emotional eating in adolescent and adult women, including college women. However, most of these studies have been conducted with primarily female, Caucasian populations, have used questionable instrumentation (e.g., 1-item surveys), and rarely considered stress coping. Stress coping is important because it is tied to both positive and negative physical and behavioral health outcomes depending on the type of coping.

The goal of this cross-sectional study was to examine the relationship among perceived stress, dietary intake of sweets, emotional eating, and stress coping (i.e., avoidant coping) in a racially/ethnically diverse sample of female undergraduate college students. Specifically, the present study had three research aims to: 1) investigate the relationship between perceived stress and dietary intake of sweets; 2) test the relationship between perceived stress and emotional eating; and 3) to determine if these relationships were moderated by avoidant coping.

Based on the literature reviewed in this chapter, the following hypotheses were proposed and tested via latent variable analysis: 1) female undergraduate college students who reported higher levels of perceived stress would report higher consumption of sweets

(Errisuriz et al., 2016; Habhab, Sheldon, & Loeb, 2009; Kandiah et al., 2006; Torres & Nowson, 2007); 2) female undergraduate college students who reported higher levels of perceived stress would also report higher levels of emotional eating (Bennett et al., 2013; Nguyen-Rodriguez et al., 2009; Spoor et al., 2007; Wilson et al., 2015); and 3) the relationship between a) perceived stress and dietary sweet intake and b) perceived stress and emotional eating would be moderated by avoidant coping. Specifically, among female undergraduate college students with higher avoidant coping, there would be a stronger association between dietary intake of sweets, emotional eating, and perceived stress compared to those with lower levels of avoidant coping.

Chapter III

Methodology

Participants

The current study was cross-sectional, and data were collected from a public university in the southwest United States during the summer and fall semesters of 2017. Sample included students enrolled in psychology and education undergraduate courses. Initially, the original sample included 757. However, 20 participants were excluded from the sample because they completed the survey twice, 10 participants were excluded because they did not report their gender and 143 participants were excluded because they were males. Finally, 12 participants were excluded from analysis because they were females, but not undergraduate students, resulting in a final sample of 572 undergraduate female students.

As shown in Table 1, the study sample consisted primarily of Hispanic (30%), Asian (29%), and Caucasian (24%), and African American (11%) women. On average, women were 21.9 years of age (*SD* = 4.9 years). The majority were enrolled in school full-time (86%), single, never married (57%), and reported being a student as their primary occupation (46%).

Table 1

Demographic Characteristics (N = 572 women)

Age in years *M (SD)*	21.9 (4.9)
Ethnicity %	
White/Caucasian – Non-Hispanic	138 (24.1)
Black/African American – Non-Hispanic	65 (11.4)
Asian – Non-Hispanic	166 (29.0)
Hispanic	170 (29.7)
Other/Multi-racial/multi-ethnic	31 (5.4)
Missing/American Indian/Alaska Native – Non-Hispanic	2 (.4)
Student Status n *(%)*	
Undergraduate	572 (100.0)
Enrollment Status n *(%)*	
Part-time	77 (13.5)
Full-time	493 (86.2)
Other	2 (.3)
Relationship Status n *(%)*	
Single, never married	324 (56.6)
Married/Domestic partnership	46 (8.0)
Divorced	6 (1.0)
Separated	1 (.2)
Dating/In a relationship	194 (33.9)
Other	1 (.2)
Employment Status n *(%)*	
Employed for wages	242 (42.3)
Self-employed	11 (1.9)
Out of work and looking	20 (3.5)
Out of work and not looking	18 (3.1)
Homemaker	6 (1.0)
Student	261 (45.6)
Unable to work	3 (.5)
Other	11 (1.9)

Data Collection Procedures

Students were recruited from psychology and education undergraduate college courses through flyers. These flyers were distributed out during courses for which the instructors explicitly allowed recruitment. Furthermore, these flyers were posted in high traffic areas around the education building (e.g., the elevators). According to the U.S. Department of Education's National Center for Education Statistics (NCES), typically, these types of courses (i.e., psychology and education) tend to be predominately female as over 75% of psychology and education degrees are conferred to females (U.S. Department of Education, 2012). Additionally, the current project made use of SONA, a research management system hosted by the referent university's psychology department. This system allows principal investigators to post information about their studies and subsequently, allows students to view and sign up for these studies as well as receive extra credit in their course for completing a study. For the current study, students were able to access the survey through this website which was similar to as if they had received a flyer with the link. The measures were administered online as a single questionnaire hosted by Qualtrics.

Among those that completed the entire survey *(n* = 722), median completion time was approximately 23 minutes (*SD* = 466 minutes, range 6 minutes – 6 days); the survey can be found in Appendix A. Data were subsequently downloaded into the Statistical Package for Social Sciences (SPSS, Version 25) to be cleaned and prepared for subsequent analysis in MPLUS (Version 8; Muthén & Muthén, 1998-2017). Ethical approval was secured through the university's institutional review board (IRB) prior to conducting the study.

Prior to accessing the survey, the Qualtrics link displayed an informed consent document. Students were asked to read a consent form before completing survey and electronically consent to participate in the study by clicking 'yes'. If the student did not consent, they were allowed to click 'no' or exit the survey. They were not allowed to proceed in the survey without giving their consent.

Measures

Demographics. The demographics questionnaire was adapted from The American Community Survey (United States Census Bureau, 2016) with additional questions about student status and college major. For example, sample questions included "*what is your age*?" and "*what is your current major*?"

Dietary intake. Dietary intake was assessed through an adapted version of the Fred Hutchinson general nutrition assessment (GNA) food frequency questionnaire (FFQ). This instrument was originally based on the Women's Health Initiatives (WHI) FFQ (Patterson et al., 1999). Updated in 2010, the GNA FFQ uses the same format and analysis algorithms as the WHI FFQ. The GNA FFQ demonstrated moderate criterion validity and test-retest reliability for the specific nutrient of percentage of energy from fats; however, the authors concluded that the FFQ was less valid among Blacks than compared to their White counterparts; in addition, they determined that validity was higher among participants with more education (Kristal, Fend, Coates, Oberman, & George, 1997). Furthermore, Kristal and colleagues suggest that because FFQs estimate nutrient intake from a large number of categories, providing psychometric information for the whole instrument would be difficult.

In the current study, the GNA FFQ questionnaire measured across a variety of food categories; in addition, certain questions aimed at assessing specific types of foods used (i.e., low/reduced fat milk versus full fat milk versus fat free/nonfat milk), while other items were interested in the consumption frequency of the general item itself (i.e., how often do you drink milk). The questionnaire asked three questions about general a) fruit, b) vegetable, and c) fried food consumption which were rated on a 9-point scale ranging from 0 (*never or less than once per week)* to 8 (*5 or more per day*). In addition, there were 121 general food items across the following nine food and beverage categories: Cereals, Breads, and Snacks (21 items); Meat, Fish, and Eggs (16 items); Spaghetti, Mixed Dishes and Soups (16 items); Dairy Products (4 items); Vegetables and Grains (27 items); Sauces and Condiments (5 items); Fruits (9 items); Sweets (6 items); Beverages and Alcohol (17 items). These items were rated on a 9-point ordinal consumption scale of 0 (*never or less than once a month*) to 8 (*2 or more per day*). Additionally, participants were asked to select the approximate serving size (small, medium, or large) consumed when they typically eat or drink the given item; a medium portion size (e.g., 1 cup or 1 banana) was given for reference. Next, items were then scored according to guidelines (Fred Hutchinson Cancer Research Center, 2010). These guidelines consider portion size and frequency of consumption. This results in the average daily servings consumed across categories (e.g., average daily servings of fruit consumed). Furthermore, participants were dichotomously categorized into high (i.e., .50 or more average daily servings) versus low consumers (i.e., less than .50 average daily serving) for the food group of interest (i.e., sweets-6 items). Based on current limits of consumption of added sugars/sweets (i.e., less than 10% of calories; USDA, 2015) and

increasing current portion sizes (Young & Nestle, 2002), a cut off of an average half daily serving (.50) of sweets was used. Dichotomizing individuals into high and low consumer groups is a common way of using food frequency questionnaires (Lietz, Anderson, Longbottom, & Barton, 2002; Marchioni, Voci, Lima, Fisberg, & Slater, 2007). The sweets food group used in the final analysis removed one item for the current study (i.e., 5 items; ice cream/milkshakes, puddings, doughnuts/pastries, chocolate/candy bars, other candy) demonstrated low internal consistency (Cronbach's $\alpha = .62$); it is important to note that Cronbach's α is sensitive to the number of items in a scale (Cortina, 1993). Other food frequency type questionnaires (which use different items) have found similarly low internal consistency estimates (Cronbach's αs = .40 - .70; Kiwanuka, Åstrøm & Trovik, 2006, Shinga-Ishihara, Nakai, Milgrom, Murakami, & Matsumoto-Nakano, 2014). One issue with making direct comparisons between different versions of food frequencies across studies is that they may not use the same items for sweets or may combine sweets with other food groups when reporting internal consistency estimates. However, according to Loewenthal (2001) for scales with less than 10 items, a Cronbach's α above .60 is considered acceptable.

Emotional eating. Emotional eating was measured using Van Strien, Frijters, Bergers, and Defares' (1986) Dutch Eating Behavior Questionnaire (DEBQ). The DEBQ has 33 items and asks questions across three subscales: the restrained eating subscale which assesses the restriction of food intake to avoid weight gain (10 items; e.g., "Do you try to eat less at mealtimes than you would like to eat?"), the emotional eating subscale which measures desire to eat under various emotional states (13 items; e.g., "Do you have a desire to eat when you have nothing to do?"), and the external eating subscale which

gauges eating behaviors in response to external stimuli (10 items; e.g., “If you see or smell something delicious, do you have a desire to eat it?”). Items had a 5-point response scale of 1 (*never*), 2 (*seldom*), 3 (*sometimes*), 4 (*often*), and 5 (*very often*). Items are averaged across subscales resulting in three separate scores (i.e., restrained eating average, emotional eating average, and external eating average) with higher scores indicating greater engagement in these eating behaviors. These subscales have previously demonstrated good to excellent reliability for restrained eating (Cronbach’s αs = .92-95), emotional eating (Cronbach’s αs = .94-.95), and external eating (Cronbach’s αs = .80-.82; Galloway, Farrow, & Martz, 2010, Van Strien et al., 1986).

In the original development of the DEBQ (Van Strien et al., 1986), using orthogonal factor analysis the DEBQ revealed a four-factor structure; the restrained and external eating items each loaded onto a separate factor, but the emotional eating items loaded onto two factors (i.e., eating to diffuse emotion and eating in response to clearly labeled emotions). However, the authors found that the combined subscale of 13 emotional eating items was also internally consistent (α = .94) and demonstrated high factorial validity in obese and non-obese men and women. Other studies, using different language versions of the DEBQ, have also found a three-factor structure similar to the original with the reliable and factorial valid subscales of restrained eating, emotional eating, and external eating factors among a general population of adults (Dakanalis et al., 2013; Dutton & Dovey, 2016) and college students (Bozan et al., 2011; Cebolla et al., 2014). However, some studies do make minor modifications (e.g., removing a low loading item; Dutton & Dovey, 2016). In the current study, the restrained eating,

emotional eating, and external eating subscales demonstrated good to excellent internal consistency (Cronbach's αs = .92, .96, .90, respectively).

Perceived stress. Cohen and Williamson's (1988) 10-item Perceived Stress Scale (PSS) was used to measure stress. The scale was answered on a 5-point Likert-type scale from 1 (*Never*) to 5 (*Very Often*). Questions asked covered general stressors in the last month, such as "how often have you felt that you were unable to control the important things in your life?" and "how often have you felt difficulties were piling up so high that you could not overcome them?" Previous studies among a general population of adults (Barbosa-Leiker et al., 2013) and college students (Roberti et al., 2006) have indicated a two-factor structure of this scale consisting of a stress/perceived helplessness factor and a counter stress/perceived self-efficacy factor. Perceived stress items/perceived helplessness (i.e., items 1-3, 6, 9, & 10) were averaged so that higher scores reflected increased perceived stress (also increased perceived helplessness). Counter stress/perceived self-efficacy items (i.e., items 4, 5, 7 & 8) were reversed coded and then averaged so that higher scores also reflected increased perceived stress (also less stress self-efficacy). In addition, a total perceived stress score was calculated from the summation of all items where higher scores indicated increased feelings of perceived stress. Previous studies have found this to be a valid (i.e., factorial and criterion validity) and reliable measure (Cronbach's αs = .74 - .91) of perceived stress among the general population and college students (Lee, 2012). The current study found this measure to have good internal consistency (Cronbach's α = .86) for the total scale as well as for each derived subscale (stress/perceived helplessness Cronbach's α = .90, counter stress/perceived lack of self-efficacy Cronbach's α = .81).

Stress coping. Carver's (1997) Brief COPE was used to measure stress coping. It is a 28-item questionnaire that surveys fourteen types of coping strategies with questions answered on a 4-point scale: 1 ("*I haven't been doing this at all*") to 4 ("*I have been doing this a lot*"). This measure has demonstrated good internal consistency and both content and face validity (Carver, 1997). In terms of subscales and factor structure, some studies (Meyer, 2001; Wichianson, Bughi, Unger, Spruitz-Metz, & Nguyen-Rodriguez, 2009) have categorized the scale as having two general types of coping strategies: adaptive and maladaptive. Adaptive coping strategies (i.e., those that are more problem-focused) include active coping, planning, positive reframing, acceptance, humor, religion, using emotional support, and using instrumental support. Maladaptive strategies (i.e., those that more emotion-focused) include self-distraction, denial, venting, substance use, behavioral disengagement, and self-blame (Wichianson et al., 2009). Studies (Meyer, 2001; Wichianson et al., 2009) using these composites of coping strategies have found the adaptive subscale to be internally consistent (Cronbach's αs = .81-.83), whereas the maladaptive subscale is not as internally consistent and tends to vary depending on the population. In a sample of psychiatric patients, the internal consistency of the maladaptive coping subscale was very low (Cronbach's α = .48) whereas in a sample of college students the internal consistency was good (Cronbach's α = .81). However, to the author's knowledge no studies have explicitly tested with either a confirmatory factor analysis or an exploratory factor analysis of how this two-factor structure of adaptive-maladaptive coping fits the data. Previous studies using adaptive versus maladaptive coping have conceptually allocated these types of coping strategies into categories and used averages of the items in their studies. Other studies (Doron et al., 2014; Sofia, 2014)

have found and utilized a higher order structure of five factors (i.e., problem-solving, support-seeking, avoidance, cognitive restructuring, and distraction) compared to the original fourteen factors. Given the mixed study findings on the factor structure of the Brief COPE, the current study tested four alternative factor models that have been found in prior studies. First, a two-factor model (Meyer, 2001; i.e., adaptive vs maladaptive), next a three-factor solution (Hasking et al., 2011; i.e., problem-focused, emotion-focused, and avoidant coping), followed by a four-factor model (Benson, 2010; i.e., engagement, distraction, disengagement, cognitive reframing), and finally a five-factor solution (Doron et al., 2014; i.e., problem-solving, support-seeking, avoidance, cognitive restructuring, and distraction) were estimated to determine which fit the data best. Higher scores of each subscale indicated greater use of those types of coping strategies. In the current study, the adaptive subscale was found to have good internal consistency (Cronbach's $\alpha = .88$) while the maladaptive subscale was also found to have good internal consistency (Cronbach's $\alpha = .82$). Also in the present study, the other subscales for the five higher order structure had lower but acceptable internal consistencies for problem-solving (4 items), support-seeking (6 items), avoidance (8 items), cognitive restructuring (6 items), and distraction (4 items), respectively (Cronbach's αs = .83, .80, .79, .78, 63).

Data Screening and Analysis Procedures

As described in more detail further below, data was first screened in SPSS for multiple respondents, missing data, outliers, and key statistical assumptions. Data was then imported into MPLUS and analyzed using structural equation modeling (SEM; Kline, 2016). Bentler and Chou (1987) suggest a ratio of 5 to 1 for sample size to the

number of free parameters. Thus, for the estimated model with the greatest number of free parameters (i.e., higher order confirmatory factor analysis model for the coping construct with 108 free parameters) the needed sample size would need to be at least 540. However, current methods suggest obtaining minimum samples sizes from tables based on the RMSEA and noncentral chi-square distributions for tests of the exact-fit, the close-fit, and the not-close-fit hypotheses specified by MacCallum, Browne, and Sugawara (1996). According to these tables, a model of with 20 degrees of freedom (df) would need a sample size of 500 or more to reach a power of .80 for a not close fit. According to these guidelines, it appears most of the models may be acceptably powered with the current final analysis sample of 572.

Data screening. Data was first analyzed for multiple respondents, missing key data (i.e., dietary intake, emotional eating, stress, and stress coping variables), outliers and key statistical assumptions such as normality. After initially eliminating those that did not identify as female and as an undergraduate student, 572 undergraduate women remained in the sample. Analysis of missing data found that 16 participants (3%) were missing any data and of those, 15 were missing variables on key data. Of the 16 participants missing any data, one participant was missing only their race/ethnicity identification. Ten participants were missing data on all of the key variables (i.e., scales to measure emotional eating, food frequency, stress, and stress coping); these participants opened the survey, accepted the consent and completed the demographic questionnaire, but then did not complete any other part of the survey. Four participants were missing only emotional eating, stress, and stress coping subscale, thus these participated made it through the demographics section and food frequency questionnaire but then exited the

survey. Finally, one participant was only missing the entire stress coping scale, which was the last scale in the survey (see Appendix A). Thus, it appears that missing data was due to respondent fatigue and were assumed to be missing at random (MAR). This means data was missing conditionally on another variable since the missing data was related to how far one progressed within the survey (Kline, 2016). Thus, these participants remained as part of the dataset; however, the current study used full information maximum likelihood (FIML) estimation which uses every piece of available observed data, which is the default in MPLUS when there is missing data (Wang & Wang, 2012). So that all available information is used to estimate the model, FIML handles them within the analysis model (Kline, 2016). To avoid imputation or deleting data, FIML uses a sample's relevant information (e.g., means, variances), then calculates the parameter estimates and standard errors from the available data (Kline, 2016). FIML tends to be less biased than more traditional approaches such as listwise or pairwise deletion (Enders & Bandalos, 2001; Wang & Wang, 2012).

Data screening was performed through descriptive statistics (e.g., means, standard deviations, skewness, and kurtosis) and are presented in Table 2. Overall, there were no serious deviations from univariate normality for variables of the Dutch Eating Behavior Questionnaire (i.e., restrained, emotional, and external eating), stress, and stress coping variables as the absolute values of skewness and kurtosis values were less than 1 (Bulmer, 1979); moreover, Kline (2016) suggests that absolute values of skewness over 3 and kurtosis over 10 indicate serious problems with non-normality. Dietary intake variables for sweets using the food frequency questionnaire (FFQ), however, experienced severe skewness and kurtosis violations as the distributions were positively skewed and

L-shaped. The sample mean for this measure was quite low (.55), indicating that the participants reported low consumption of sweets; specifically, on average, eating these foods once a month or less. To accommodate for this when conducting the confirmatory factor analysis for the dietary intake construct, the mean- and variance-adjusted weighted least squares (WLSMV) estimator was used (Kline, 2016). The WLSMV estimator, as opposed to maximum likelihood (ML) estimation, was used because it can accommodate polytomous data (e.g., dietary intake measured on an ordinal scale), and provides robust standard errors (Muthén, du Toit, & Spisic, 1997). Furthermore, Finney and Distefano (2013) suggest that results from computer simulations favor WLSMV over the mean-adjusted weight least squares estimator (WLSM). For the final structural regression models that tested hypothesis 1-3, this variable was dichotomized into high and low consumers; categorizing individuals into high and low consumer groups is a common way of using food frequency questionnaires (Kiwanuka, Åstrøm & Trovik, 2006; Lietz et al., 2002; Marchioni et al., 2007). Using a dichotomized version of sweet dietary intake resulted in a kurtosis value of less than 1 and a skewness value of close to 1 (see Table 2). Furthermore, box plots and histograms were inspected for outliers; no extreme outlier values (i.e., greater than 3 times interquartile range [IQR]) were found (Tukey, 1977).

Table 2

Descriptive Statistics of Key Study Variables

Variable	N	Min	Max	Mean	SD	Skewness	Kurtosis
DEBQ: Emotional Eating	558	1.00	5.00	2.40	1.07	.38	-.59
PSS: Sum Score of Perceived Stress	558	12.00	50.00	30.08	6.78	.10	-.19
PSS: Counter stress average (lack of self-efficacy)	558	1.00	5.00	2.79	.74	.08	.29
PSS: Stress average (Perceived helplessness)	558	1.00	5.00	3.15	.87	.08	-.41
FFQ: Daily Sweet Intake (continuous)	561	.00	7.11	.55	.79	3.78	19.61
FFQ: Daily Sweet Intake (dichotomized)	561	.00	1.00	.27	.45	--	--
COPE: Avoidant Coping	557	1.00	4.00	1.68	.53	.88	.50

Note. DEBQ = Dutch Eating Behavior Questionnaire, PSS = Perceived Stress Scale, COPE = Brief COPE measure, FFQ = food frequency questionnaire, DEBQ: Emotional Eating was calculated from items 11, 13-22 of the Dutch Eating Behavior Questionnaire, PSS: Stress was composed of Perceived Stress Scale items 1-3, 6, and 9-10. Counter stress was composed of Perceived Stress Scale items 4, 5, 7, and 8, Daily Sweet Intake (dichotomized) was based on items 2–6 of the sweets subscale of the food frequency questionnaire.

Data analysis. Using a two-step modeling procedure as suggested by Anderson and Gerbing (1988), a confirmatory factor analysis was first conducted to establish the factor structure of each construct based on prior work with these measures (Carver, 1997; Cohen & Williamson, 1988, Doron et al., 2014, Meyer, 2001; Patterson et al., 1999; Wichianson et al., 2009; Van Strien et al., 1986; see Figures 1 – 11). At a minimum, a null model and at least one hypothesized factor structure model was tested for each construct. After establishing the factor structure for each construct, final structural regression models were estimated using FIML to simultaneously test the hypothesized direct and moderated relationships among stress, dietary intake, emotional eating, and coping (see Figures 12-13).

Evaluating Model Fit

The following model fit criteria would determine good model fit of each latent variable model: (1) comparative fit index [CFI] ≥ .95 (Hu & Bentler, 1999), (2) Tucker-Lewis Index [TLI] ≥ .95 (Tucker & Lewis, 1973), (3) root mean square error of approximation [RMSEA] ≤ .06 (Hu & Bentler, 1999), and (4) standardized root mean square residual [SRMR] ≤ .05 (Byrne, 1998). In addition, the following fit index cut-off values would indicate acceptable model fit: (1) CFI ≥ .90 (Bentler, 1990), (2) TLI ≥ .90 (Tucker & Lewis, 1973), (3) RMSEA ≤ .08 (Brown & Cudek, 1993; MacCallum et al, 1996; Byrne, 2006), and (4) SRMR ≤ .08 (Hu & Bentler, 1999).

Although the model chi-square test statistic (χ^2) is reported in the tables, little weight was given to this fit index as it tends to be biased when sample sizes are large (i.e., higher than 400; Kenny, 2015). Additionally, a fit index of weighted root mean square residual (WRMR; Yu, 2002) was used for the dietary intake measurement model. Weighted root mean square residual (WRMR) of 1.0 or lower, ideally less than .90, indicates better model fit, even under severe non-normality, as was the case with the dietary intake of sweets construct (Schreiber, Nora, Stage, Barlow, & King, 2006; Yu, 2002). However, this index has not been extensively studied and should be interpreted with caution. In addition, *p*-value of close fit for RMSEA is also provided in the tables. This index tests whether the RMSEA value is greater than .05 (Kline, 2016); if the *p*-value is statistically significant (i.e., < .05) then the null hypothesis of a close fit is rejected and the current model is deemed worse than close fitting. Akaike Information Criterion (AIC; Akaike, 1974) and Bayes Information Criterion (BIC; Rafferty, 1995) are reported for the final full structural models because other fit indices were not provided

due to the use of numerical integration for computations in MPLUS. Since the final model estimated both a single-indicator categorical outcome (i.e., dietary intake) and a continuous latent outcome (i.e., emotional eating) numerical integration was necessary (Wang & Wang, 2012). When using numerical integration to compute the model, MPLUS does not provide the typical fit indices for the model except for the log-likelihood value and information criteria (e.g., AIC, BIC) (Wang & Wang, 2012). Smaller AIC and BIC values indicate a better fitting model when compared to other models. In addition, models were evaluated for Heywood cases, interpretability of parameter estimates, and standardized residuals to screen for local misfit. In addition, modification indices were examined to determine if specific observed variables should be loaded on different factors (if theoretically plausible) or removed from the confirmatory factor analysis models. Furthermore, in order to avoid inaccurate conclusions, no single model fit index was relied upon to evaluate model fit. Instead, a more comprehensive approach which was based on multiple model fit indices was utilized to evaluate all latent variable models.

Chapter IV

Results

Descriptive Statistics for Study Variables

Descriptive information for all key study variables is shown in Tables 2 and 3 for the 572 undergraduate women in the final analysis sample.

Dietary intake of sweets in total study sample. In terms of sweets dietary intake, 27% of the undergraduate women were classified as high consumers (i.e., half a serving or more per day), 71% were classified as low consumers (i.e., less than half a serving per day) of sweet foods, and 2% of participants were missing data for this construct. Furthermore, when examining high and low consumers by racial/ethnic group, there were no statistically significant differences between racial/ethnic groups on being classified as a high or low consumer (see Table 3). To the author's knowledge, no prior study of sweet dietary intake gives specific breakdowns of high and low consumers for sweet intake using these specific items, making it difficult to compare intake of sweet foods of these college undergraduate women to other studies that used different food frequency questionnaires.

Dietary intake of sweets comparisons between racial/ethnic groups. Next, it was investigated whether the levels of dietary sweet intake differed between racial/ethnic groups.. The majority of the sample was either Hispanic (30%), Asian (29%) or Caucasian (24%). A chi-square test of independence was used to examine the association between racial/ethnic group and the dichotomized variable of dietary sweet intake. Results indicated no statistically significant differences in dietary sweet intake between

racial/ethnic groups (χ^2 (4, N = 559) = .746, p = .945, Cramer's V = .037; see Table 3). The literature suggests that there may be potential differences in dietary intake, specifically sweets between Caucasians and minorities (Satia, 2009). However, in the current study no differences were found in this sample of college students.

Table 3

Percentage of High and Low Dietary Sweet Consumers by Race/Ethnicity (N = 559)

Race/Ethnic Group	Low Consumer (*n* = 407)	High Consumer (*n* = 152)	Total (*n* = 559)
White/Caucasian - Non-Hispanic	75%	25%	136
Black/African American - Non-Hispanic	70%	30%	63
Asian - Non-Hispanic	70%	30%	162
Hispanic - Any Race	75%	25%	169
Other/Multi-racial/Multi-ethnic	72%	28%	29

Notes. Percentages indicate the proportion of consumers within that racial/ethnic category. 13 participants were missing data on dietary intake. 1 participant was missing their race/ethnicity, and an additional 1 participant identified as American Indian/Alaska Native – Non-Hispanic and was not included in the above analysis. High versus low consumer was based on items 2 – 6 of the sweets subscale of the food frequency questionnaire.

Emotional eating in total study sample. To make an accurate comparison of emotional eating scores, this study first used all 13 original emotional eating items to compute the average emotional eating score among the undergraduate women *(M* = 2.55, *SD* = 1.03), which means that the women, on average, reported seldom to sometimes engaging in emotional eating. Using these same 13 items, Van Strien et al.'s (1986) study found a slightly lower average emotional eating score of 2.06 (*SD* = .72) among women. However, in the current study, issues arose with the factor structure of the DEBQ and as such the emotional eating scale was reduced to an 11-item adjusted emotional eating scale (i.e., items 11, 13-22). Using these 11 items, the average emotional eating score for the current study was similar the original estimate using all items *(M* = 2.40, *SD* = 1.07,

see Table 2), which means that that the women, on average, still reported seldom to sometimes engaging in emotional eating. Overall, our female sample experienced a higher level of emotional eating behaviors than the women in the original DEBQ study, but lower amounts of emotional eating than some more recent studies among women such as Dutton and Dovey (2016; M = 2.56, SD = .85) and Dakanalis et al. (2013; M = 2.81, SD = .80).

Emotional eating comparisons between racial/ethnic groups. Next, a one-way analysis of variance (ANOVA) was conducted to test if there were differences among racial/ethnic groups in average levels of emotional eating. Overall, there were no significant differences among any of the racial/ethnic groups tested on emotional eating (using the final emotional eating subscale with 11 items; discussed more later; see Table 4).

Perceived stress total study sample comparisons. While the current study used a response scale of 1 to 5, the original PSS-10 total scores used a response scale of 0 to 4 so scores could range from 0 to 40. Thus, to compare the levels reported in the current study to those in other studies, averages are converted to the original response scale. In the current study, PSS total scores could range from 10 to 50 *(*M = 30.08, SD = 6.78; see Table 2), and when converted to the original response scale (0 to 4), the average level of total perceived stress was 29.08 (SD = 6.78). Comparatively, another study using a norming sample of 2,387 U.S. mostly Caucasian adults (27% were aged 18-29; 81% White, 4% Hispanic, 7% Black), the average PSS-10 score (response options 0-4) among females was 13.7 (SD = 6.6; Cohen & Williamson, 1988). Thus, the current sample of college women more frequently reported feelings of perceived stress than the average

female population. Considering the stressful environment of college and the increasing demands on college students, one would expect college students to report higher levels of stress than the average adult female. However, caution should be given as the morning sample was primarily comprised of people who identified as White, and studies show that minorities do tend to perceive themselves as more stressed (Williams, 2000).

Perceived stress college student sample comparisons. Other studies using college students have presented perceived stressed by summing items for each subscale. The current sample scored (using the 1 to 5 response scale), on average, a 3.15 (*SD* = .87) in terms of perceived helplessness/stress, and a 2.79 (*SD* = .74) in terms of a lack of perceived self-efficacy/counter stress. To compare to other studies which used sum scores for the subscales, the current study also created average sum scores for perceived helplessness *(M* = 12.92, *SD* = 5.19) and perceived lack of self-efficacy *(M* = 7.16, *SD* = 2.98). Compared to another sample of college students (Roberti et al., 2006; 82% Caucasian, 79% female), the current sample scored slightly, higher but similar in terms of perceived helplessness. Specifically, Roberti et al.'s (2006) study found lower but comparable levels of stress in terms of perceived helplessness *(M* = 12.09, *SD* = 4.72) and perceived lack of self-efficacy *(M* = 6.06, *SD* = 2.20). Thus, the current sample of college women reported higher perceived stress levels but comparable compared to another sample of college students.

Perceived stress comparisons between racial/ethnic groups. Next, another one-way analysis of variance (ANOVA) was conducted to test whether there… were differences among racial/ethnic groups on perceived stress levels (both total score and subscale scores). Overall, there were no significant differences among racial/ethnic

groups in levels of total perceived stress or the perceived helplessness stress subscale (6 items; see Table 4). There was however, a significant difference in perceived lack of self-efficacy subscale of stress ($F(4, 551) = 3.07$, $p = .016$) among racial/ethnic groups. Tukey's post-hoc analysis revealed that Caucasian women scored significantly lower in perceived lack of self-efficacy compared to Asian women ($M_D = -.30$, $SD = .09$, $p = .006$). More specifically, Caucasian women reported lower levels of lack of perceived stress self-efficacy than did Asian women (i.e., Asian women felt more stressed than did Caucasian women). No other racial/ethnic differences were observed within perceived lack of self-efficacy. This is different from what has been reported in the literature regarding comparisons in perceived long-term stress experiences across racial/ethnic groups. One study found that White/Caucasian students reported the highest stress scores and Asian women were the least stressed (Turnerx & Smith, 2015).

Avoidant coping college student sample comparisons. In terms of coping, participants reported low amounts of avoidant coping *(M* = 1.68, *SD* = .53; see Table 2). Women in the present study reported engaging in avoidant coping, on average, not at all to a little bit. Comparatively, this study had low amounts of avoidant coping behaviors reported; a sample of French college students (Doron et al., 2014; 57% female) found that, on average, students had higher levels of avoidant coping *(M* = 2.82, *SD* = .96) behaviors than the current study *(M* = 1.68, *SD* = .53). Currently, no study using the Doron et al.'s (2014) version of the Brief COPE among U.S. college students reports the higher-level coping averages (e.g., avoidant coping). **E**

Avoidant coping comparisons between racial/ethnic groups. Next, a one-way analysis of variance (ANOVA) was conducted to test if there were differences among

racial/ethnic groups in average levels of avoidant coping. Overall, there were no significant differences among any of the racial/ethnic groups tested on avoidant coping; see Table 4).

Table 4

Analysis of Variance between Racial/Ethnic Groups on Key Variables (N = 556)

Variable	df (between, within)	F	η^2	p
DEBQ: Emotional Eating (11 items)	4, 551	1.60	.012	.172
PSS: Sum Score of Perceived Stress	4, 551	.11	.001	.981
PSS: Counter stress (Lack of self-efficacy)	4, 551	3.07	.022	.016
PSS: Stress (Perceived helplessness)	4, 551	1.10	.008	.360
COPE: Avoidant Coping	4, 550	.13	.001	.970

Notes. η^2 = partial-eta squared. Key variables wee compared between the following five racial/ethnic groups: White/Caucasian, Black/African American, Hispanic, Asian, Other/Multi-racial. One participant was excluded from this analysis as they were the only respondent for American Indian/Alaska Native and one participant did not report on their race/ethnicity and was also left out of the analysis. DEBQ = Dutch Eating Behavior Questionnaire, PSS = Perceived Stress Scale, COPE = Brief COPE measure, FFQ = food frequency questionnaire, DEBQ: Emotional Eating was calculated from items 11, 13-22 of the Dutch Eating Behavior Questionnaire, PSS: Stress was composed of Perceived Stress Scale items 1-3, 6, and 9-10. Counter stress was composed of Perceived Stress Scale items 4, 5, 7, and 8.

Correlations between key study variables. Finally, prior to testing the factor structures of each model using confirmatory factor analysis, correlations of key variables were analyzed and can be found in Table 5. The correlation between the two stress factors was significant but smaller (r = .32) than what has previously been found between these two factors in a sample of primarily Caucasian (82%) college students (Roberti et al., 2006, r = .65). Another interesting finding was that, as expected, avoidant coping was significantly associated with dietary intake of sweets, emotional eating, stress (perceived helplessness), and counter stress (perceived lack of self-efficacy).

Table 5

Inter-correlations among Key Variables

Variable	1	2	3	4	5
1. Age	--				
2. DEBQ: Emotional Eating[a]	.03				
3. PSS: Counter stress (lack of self-efficacy)	-.10*	.07			
4. PSS: Stress (Perceived helplessness)	-.05	.32**	.33**		
5. COPE: Avoidant Coping	-.01	.32**	.31**	.56**	
6. FFQ: Sweet Dietary Intake[b]	-.03	.18**	.04	.06	.09*

Notes. * p < .05, ** p < .01; DEBQ = Dutch Eating Behavior Questionnaire, PSS = perceived stress questionnaire, COPE = brief COPE, FFQ = food frequency questionnaire. [a] = emotional eating was averaged across items 11, 13-22; [b] sweet dietary intake was calculated based on five of the original six items (items 2-6).

Latent Variable Analysis

Using MPLUS (Version 8; Muthén & Muthén, 1998-2017), confirmatory factor analysis (CFA) was used to examine the factor structure for each key construct separately (i.e., dietary intake of sweets, stress, emotional eating, and coping) based on prior work with these measures (Carver, 1997; Cohen & Williamson, 1988, Doron et al., 2014, Meyer, 2001; Patterson et al., 1999; Wichianson et al., 2009; Van Strien, Frijters, Bergers, & Defares, 1986). The factor structure for each construct was evaluated separately. Multiple model specifications were tested for each construct. Next, the best fitting model for each construct was used in final structural regression model to evaluate the structural relationships between constructs of interest (i.e., stress, coping, emotional eating, and dietary intake of sweets).

Factor structure of the dietary intake of sweets measure. Dietary intake of sweets was measured with six-items which were hypothesized to load on a single factor latent construct (see Figure 1) based on how this food frequency is typically scored in the literature (Fred Hutchinson Cancer Research Center, 2010; Patterson et al., 1999). Due to the ordinal nature of the response categories and the severe skewness associated with the observed responses, mean- and variance-adjusted weighted least squares (WLSMV) was used as the estimator (Kline, 2016) during the confirmatory factor analysis for the dietary intake construct. In addition, WRMR as opposed to SRMR (which is not available for WLSMV estimation) was used as an additional fit index. For M2: One-factor (unadjusted) model's (see Table 6) fit indices, everything but the RMSEA point estimate and confidence interval was within the acceptable ranges (WLSMV χ^2 (9) = 67.05, $p <$ .001, CFI = .955, TLI = .925, RMSEA = .107 [.084 - .132], WRMR = .787). Additionally, since model-chi square estimates tend to be biased with large (i.e., > 400) sample sizes, it was determined that the other model fit indices (not including RMSEA) were within the acceptable ranges. However, after examining the proportion of explained variance (r^2) for each of the six items (estimates not shown), most items displayed low proportions of explained variance ($r^2 < .30$; Moore, Notz, & Flinger, 2013) especially the first item (i.e., "low or nonfat frozen desserts"). The latent factor accounted for a very low proportion of explained variance in this item ($r^2 = .15$). An adjusted model (see Figure 2) removing this item was tested and compared to the original model (see Tables 6-7). While the latent factor for sweet dietary intake accounted for a low proportion of explained variance in the other items ($r^2 < .50$; see Table 7), these items had significant r^2 values greater .30, which, while weak, are still acceptable (Moore, Notz, & Flinger,

2013). This model fit the data within the acceptable ranges and offered an improved fit (WLSMV χ^2 (5) = 23.59, p < .001, CFI = .984, TLI = .967, RMSEA = .081 [(.050 - .116], WRMR = .507) compared to the original model. Furthermore, the RMSEA estimate was improved in this model. Thus, this adjusted model (M3) was used to support the notion that a single-factor structure was tenable using five items instead of the original six. Thus, sweet food consumption, was included as a single-indicator construct in the final structural regression analysis.

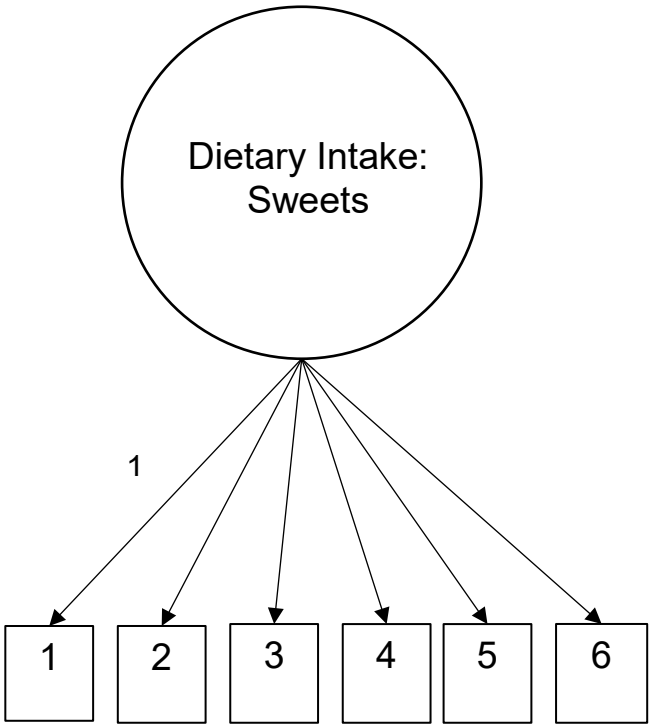

Figure 1. Hypothesized Single-Factor Confirmatory factor analysis (CFA) model for dietary intake of sweets. Residual variances not shown for visual clarity.

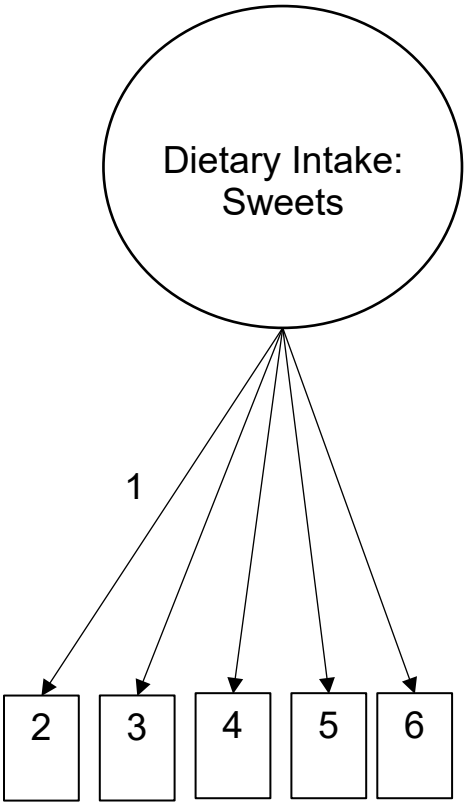

Figure 2. Adjusted CFA model for dietary intake of sweets. This model removed item 1 (low/nonfat desserts). Residual variances not shown for visual clarity.

Table 6

Fit Statistics for Weighted Least Squares Model for Estimated Dietary Intake of Sweets (N = 561)

	WLSMV χ^2 [a]	df	NFParm	CFI	TLI	RMSEA (90% CI)	WRMR
M1: Null model	1300.99***	15	--	--	--	--	--
M2: One-factor model	67.05***	9	54	.955	.925	.107 (.084-.132) close-fit p < .001	.787
M3: Adjusted one-factor model	23.59***	5	45	.984	.967	.081 (.050-.116) close-fit p = .049	.507

Notes. *p < .05. ** p < .01. *** p < .001. WLSMV = mean- and variance-adjusted weighted least squares; $\chi 2$ = chi-square, df = degrees of freedom, NFParm = number of free parameters, CFI = comparative fit index, TLI = Tucker-Lewis Index, RMSEA = root mean square error of approximation, WRMR = weighted root mean square residual. [a] When using the WLSMV estimator, traditional chi-square difference tests cannot be calculated in the traditional manner.

Table 7

Parameter Estimates for Adjusted One-factor Sweet Food Consumption CFA Model (N = 561)

Item	Unstandardized estimate (SE)	*p* value	Completely standardized estimate	R^2
Factor Loadings				
Sweets (α = .62)				
2. Ice cream and milkshakes	1.00 (.00)	--	.60	.36
3. Pudding, custard and flan	1.07 (.08)	p < .001	.64	.42
4. Doughnuts, pies and pastries	1.22 (.08)	p < .001	.74	.54
5. Chocolate, candy bars and toffee	1.05 (.07)	p < .001	.63	.40
6. Other candy	1.03 (.07)	p < .001	.62	.39

Notes. R^2 = proportion of explained variance; α = Cronbach's alpha; Unstandardized factor loading for Item 1 was fixed to the value "1" for identification purposes. Thresholds are the point where a latent response variable, y*, is set to be where y = 1 if the threshold is exceeded and y = 0 if it is not. The proportion of variance explained is the how much of the response variables are by explained by the latent factor. 11 cases had missing data and were not included in the analysis.

Eating Behaviors - Emotional Eating

Using Van Strien et al.'s (1986) Dutch Eating Behavior Questionnaire (DEBQ), all 33 items were specified to load on their hypothesized subscale (i.e., restrained eating, emotional eating, and external eating latent factors). This factor structure (see Figure 3) was based on the previous work of Van Strien and colleagues (1986), and other studies who have found a three-factor structure (Cebolla, Barrada, Van Strien, Oliver, & Baños, 2014; Dutton & Dovey, 2016). However, each of these studies used a different approach to support their factor structure; for example, the original articles used a varimax factor analysis (Van Strien et al., 1986), Cebolla and colleagues (2014) used exploratory structural equation modeling, and Dutton and Dovey (2016) used exploratory factor analysis. Moreover, certain studies indicate that while a three-factor structure fits the data well, some of the items are problematic and experience low or cross-loadings (Dutton & Dovey, 2016).

Using MPLUS's maximum likelihood estimator (ML), the original three-factor structure hypothesized by Van Strien et al. (1986) did not fit the data well (χ^2 (492) = 2737.32, $p < .001$, CFI = .840, TLI = .828, RMSEA = .089 [.086-.093], SRMR = .066; see Table 8). Subsequently, an exploratory factor analysis was conducted to investigate low item loadings, cross-loadings, and/or a different factor structure altogether. Factor loading criteria was set at $\geq$.32 (see Tabachnick & Fidell, 2001) and a limit of $\leq$ .25 was set for cross-loadings onto other factors. Previous studies with the DEBQ have found similar issues where four and five factor solutions have been identified, but that these other factors accounted for very little added variance and instead opted for a simpler three-factor solution (Wardle, 1987). In line with other studies, EFA results for this

sample found solutions of up to five factors that added very little variance. Furthermore, EFA results indicated that the three-factor model did fit the data acceptably; however, there were several items that had low loadings and/or cross-loaded onto different subscales. The original items of 12, 23, and 31 were removed due to these issues and provided an adequate, slightly better fitting model. This new adjusted model (see Figure 4) was tested using confirmatory factor analysis (CFA) and still did not adequately fit the data (χ^2 (432) = 2013.64, $p < .001$, CFI = .877, TLI = .867, RMSEA = .080 [.077-.084], SRMR = .056) according the previously set model fit criteria.

Because none of these models fit the data acceptable, a separate CFA was conducted using just the items for the emotional eating subscale since this was the construct of interest (see Tables 9 and 10). Previous studies have used a single subscale independently for the restraint eating subscale (Laessle, Tuschl, Kotthaus, & Prike, 1989), and the emotional eating subscale (Lowe et al., 2006). Again, using all the original items for the emotional eating subscale (i.e., items 11-23; see Figure 5), the model did not fit the data well (χ^2 (65) = 1201.71, $p < .001$, CFI = .837, TLI = .805, RMSEA = .177 [.168-.186], SRMR = .066). Next, an adjusted model using the revised factor structure from the EFA for just the emotional eating subscale (i.e., removing items 12 and 23 for this subscale) was analyzed (see Figure 6). This model fit was marginally acceptable (χ^2 (33) = 641.03, $p < .001$, CFI = .900, TLI = .875, RMSEA = .156 [.145-.167], SRMR = .043) and was used in the final structural regression analysis. One reason this model has a high RMSEA is that this fit index tends to be higher in models with smaller degrees of freedom (Kenny, Kaniskan, & McCoach, 2015). While this marginally acceptable model

was the best fitting model for the emotional eating construct, results need to be interpreted with caution pending further independent cross-validation.

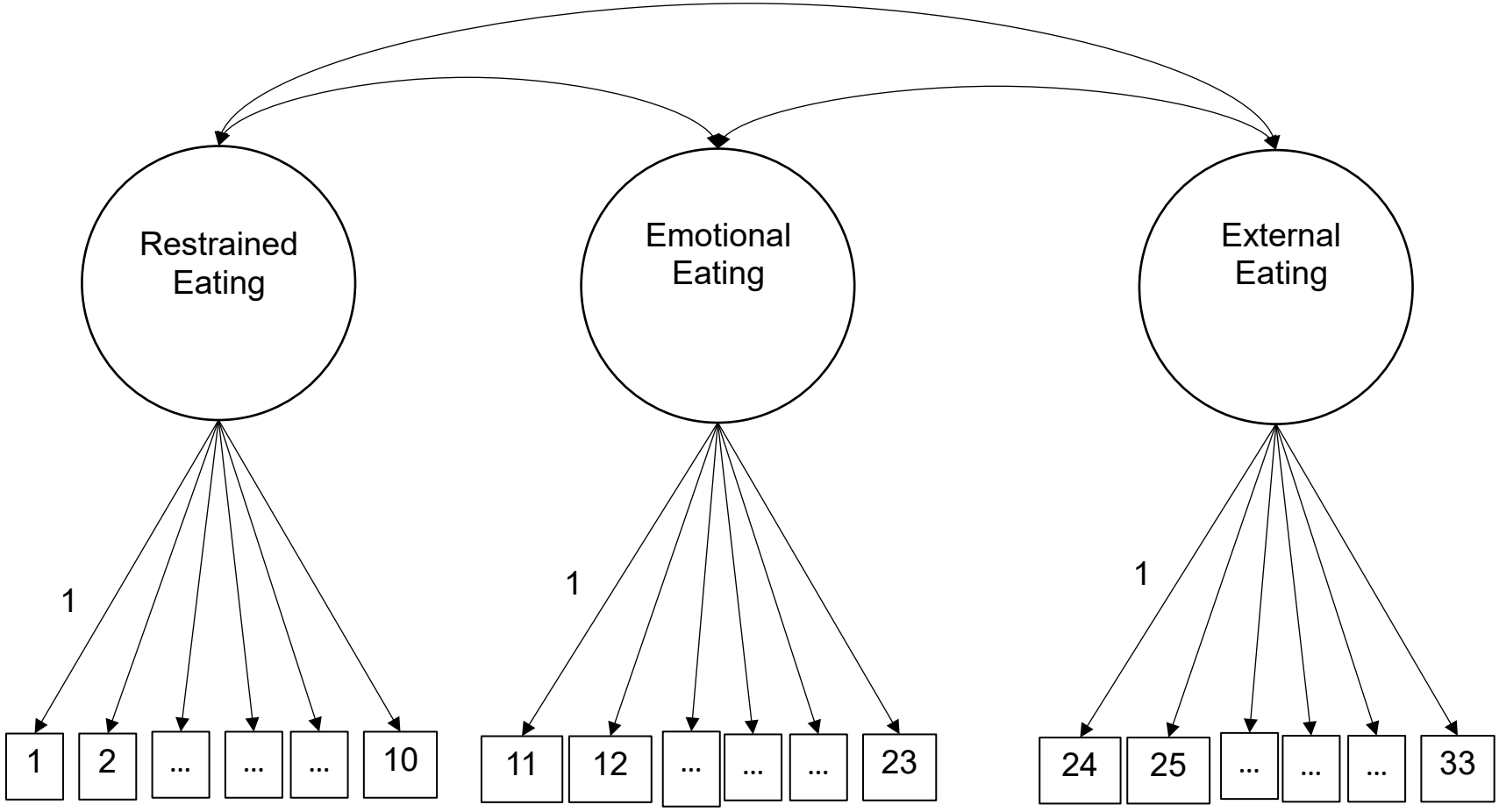

Figure 3. CFA model for Dutch Eating Behavior Questionnaire. Model is based on Van Strien et al.'s (1986) original 33 –item factor structure for the scale. Restrained eating has 10 items (1-10), emotional eating has 13 items (11-23), and external eating has 13 items (24-33). Residual variances not shown for visual clarity.

Table 8

Fit Statistics for Maximum Likelihood Estimated DEBQ Model (N = 558)

	$\chi 2$	df	NFParm	CFI	TLI	RMSEA (90% CI)	SRMR
M1: Null model	14739.69***	528	--	--	--	--	--
M2: Three-factor model	2737.32***	492	102	.840	.828	.089 (.086-.093) close-fit p < .001	.066
M3: Three-factor adjusted model	2013.64***	432	95	.877	.867	.080 (.077 - .084) close-fit p < .001	.056

Note. *p < .05, **, p < .01, *** p < .001; χ^2 = chi-square, df = degrees of freedom, NFParm = number of free parameters, CFI = comparative fit index, TLI = Tucker-Lewis Index, RMSEA = root mean square error of approximation, SRMR = standardized root mean square residual.

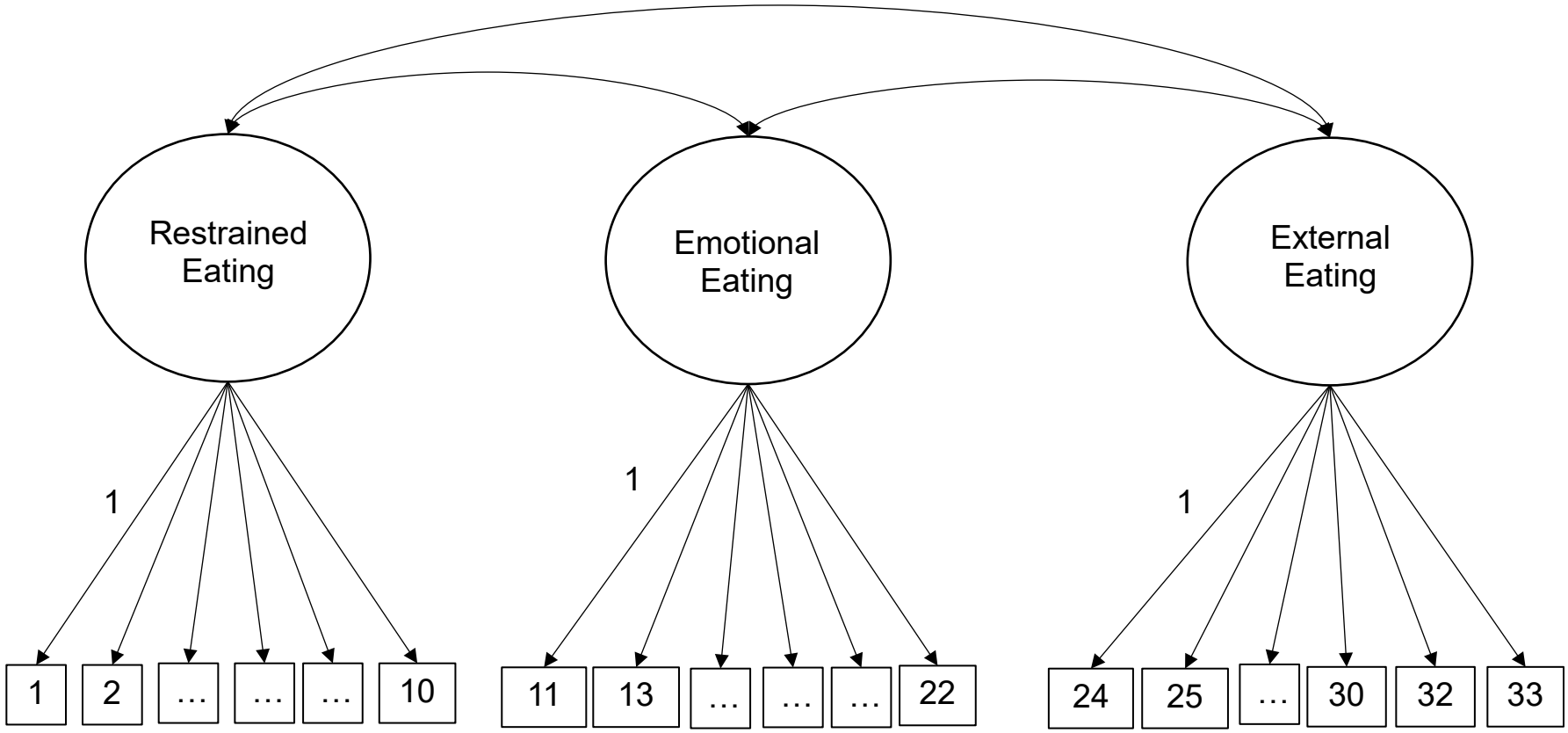

Figure 4. Adjusted CFA model for Dutch Eating Behavior Questionnaire. Model is based on exploratory factor analysis which indicated that several items had low and or problematic cross-loadings. Original items 12, 23, and 31, were ultimately removed. Restrained eating has 10 items (1-10), emotional eating has 11 items (11, 13-22), and external eating has 9 items (24-30, 32-33). Residual variances not shown for visual clarity.

Table 9
Fit Statistics for Maximum Likelihood Estimated Model of DEBQ: Emotional Eating Subscale (N = 558)

	$\chi 2$	df	NFParm	CFI	TLI	RMSEA (90% CI)	SRMR
M1: Null model	7065.04***	78	--	--	--	--	--
M2: Original subscale (items 11-23)	1201.71***	65	39	.837	.805	.177 (.168-.186) close-fit $p < .001$	.066
M3: Adjusted model (items 11, 13-22)	641.03***	33	44	.900	.875	.156 (.145-.167) close-fit $p < .001$	.043

Note. *$p < .05$, **, $p < .01$, *** $p < .001$; $\chi 2$ = chi-square, df = degrees of freedom, NFParm = number of free parameters, CFI = comparative fit index, TLI = Tucker-Lewis Index, RMSEA = root mean square error of approximation, SRMR = standardized root mean square residual.

Table 10
Parameter Estimates for the Adjusted DEBQ: Emotional Eating Scale (N = 558)

Item	Unstandardized estimate (SE)	*p* value	Completely standardized estimate	R^2
Factor Loadings				
Emotional Eating (α = .96)				
11. Do you have the desire to eat when you are irritated?	1.00 (.00)	--	.68	.46
13. Do you have a desire to eat when you are depressed or discouraged?	1.26 (.07)	p < .001	.84	.70
14. Do you have a desire to eat when you are feeling lonely?	1.29 (.07)	p < .001	.86	.74
15. Do you have a desire to eat when somebody lets you down?	1.32 (.07)	p < .001	.90	.81
16. Do you have a desire to eat when you are cross?	1.04 (.06)	p < .001	.78	.60
17. Do you have a desire to eat when you are approaching something unpleasant to happen?	1.20 (.07)	p < .001	.87	.75
18. Do you get the desire to eat when you are anxious, worried or tense?	1.21 (.07)	p < .001	.80	.65
19. Do you have a desire to eat when things are going against you or when things have gone wrong?	1.28 (.07)	p < .001	.88	.78
20. Do you have a desire to eat when you are frightened?	.80 (.05)	p < .001	.70	.49
21. Do you have a desire to eat when you are disappointed?	1.23 (.07)	p < .001	.87	.75
22. Do you have a desire to eat when you are emotionally upset?	1.25 (.07)	p < .001	.84	.71

Note. *p < .05, **, p < .01, *** p < .001; R^2 = proportion of explained variance; α = Cronbach's α; Unstandardized factor loadings for Item 11 was fixed to "1" for identification purposes. DEBQ = Dutch Eating Behavior Questionnaire; 14 cases were dropped from analysis due to missing data.

Figure 5

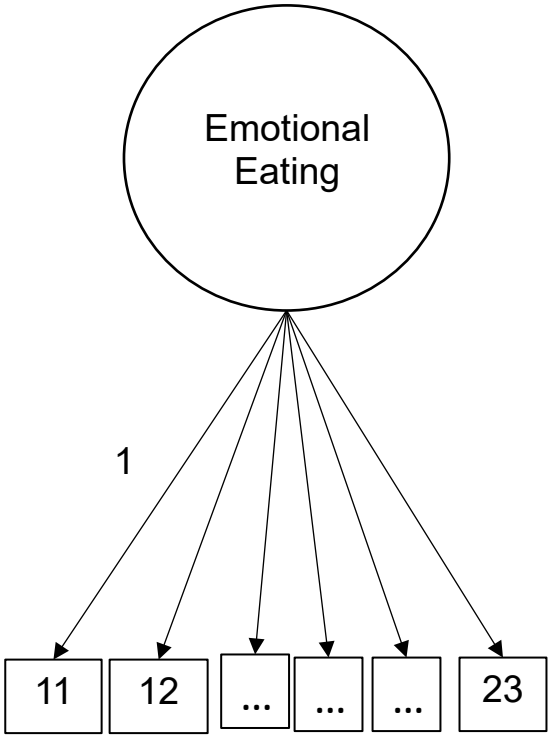

Figure 5. CFA model for Dutch Eating Behavior Questionnaire Emotional Eating Subscale. Mode l is based on Van Strien et al.'s (1986) original emotional eating factor structure for the subscale. Emotional eating has 13 items (11-23). Residual variances not shown for visual clarity.

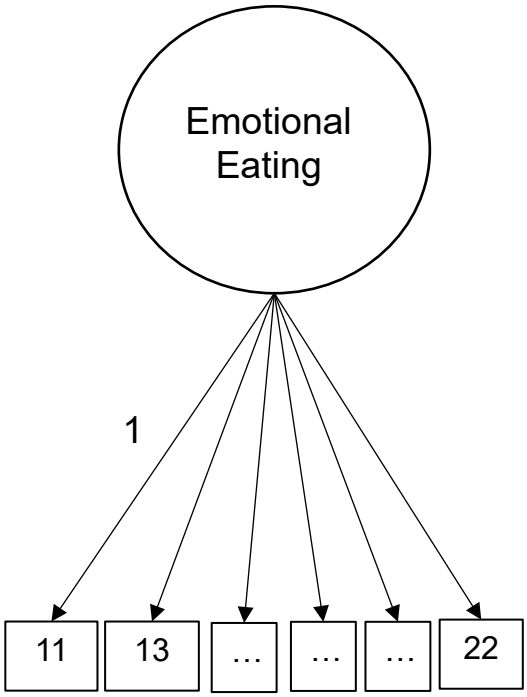

*Figure 6. A*djusted CFA model for Dutch Eating Behavior Questionnaire Emotional Eating Subscale. Model is based on exploratory factor analysis which indicated that several items had low and or problematic cross-loadings. Original items 12 and 23, were ultimately removed from the subscale. Emotional eating has 11 items (11, 13-22). Residual variances not shown for visual clarity.

Perceived Stress

Using Cohen and Williamson's (1988) 10-item Perceived Stress Scale (PSS) and based on the validation work of Barbosa-Leiker et al. (2013) and Roberti et al. (2006), perceived stress had two hypothesized correlated subscales: stress/perceived helplessness (six items) and counter stress/lack of perceived self-efficacy (four items) which were loaded on each respective construct (see Figure 7). Using MPLUS's maximum likelihood estimator (ML), this two-factor model (see Tables 11 and 12) fit the data well (χ^2 (34) = 139.09, $p < .001$, CFI = .964, TLI = .952, RMSEA = .072, SRMR = .040) and was used in the final structural regression analysis.

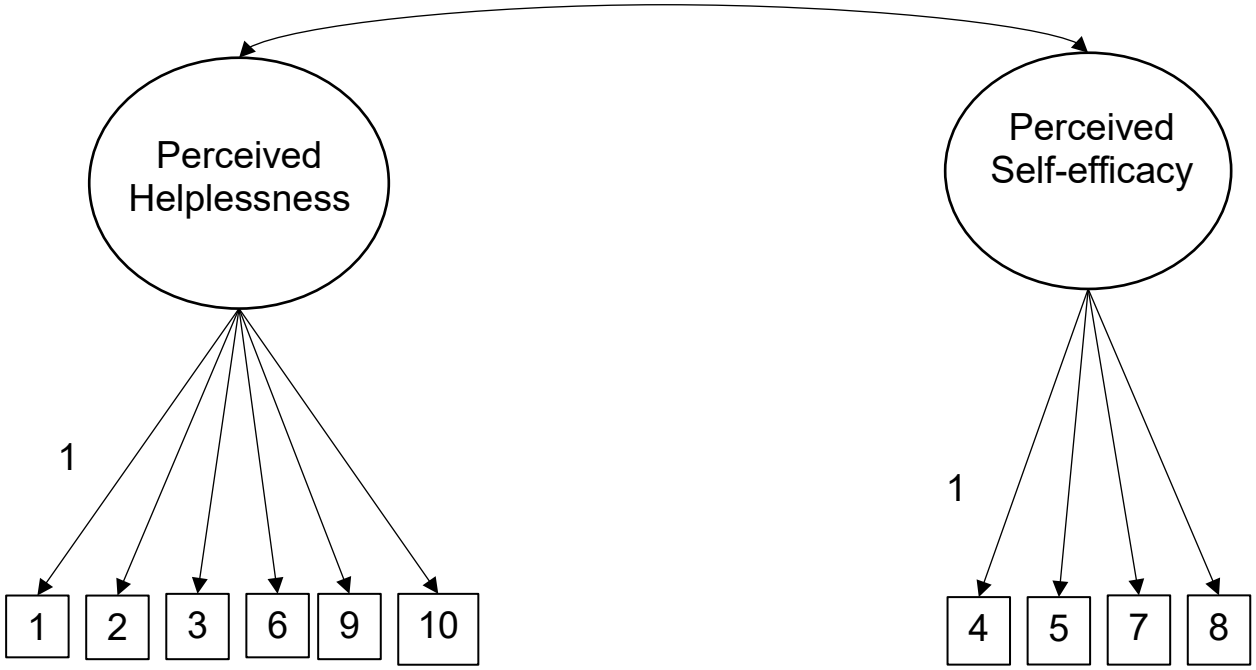

Figure 7. CFA model for two-factor model of perceived stress. Model is based on Robert et al. (2006) who have indicated a two-factor structure of this scale consisting of a stress/perceived helplessness factor and a counter stress/perceived self-efficacy factor. Items for perceived self-efficacy are reversed coded so that higher numbers reflect a perceived lack of self-efficacy. Residual variances not shown for visual clarity

Table 11

Fit Statistics for Maximum Likelihood Estimated Two-Factor CFA Model of Perceived Stress (N = 558)

	$\chi 2$	df	NFParm	CFI	TLI	RMSEA (90% CI)	SRMR
M1: Null model	2775.49***	45	--	--	--	--	--
M2: Two-factor model	126.75***	34	31	.966	.955	.069 (.057-.082) close-fit p = .007	.040

Note. *p < .05, **, p < .01, *** p < .001; $\chi 2$ = chi-square, df = degrees of freedom, NFParm = number of free parameters, CFI = comparative fit index, TLI = Tucker-Lewis Index, RMSEA = root mean square error of approximation, SRMR = standardized root mean square residual.

Table 12

Parameter Estimates for Two-Factor Model of Perceived Stress (N = 558)

Item	Unstandardized estimate (SE)	p-value	Completely standardized estimate	R^2
Factor Loadings				
Perceived Helplessness (α = .90)				
1. Upset because of something that happened unexpectedly	1.00 (.00)	--	.77	.59
2. Unable to control the important things in your life	1.17 (.06)	p < .001	.81	.66
3. Felt nervous and "stressed"	.97 (.06)	p < .001	.72	.52
6. Could not cope with all the things that you had to do	1.14 (.06)	p < .001	.77	.59
9. Been angered because of things that were outside of your control	1.07 (.06)	p < .001	.75	.57
10. Felt difficulties were piling up so high that you could not overcome them	1.32 (.07)	p < .001	.82	.67
Perceived (lack of) Self-efficacy (α = .81)				
4. Felt confident about your ability to handle personal problems	1.00 (.00)	--	.74	.55
5. Felt that things were going your way	1.04 (.06)	p < .001	.82	.68
7. Been able to control irritations in your life	.83 (.06)	p < .001	.61	.37
8. Felt that you were on top of things	.98 (.06)	p < .001	.73	.54
Factor Covariances				
Perceived Helplessness ↔ Perceived (lack of) Self-efficacy	.20 (.03)	p < .001	.40***	--

Note. *p < .05, **, p < .01, *** p < .001; R^2 = proportion of explained variance; α = Cronbach's α; Unstandardized factor loadings for Items 1 and 4 fixed to "1" for identification purposes. Items 4, 5, 7, and 8 were reversed coded to where increasing scores reflected increasing lack of perceived self-efficacy (and subsequently more stress). 14 cases were dropped from analysis due to missing data.

Stress Coping

For stress coping, the factor structure of Carver's (1997) Brief COPE was evaluated; all models were estimated using MPLUS' maximum likelihood estimator (ML). Four models with different hypothesized factor structures were compared. First, based on the work of Meyer (2001) and Wichianson et al. (2009) which divided the COPE into adaptive and maladaptive subscales, a correlated two factor solution was specified (see Figure 8). These factors were specified to be correlated as prior work (Meyer, 2001) found that composites of adaptive and maladaptive strategies using the Brief COPE were positively moderately related. This model (see Table 13) did not fit the data (χ^2 (349) = 3674.45, $p < .001$, CFI = .539, TLI = .501, RMSEA = .131 [.127, .135], SRMR = .110). Next, a partially correlated three-factor coping model (i.e., problem-focused, emotion-focused, and avoidant coping; see Figure 9) as suggested by Hasking, Lyvers, and Carlopio (2011) was evaluated. Only problem-focused and emotion-focused coping were specified to be correlated based on previous work that found a moderate positive correlation between the two constructs (Hasking et al., 2011). This model also fit the data poorly (χ^2 (352) = 3221.69, $p < .001$, CFI = .602, TLI = .573, RMSEA = .121 [.117, .125], SRMR = .136). Next, a four-factor coping model (i.e., engagement, distraction, disengagement, cognitive reframing; see Figure 10) based on work by Benson (2010) was tested. All factors were specified as uncorrelated as Benson (2010) did not explicitly specify any correlations among factors. Again, this model did not fit the data (χ^2 (345) = 3319.07, $p < .001$, CFI = .590, TLI = .551, RMSEA = .124 [.120, .127], SRMR = .106). Finally, based on the work of Doron et al. (2014) a fifth model (see Figure 11) with five higher order factors was tested. All higher order factors were

specified to be correlated with each other based on Doron et al.'s (2014) work. This model demonstrated improved fit (χ^2 (326) = 987.42, $p < .001$, CFI = .908, TLI = .894, RMSEA = .060 [.056, .065], SRMR = .070) compared to the other models, however while the fit was not ideal, model fit criteria were within the acceptable range (see Table 13). Parameter estimates for this model can be found in Table 14. The best fitting and most parsimonious was model five (i.e., five higher order factor model). These five subscales were then investigated via correlational analysis to see which, if any, best related to dietary intake of sweets, emotional eating, and stress subscales. Since the current study was interested in investigating different types of emotion focused coping (which could include avoidant coping) and because of its revealed correlational association, a singular component (i.e., avoidant coping higher order factor) was then used in the final structural regression model as a potential moderator of the relationships between 1) stress and dietary intake of sweets, and 2) stress and emotional eating.

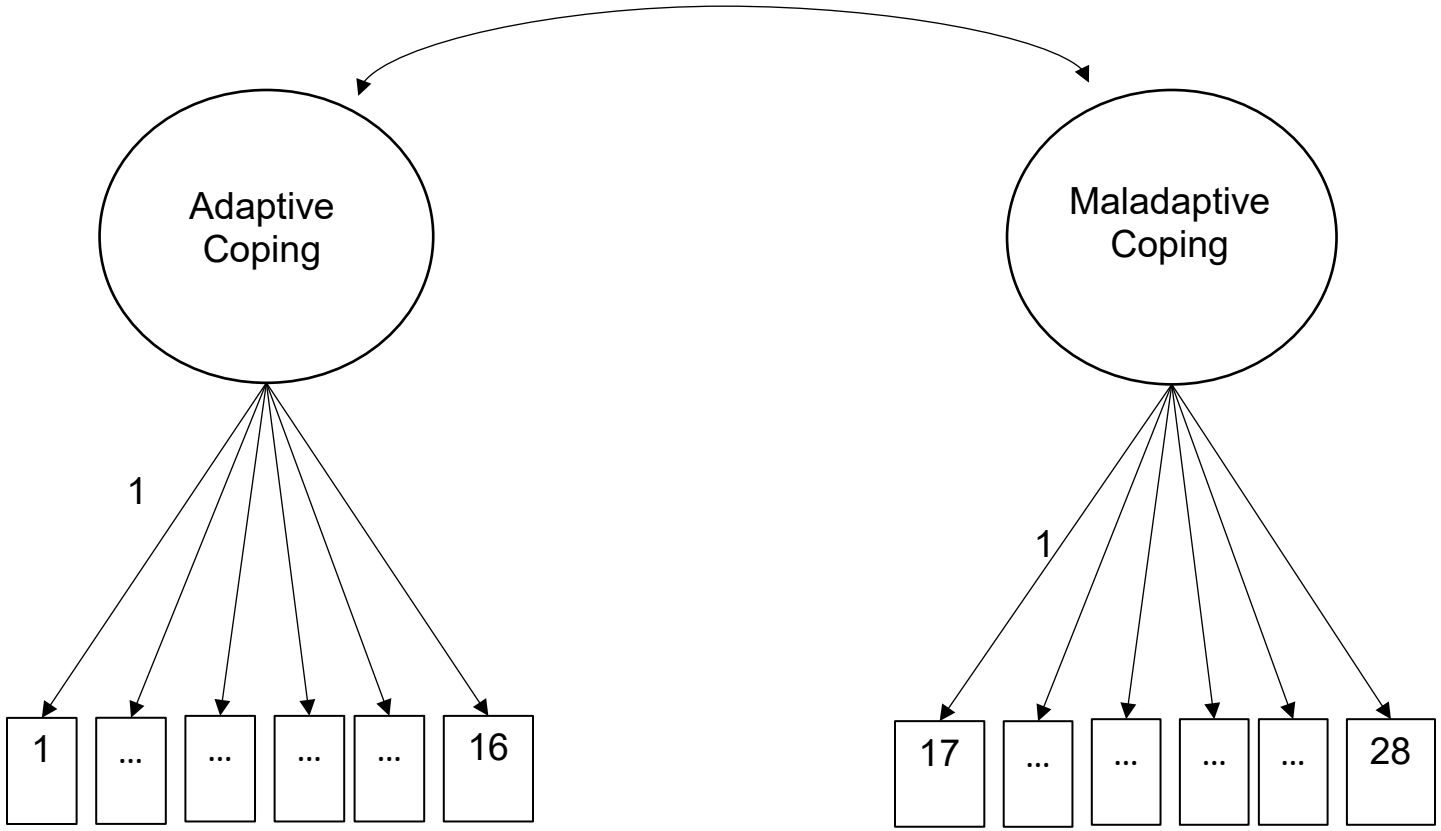

Figure 8. CFA model for two-factor model of coping. Adaptive and maladaptive coping subscales were created based on Meyer (2001) and Wichianson, et al. (2009). This model used all 28 original Brief COPE items. Adaptive coping contained 16 items from the original subscales of humor, acceptance, religion, positive reframing, instrumental support, active coping, planning, and use of emotional support. Maladaptive coping contained 12 items from the six original subscales of self-distraction, self-blame, venting, substance use, behavioral disengagement, and denial. Factors were specified as correlated based on prior work (Meyer, 2001). Residual variances not shown for visual clarity.

Table 13

Fit Statistics for Maximum Likelihood Estimated Models of Perceived Coping (N = 557)

	$\chi 2$	df	NFParm	CFI	TLI	RMSEA (90% CI)	SRMR
M1: Null model	7590.56***	378	--	--	--	--	--
M2: Two-factor model	3674.45***	349	85	.539	.501	.130 (.127, .135) close fit p < .001	.110
M3: Three-factor model (Hasking et al., 2011)	3221.69***	352	82	.602	.573	.121 (.117, .125) close fit p < .001	.136
M4: Four-factor model (Benson, 2010)	3319.07***	345	89	.590	.551	.124 (.120, .127) close fit p < .001	.106
M5: Five-factor higher order model (Doron et al., 2014)	987.42***	326	108	.908	.894	.060 (.056, .065) close fit p < .001	.070

Notes. *p < .05, **, p < .01, *** p < .001; χ^2 = chi-square, df = degrees of freedom, NFParm = number of free parameters, CFI = comparative fit index, TLI = Tucker-Lewis Index, RMSEA = root mean square error of approximation, SRMR = standardized root mean square residual.

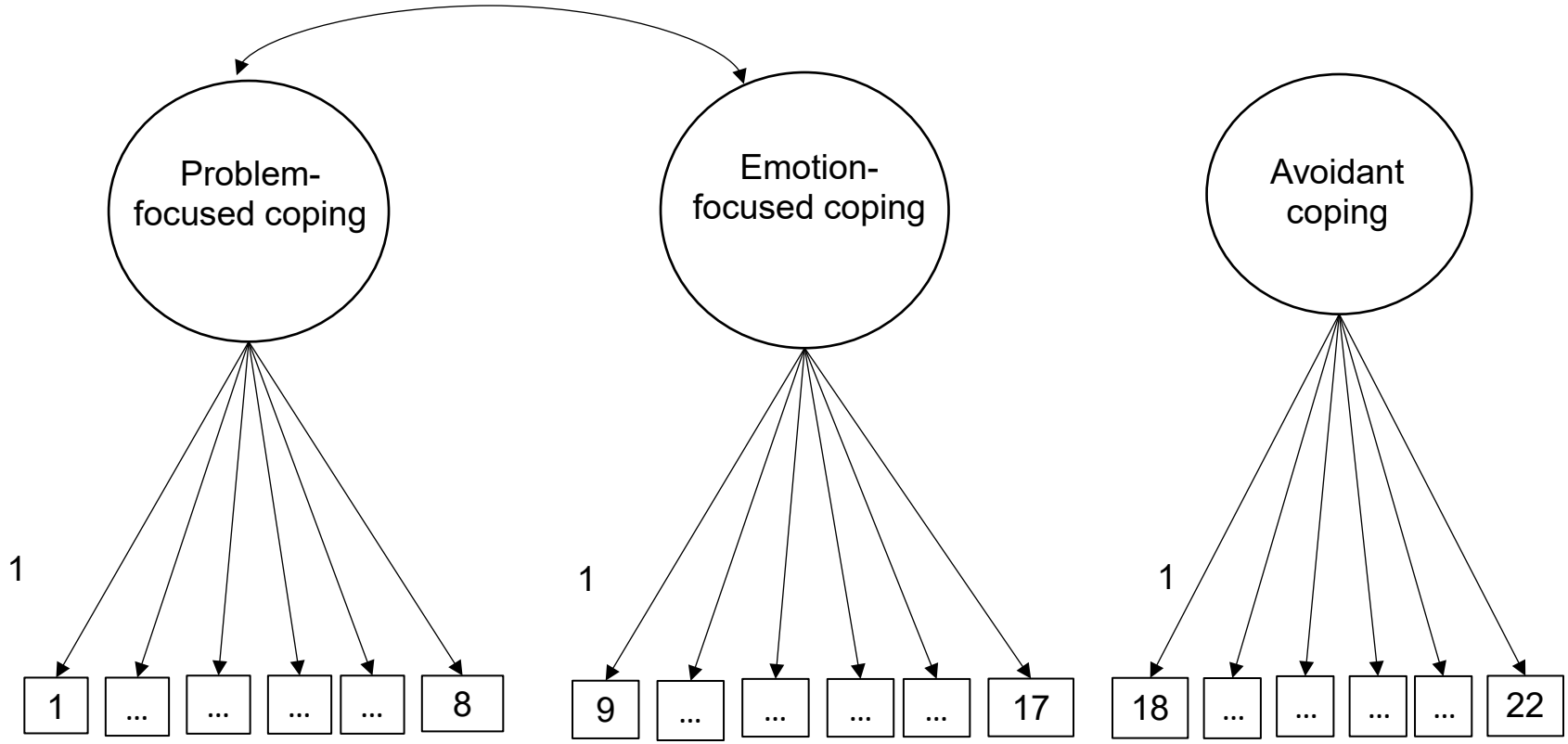

Figure 9. CFA model for three-factor model of coping. Coping subscales were created based on Hasking, Lyvers, and Carlopio (2011). This model used 22 of the original 28 Brief COPE items. Problem-focused coping contained 8 items from the original subscales of self-distraction, humor, self-blame, and venting. Emotion-focused coping contained 8 items from the original subscales of instrumental support, active coping, planning, and use of emotional support. Avoidant coping contained 6 items from the original subscales of substance use, behavioral disengagement, and denial. Only a correlation between problem and emotion-focused coping was specified. All other factors were left uncorrelated based on prior work (Hasking et al., 2011). Residual variances not shown for visual clarity.

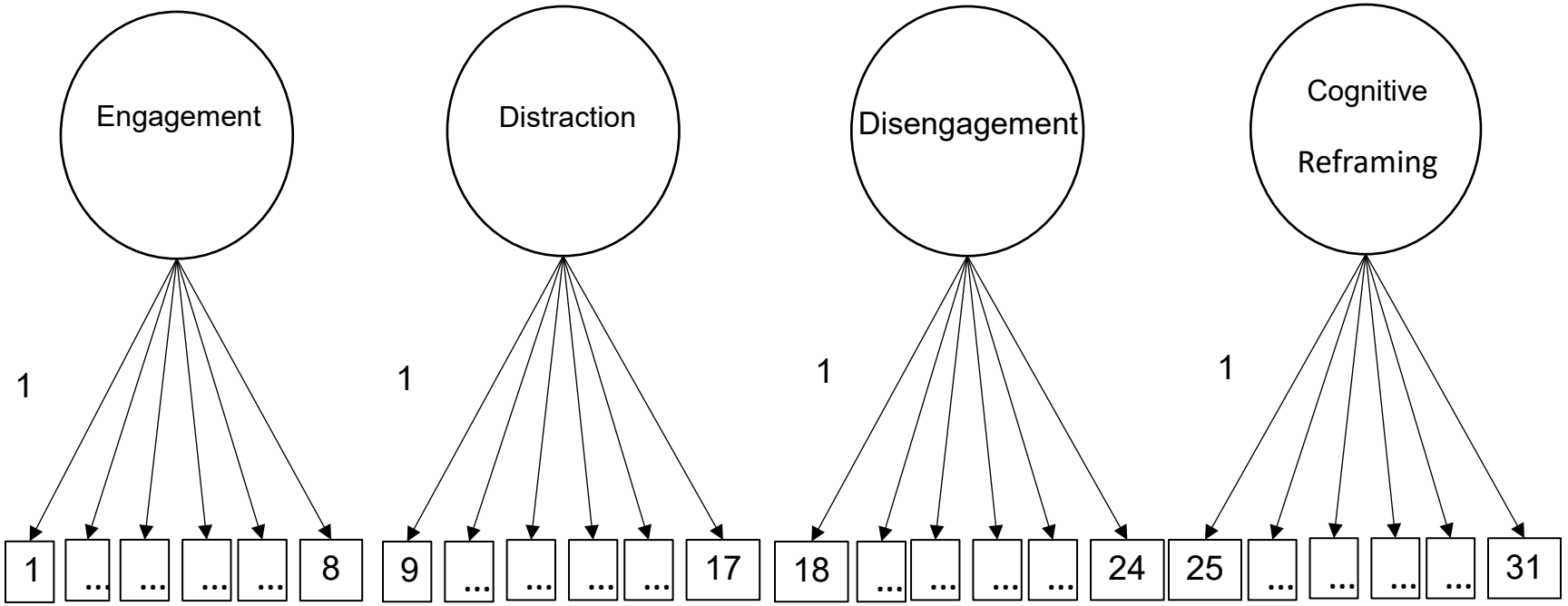

Figure 10. CFA model for four-factor model of coping. Coping subscales were created based on Benson (2010). This model used all 28 original Brief COPE items. Engagement coping contained 8 items from the original subscales of instrumental support, active coping, planning, and use of emotional support. Distraction coping contained 8 items from the original subscales of self-distraction, humor, self-blame, and venting. Disengagement coping contained 6 items from the original subscales of substance use, behavioral disengagement, and denial. Cognitive reframing coping contained 6 items from the original subscales of acceptance, religion, and positive reframing. Factors were specified as uncorrelated as prior work (Benson, 2010) did not explicitly specify any relationships between them. Residual variances not shown for visual clarity.

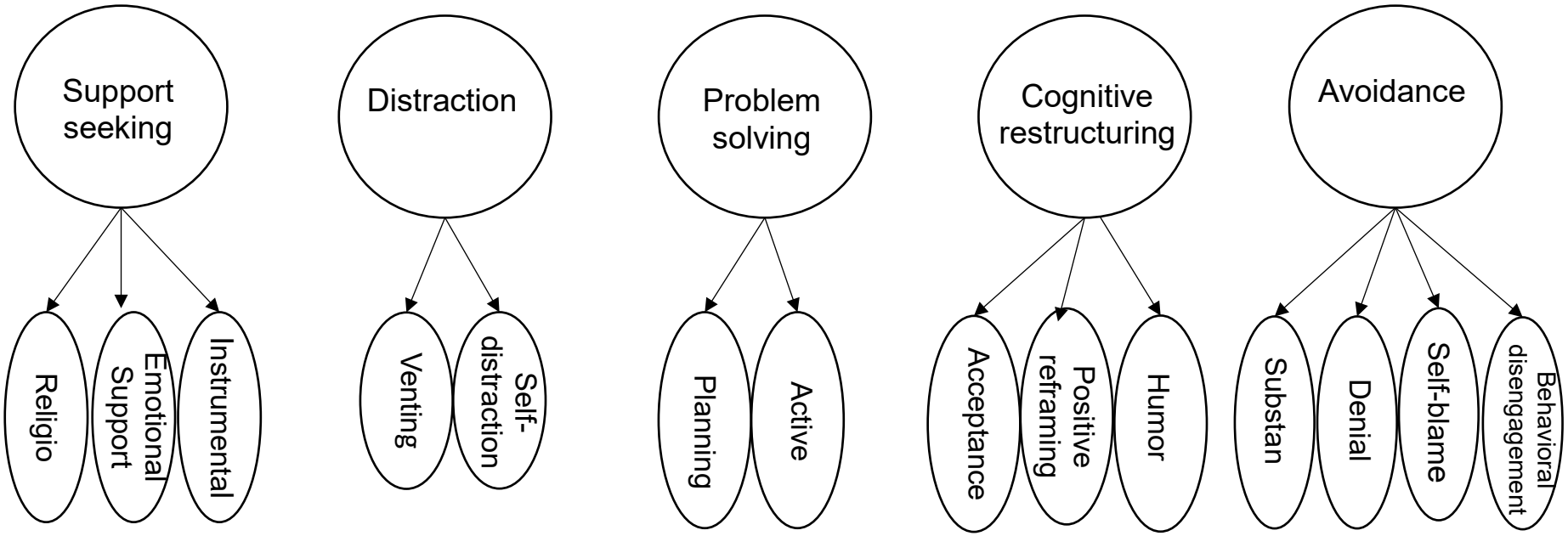

Figure 11. CFA model for five higher order-factor model of coping. Subscales were created based on the work of Doron et al. (2014). Item level data not shown for figure simplicity. Each lower order latent construct had two items load on it where the one item was "fixed" to 1 for identification purposes (not shown). All higher order factors were all correlated with each other, however correlations, residual variances, and manifest indicators are not shown for figure simplicity.

Table 14

Parameter Estimates for Five-factor Higher Order Perceived Coping CFA Model (N = 557)

Item	Unstandardized estimate (SE)	*p* value	Completely standardized estimate	R^2
First Order Factor Loadings				
Behavioral Disengagement				
6. Giving up trying to deal with it	1.00 (.00)	--	.68	.46
16. Giving up the attempt to cope	.92 (.08)	p < .001	.68	.45
Self-Blame				
13. Criticizing myself	1.00 (.00)	--	.71	.50
26. Blaming myself for things that happened	1.25 (.10)	p < .001	.88	.77
Denial				
3. Saying to myself "this isn't real"	1.00 (.00)	--	.76	.57
8. Refusing to believe that it has happened	.94 (.08)	p < .001	.82	.67
Substance Use				
4. Using alcohol or other drugs to make myself feel better	1.00 (.00)	--	.89	.80
11. Using alcohol or other drugs to help me get through it	.96 (.06)	p < .001	.93	.86
Humor				
18. Making jokes about it	1.00 (.00)	--	.99	.98
28. Been making fun of the situation	.61 (.08)	p < .001	.66	.44

Positive Reframing				
12. Trying to see it in a different light, to make it seem more positive	1.00 (.00)	--	.74	.54
17. Looking for something good in what is happening	1.10 (.07)	$p < .001$	.84	.71
Acceptance				
20. Accepting the reality of the fact that it has happened	1.00 (.00)	--	.74	.55
24. Learning to live with it	1.03 (.07)	$p < .001$	.78	.61
Active Coping				
2. Concentrating my efforts on doing something about the situation I'm in	1.00 (.00)	--	.68	.46
7. Taking action to try to make the situation better	1.18 (.08)	$p < .001$	.79	.62
Planning				
14. Trying to come up with a strategy about what to do	1.00 (.00)	--	.79	.62
25. Thinking hard about what steps to take	1.00 (.05)	$p < .001$	.80	.64
Self-Distraction				
1. Turning to work or other activities to take my mind off things	1.00 (.00)	--	.55	.30
19. Doing something to think about it less	1.26 (.16)	$p < .001$	.68	.47
Venting				
9. Saying things to let my unpleasant feelings escape	1.00 (.00)	--	.68	.46
21. Expressing my negative feelings	.89 (.08)	$p < .001$	.62	.39
Instrumental Support				
10. Getting help and advice from other people	1.00 (.00)	--	.89	.79

23. Trying to get advice or help from other people about what to do	.97 (.04)	p < .001	.84	.70
Emotional Support				
5. Getting emotional support from others	1.00 (.00)	--	.80	.64
15. Getting comfort and understanding from someone	1.12 (.05)	p < .001	.86	.74
Religion				
22. Trying to find comfort in my religion or spiritual beliefs	1.00 (.00)	--	1.00	1.00
27. Praying or meditating	.76 (.03)	p < .001	.77	.60
Second Order Factor Loadings				
Avoidance (α = .79)				
Behavioral Disengagement	1.00 (.00)	--	.85	.72
Self-Blame	1.02 (.13)	p < .001	.71	.50
Denial	.87 (.09)	p < .001	.70	.49
Substance Use	.62 (.08)	p < .001	.48	.23
Cognitive Restructuring (α = .78)				
Humor	1.00 (.00)	--	.43	.18
Positive Reframing	1.41 (.16)	p < .001	.86	.73
Acceptance	1.45 (.17)	p < .001	.88	.78
Problem Solving (α = .83)				
Active Coping	1.00 (.00)	--	.92	.84
Planning	1.39 (.10)	p < .001	1.00	1.00

Distraction (α = .63)				
Self-Distraction	1.00 (.00)	--	.71	.51
Venting	1.45 (.19)	p < .001	.89	.78
Support Seeking (α = .80)				
Instrumental Support	1.00 (.00)	--	.98	.97
Emotional Support	.87 (.05)	p < .001	.96	.92
Religion	.29 (.06)	p < .001	.22	.05
Second Order Factor Covariances				
Avoidance ↔ Cognitive Restructuring	.04 (.01)	p = .007	.17**	--
Avoidance ↔ Problem Solving	.03 (.02)	p = .093	.10	--
Avoidance ↔ Distraction	.16 (.02)	p < .001	.84***	--
Avoidance ↔ Support Seeking	.06 (.02)	p = .005	.15**	--
Cognitive Restructuring ↔ Problem Solving	.19 (.03)	p < .001	.86***	--
Cognitive Restructuring ↔ Distraction	.10 (.02)	p < .001	.62***	--
Cognitive Restructuring ↔ Support Seeking	.21 (.03)	p < .001	.58***	--
Problem Solving ↔ Distraction	.09 (.02)	p < .001	.46***	--
Problem Solving ↔ Support Seeking	.23 (.03)	p < .001	.52***	--
Distraction ↔ Support Seeking	.17 (.03)	p < .001	.54***	--

Note. * p < .05, ** p < .01, *** p < .001; R^2 = proportion of explained variance; α = Cronbach's α; Unstandardized factor loadings for Items 6, 13, 3, 4, 18, 12, 20, 2, 14, 1, 10, 5, 22 were fixed to "1" for identification purposes. Additionally, variances of the latent constructs of behavioral disengagement, humor, active coping, self-distraction, and instrumental support were fixed to "1" for identification of the higher order factors. 15 cases were dropped from analysis due to missing data.

Structural Regression Analysis

After all factor structures of the models were identified using confirmatory factor analysis, these factor structures were then used in the final structural analysis (see Figures 12 and 13). All structural regression models used the maximum likelihood estimator (ML). First, a full baseline model (i.e., without any interaction terms) for dietary sweet intake was used to answer hypothesis 1 (see Tables 15 and 16) and a separate baseline model for emotional eating was used to answer hypothesis 2 (see Tables 17 and 18). Second, a final structural model including interaction terms was specified to answer hypothesis 3 (see Figures 12 and 13, and Tables 19 and 20). The observed variable of avoidant coping and latent construct of stress (i.e., perceived helplessness) were used to create the interaction terms according to Wang and Wang (2012)'s guide.

Hypothesis 1. It was hypothesized that those who reported higher levels of stress would also report higher consumption levels of unhealthy food (e.g., sweets). Stress was conceptualized as a two-factor construct comprised of a stress/perceived helplessness factor and a counter stress/perceived (lack of) self-efficacy factor. A baseline model regressing dietary intake on stress was specified and tested. However, it is difficult to interpret the fit of this model because standard fit indices were not reported by MPLUS. The values given (e.g., AIC and BIC) can be found in Table 15. For these information criteria, smaller values are preferred and used to compare one model to another. To answer hypothesis 1, estimates for this baseline model of sweet intake are presented in Table 16. Completely standardized estimates of the paths from both stress factors on dietary sweet intake showed that the perceived helplessness factor (6 items) was not a significant predictor of dietary sweets intake ($\beta = .08$, $p = .211$), and neither was

perceived (lack of) self-efficacy (β = .02, p = .742). Thus, our hypothesis which suggested that stress would predict dietary intake of sweets was not supported.

Table 15

Fit Statistics for Maximum Likelihood Estimated Baseline Structural Regression Models of Sweet Dietary Intake (N = 557)

	Log likelihood (H0 value)	NFParm	AIC	Bayesian (BIC)
M1: Null model	--	--	--	--
M2: Baseline model for Sweet Intake	-6957.07	34	13982.15	14129.36

Note. NFParm = number of free parameters, AIC = Akaike Information Criterion, BIC = Bayes Information Criterion.

Table 16

Model Coefficients for Baseline Structural Regression Models of Sweet Dietary Intake

Item	Unstandardized estimate (SE)	p-value	Completely standardized estimate	R^2
MODEL COEFFICIENTS				
DV: Dietary Intake of Sweets				.01
Stress (Perceived Helplessness)	.19 (.15)	p = .211	.08	--
Counter Stress (Perceived lack of self-efficacy)	.06 (.17)	p = .742	.02	--

Hypothesis 2. The study's second hypothesis was similar to the first in that those who reported higher levels of stress would also report higher levels of emotional eating. The initial baseline emotional eating model (see Table 17) fit the data within an acceptable range (χ^2 (186) =927.28, p < .001, CFI = .916, TLI = .905, RMSEA = .085 [.079, .090], SRMR = .041). To answer hypothesis 2, estimates for this baseline structural

regression model of emotional eating are presented in Table 18. Perceived helplessness was a significant positive predictor of emotional eating (β = .38, p < .001). Conversely, perceived (lack of) self-efficacy was not predictive of emotional eating (β = -.07, p = .145) in the emotional eating baseline model; however, in the final combined structural regression model (see Figure 13) with interaction term it did become a significant predictor of emotional eating (β = -.12, p = .022), so this should be interpreted with caution. Thus, being more stressed in terms of feeling more helpless was predictive of undergraduate women reporting engaging in more emotional eating. In addition, higher levels of perceived lack of self-efficacy about handling stress (i.e., more stressed) was related to less emotional eating in undergraduate women. However, this was a weak association that only became significant the final model. Parameter estimates for the final model can be found in Figure 13.

Table 17

Fit Statistics for Maximum Likelihood Estimated Baseline Structural Regression Models of Emotional Eating (N = 557)

	$\chi2$	df	Log likelihood (H0 value)	NFParm	CFI	TLI	RMSEA (90% CI)	SRMR	AIC	Bayesian (BIC)
M1: Null model	8988.28***	210	--	--	--	--	--	--	--	--
M2: Baseline model for Emotional Eating	927.28***	186	-14094.16	66	.916	.905	.085 (.079, .090) close fit p < .001	.041	28320.32	28605.73

Note. *p < .05, **, p < .01, *** p < .001; $\chi2$ = chi-square, df = degrees of freedom, NFParm = number of free parameters, CFI = comparative fit index, TLI = Tucker-Lewis Index, RMSEA = root mean square error of approximation, SRMR = standardized root mean square residual, AIC = Akaike Information Criterion, BIC = Bayes Information Criterion.

Table 18

Model Coefficients for Baseline Structural Regression Models of Emotional Eating

Item	Unstandardized estimate (SE)	p-value	Completely standardized estimate	R^2
MODEL COEFFICIENTS				
DV: Emotional Eating				.13
Stress (Perceived Helplessness)	.46 (.06)	p < .001	.38	--
Counter Stress (Perceived lack of self-efficacy)	-.09 (.17)	p = .145	-.07	--

Hypothesis 3. The final hypothesis suggested that perceived coping would moderate the relationship between both 1) stress and dietary intake of sweets and 2) stress and emotional eating. Furthermore, since the literature supports that 1) women tend to engage in more emotion-focused types of coping (which can include avoidant coping behaviors) and 2) the links between certain maladaptive coping styles, such as avoidant coping, negative health outcomes, dietary intake of sweets, and emotional eating, the current study focused on avoidant coping as a potential moderator of the relationship between stress and 1) dietary intake and 2) emotional eating.

Thus, it was hypothesized that a weaker relationship between stress and dietary intake, and stress and emotional eating, would be observed in those participants with higher levels of avoidant coping. Avoidant coping was added to the model as both a main effect and as part of an interaction term for this final model. The full model prior to the addition of the interaction terms can be seen in Figure 12. Again, due to the numerical integration function within MPLUS it is difficult to interpret the fit of this model because standard fit indices were not reported by MPLUS. However, the values given (e.g., AIC and BIC) can be found in Table 19. Model 3 (i.e., the model with interaction terms) appears to fit the data better than the model without interaction terms as the AIC and BIC values are smaller.

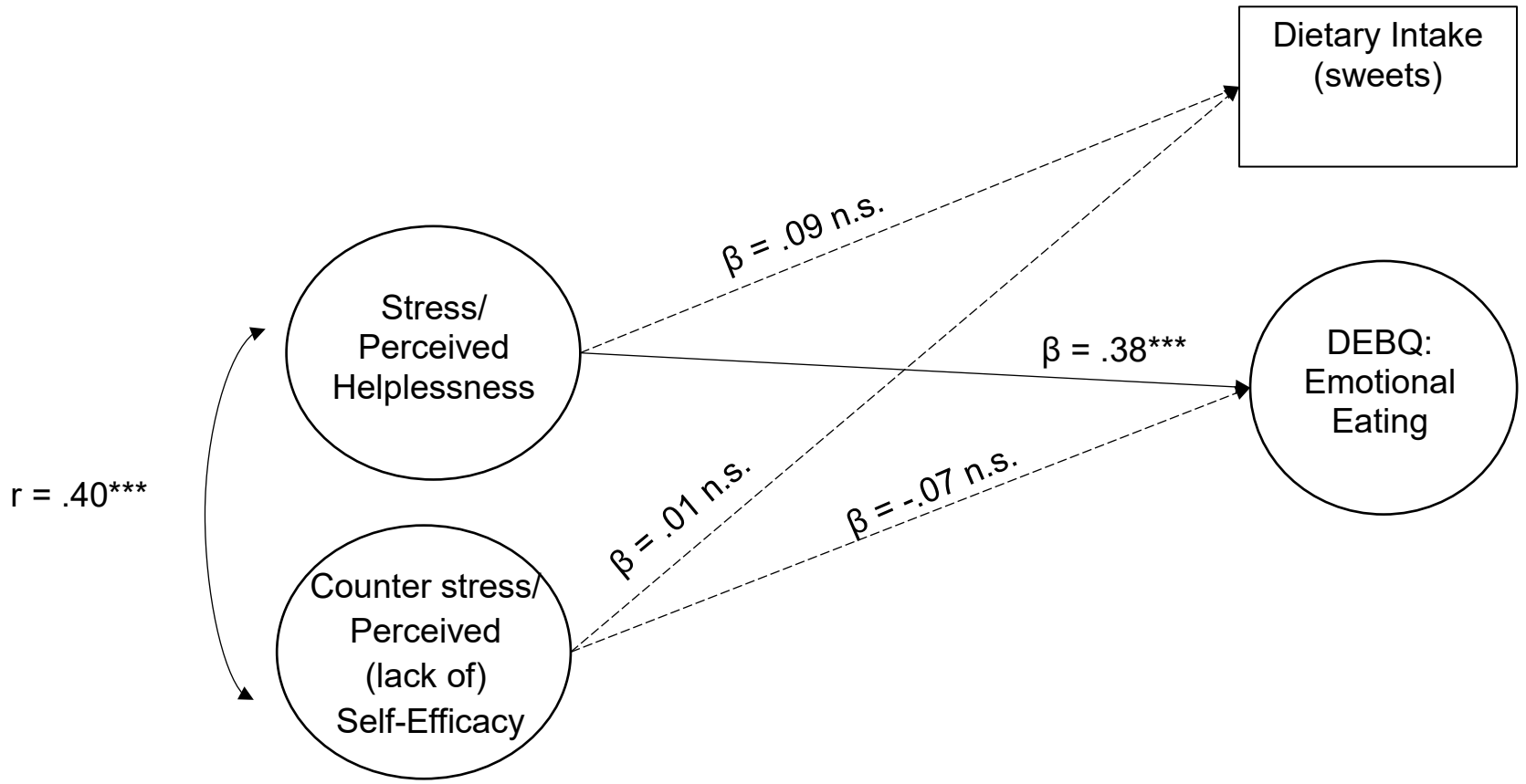

Figure 12. Combined structural model for using stress to predict emotional eating and dietary intake. Stress latent factor was composed of PSS items 1-3, 6, and 9-10. Counter stress latent factor was composed of PSS items 4, 5, 7, and 8. Emotional eating latent factor was composed of DEBQ items 11, and 13-22. Dietary intake of sweets was a dichotomous (i.e. high and low consumers of sweets) was an observed average of items 2-6 from the sweets subscale of the FFQ. Residual variances not shown for figure clarity.

Table 19

Fit Statistics for Estimated Final Combined Structural Regression Models (N = 557)

	Log likelihood (H0 value)	NFParm	AIC	Bayesian (BIC)	Adjusted BIC
M1: Null model	--	--	--	--	--
M2: Full combined model	-14421.36	69	28980.72	29279.47	29060.43
M3: Full combined model with interaction term	-14372.68	73	28891.35	29206.90	28975.17

Note. AIC = Akaike Information Criterion, BIC = Bayes Information Criterion, Adjusted BIC takes into account sample size by recalculating it [n* = (n+2)/24)].

In this final model, the interaction term between stress and avoidant coping was not a significant predictor of either dietary intake of sweets (β = -.01, p = .810) nor emotional eating (β = -.05, p = .267). Furthermore, neither stress (β = .08, p = .662), counter stress (β = -.00, p = .968), nor avoidant coping (β = .09, p = .173) were statistically significant for dietary intake of sweets. However, there were three main effects of stress (β = .39, p = .005), counter stress (β = -.12, p = .001), and avoidant coping (β = .27, p < .001) for emotional eating. Thus, those who reported more stress, less self-efficacy for handling stress, and engaged in more avoidant coping practices were more likely to engage in emotional eating behaviors. Parameter estimates for the final model with interaction terms can be found in Figure 13 as well as Table 20.

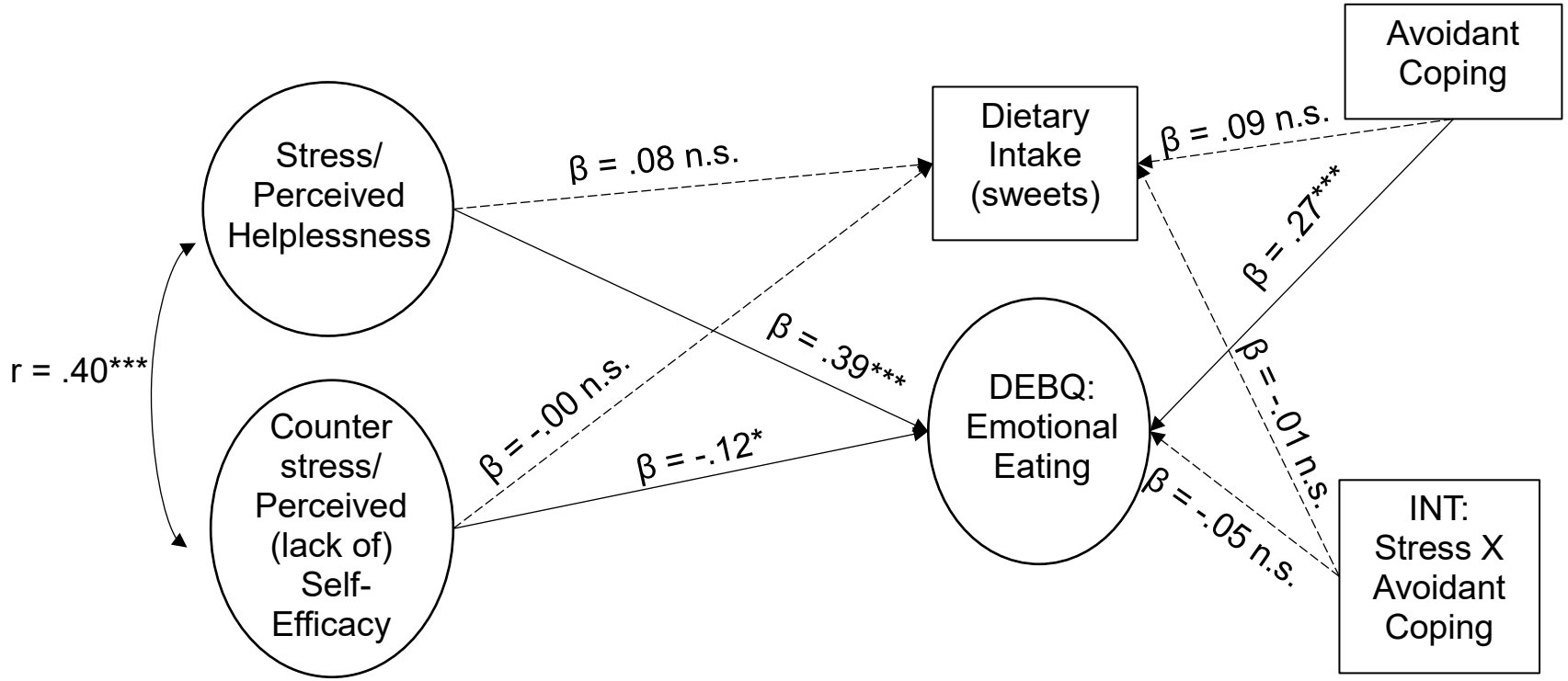

Figure 13. Final combined structural model with interaction terms. This model used stress to predict emotional eating and dietary intake and the higher order factor avoidant coping as a potential moderator of the relationship along with the potential interaction of stress and coping. Stress latent factor was composed of PSS items 1-3, 6, and 9-10. Counter stress latent factor was composed of PSS items 4, 5, 7, and 8. Emotional eating latent factor was composed of DEBQ items 11, and 13-22. Dietary intake of sweets was a dichotomous (i.e. high and low consumers of sweets) based on items 2-6 from the sweets subscale of the FFQ. Avoidant coping was continuous based on the average of the 8 items from the coping subscales of Behavioral Disengagement, Denial, Self-blame, and Substance Use from the Brief COPE. The interaction term between stress and avoidant coping was created in MPLUS according to Wang and Wang (2012). Residual variances not shown for figure clarity.

Table 20

Parameter Estimates for the Final Structural Model with Interaction Terms (N = 557)

Item	Unstandardized estimate (SE)	p-value	Completely standardized estimate	R^2
DEBQ: Emotional Eating				
Factor Loadings				
Emotional Eating (α = .96)				
11. Do you have the desire to eat when you are irritated?	1.00 (.00)	--	.67	.45
13. Do you have a desire to eat when you are depressed or discouraged?	1.26 (.07)	p < .001	.83	.69
14. Do you have a desire to eat when you are feeling lonely?	1.29 (.07)	p < .001	.86	.74
15. Do you have a desire to eat when somebody lets you down?	1.31 (.07)	p < .001	.90	.81
16. Do you have a desire to when you are cross?	1.03 (.06)	p < .001	.77	.59
17. Do you have a desire to eat when you are approaching something unpleasant to happen?	1.19 (.06)	p < .001	.86	.74
18. Do you get the desire to eat when you are anxious, worried or tense?	1.20 (.07)	p < .001	.80	.64
19. Do you have a desire to eat when things are going against you or when things have gone wrong?	1.27 (.07)	p < .001	.88	.77
20. Do you have a desire to eat when you are frightened?	.80 (.05)	p < .001	.69	.47
21. Do you have a desire to eat when you are disappointed?	1.22 (.06)	p < .001	.86	.74
22. Do you have a desire to eat when you are emotionally upset?	1.25 (.07)	p < .001	.84	.70

Perceived Stress Scale (PSS)

	Factor Loadings			
	Perceived Helplessness (α = .90)			
1. Upset because of something that happened unexpectedly	1.00 (.00)	--	.77	.59
2. Unable to control the important things in your life	1.19 (.06)	p < .001	.81	.66
3. Felt nervous and "stressed"	.97 (.06)	p < .001	.72	.51
6. Could not cope with all the things that you had to do	1.15 (.06)	p < .001	.77	.60
9. Been angered because of things that were outside of your control	1.08 (.06)	p < .001	.75	.57
10. Felt difficulties were piling up so high that you could not overcome them	1.32 (.07)	p < .001	.81	.66
	Perceived (lack of) Self-efficacy (α = .81)			
4. Felt confident about your ability to handle personal problems	1.00 (.00)	--	.74	.55
5. Felt that things were going your way	1.04 (.06)	p < .001	.82	.68
7. Been able to control irritations in your life	.82 (.06)	p < .001	.61	.37
8. Felt that you were on top of things	.97 (.06)	p < .001	.73	.54
	Factor Covariances			
Perceived Helplessness ↔ Perceived (lack of) Self-efficacy	.20 (.03)	p < .001	.40***	--
MODEL COEFFICIENTS				
DV: Emotional Eating				.13
Stress (Perceived Helplessness)	.47 (.17)	p = .005	.39**	--
Counter Stress (Perceived lack of self-efficacy)	-.15 (.06)	p = .022	-.12*	--
Avoidant Coping	.45 (.09)	p < .001	.27***	--
Stress (Perceived Helplessness) X Avoidant Coping	-.10 (.09)	p = .267	-.05	--

DV: Dietary Intake of Sweets				.01
Stress (Perceived Helplessness)	.20 (.45)	p = .662	.08	--
Counter Stress (Perceived lack of self-efficacy)	-.01 (.17)	p = .968	-.00	--
Avoidant Coping	.31 (.23)	p = .173	.09	--
Stress (Perceived Helplessness) X Avoidant Coping	-.06 (.24)	p = .810	-.01	--

Note. *p < .05, **, p < .01, *** p < .001; R^2 = proportion of explained variance; α = Cronbach's α; Unstandardized factor loadings for DEBQ Items 11, PSS Items 1 and 4 fixed to "1" for identification purposes. 14 cases were dropped from analysis due to missing data.

Chapter V

Discussion and Conclusions

This study assessed the relationship between stress, dietary intake of sweets, emotional eating and avoidant coping in a sample of undergraduate women at a public research university in the southwest United States. The sample was mostly comprised of racial and ethnic minorities. Hispanics (29.7%) and Asians (29.0%) were the largest group of respondents followed by Caucasians (24.1%) and African Americans (11.4%). These percentages closely match the demographics of the university from which they were sampled (University of Houston, 2017). Previous studies of the measured constructs were majorly comprised of Caucasian females. However, Hispanic women were underrepresented in the current study as they comprise 48.9% of the undergraduate female population.

Sample Descriptives and Comparisons between Groups

Sweet intake levels. Descriptive findings of the current study revealed that only 27% of the sample was designated as high consumers (i.e., an average of ½ daily serving or more) of sweets. Although direct comparisons with levels reported in other studies are difficult, the finding that less than a third of individuals reported eating half a serving of sweets or more a day seems low considering many Americans consume over the recommended amount of daily added sugars which can come from sweets as well as other sources (Ervin & Ogden, 2013). The general recommendation is to limit added sugars, which can include sweet foods, to no more than 10% of one's daily calories (USDA, 2015), which for a 2,000 calorie diet would be about 50 grams of sugar. However, Ervin

and Ogden (2013) reported that women tended to eat more than that guidelines; specifically non-Hispanic black women tended to consume on average greater amounts of their daily calories from added sugars (16%) than non-Hispanic white women (13%) and Mexican American women (13%). Future studies should look to better define and compare added sugars versus sweet consumption among college students. In addition, the authors reported that specifically among women aged 20-39, on average, 275 of their daily calories are from added sugars. Hence, the finding that only 27% were categorized as high consumers of sweets appears to be low. Additionally, while the literature suggests that there may be potential differences in dietary intake, specifically sweets between Caucasians and minorities (Satia, 2009), the current study found no differences in dietary intake of sweets. Future research should investigate other items with added sugars which might be consumed under stressful situations and continue to investigate if there are differences in the amount of sweets between different racial/ethnic groups.

An additional reason sweet intake may have been low were that the items used to capture sweet intake (i.e., ice cream/milkshakes, puddings, doughnuts/pastries, chocolate/candy bars, other candy) may not have fully capture sweet type items that college students may be eating. While food frequency questionnaires (FFQs) are a common and cost-effective method for measuring food intake, they may not be as accurate due to participant recall bias (Shim, Oh, & Kim, 2014). Future research should aim to use multiple methods to assess the types of sweet foods colleges student may be eating through 24-hour food recalls in addition to food frequency questionnaires given over multiple time periods. Using multiple methods can lead to more accurate

information than just a single method especially when these food items may not be consumed regularly (Carroll et al., 2012).

Furthermore, sweet food consumption can be heavily influenced by culture. Some cultures may tend to eat other unhealthy foods (e.g., comfort foods, junk food, etc.) or other types of sweets when under stress. Racial and ethnic minorities are generally less likely to meet dietary guidelines and are more likely be at risk for diet-related disparities (i.e. differences in types of food consumed). Studies have found that identifying as Black/African American, having low educational attainment, and reporting low income was positively associated with increased consumption of sweetened beverages such as sodas (Park, Blanck, Sherry, Brener, & Toole, 2012; Rehm, Matte, Van Wye, & Young, 2008). For many, these diet-related disparities can be traced back to a variety of contributors such as domains of social inequality (i.e. SES), psychosocial factors (e.g. knowledge of dietary guidelines), environmental influences (e.g. availability of healthy food choices, cost), and cultural preferences (Satia, 2009). Thus, racial and ethnic minorities may already be consuming unhealthier foods and sweets when not under stress. Future research should investigate dietary patterns in racial/ethnic minorities in a longitudinal design both before, during, and after periods of perceived stress.

In addition, different cultural groups may be consuming culturally specific food and beverages items as well as more comfort style foods when under stress. Previous studies of Korean high school students (Kim, Yang, Kim, & Lim, 2013) found that when stressed, these students ate more and had a higher frequency of sweet intake as measured by traditional sugary foods (i.e., confectionaries, candies, chocolates), sugary beverages (i.e., flavored milk), as well as culturally relevant sugary food and beverage items (i.e.,

traditional Korean beverages, and spicy, sweet, and fried rice cakes). Other studies of American college students have looked beyond just sweet foods to include more junk foods and comfort foods as well. For example, when under stress, Kandiah et al. (2006) found that female college students commonly consumed sweet foods (e.g., desserts, chocolate/candy bars, candy, ice cream, muffins/sweet breads, and fresh or canned fruit) and mixed dished/comfort food (e.g., burgers, pizza, casseroles, tacos, ethnic foods, and fast food). Thus, because research has indicated that stress can influence people to eat more energy- and nutrient-dense type foods, which tend to be high in fat and sugar (Torres & Nowson, 2007), steps should be taken to develop culturally competent food frequency questionnaires (FFQs) that are specific to the population interest (Shim et al., 2014; Teufel, 1997) as well as using other methods that can elicit culturally specific foods (e.g., 24-hour recalls), and should investigate culturally specific high calorie foods (including sweets) and other typical comfort foods (e.g., pizza, burgers, casseroles, etc.) in relation to stress.

Emotional eating levels. In regard to emotional eating, the current study found that the emotional eating average (of original items) was higher than what has previously been found. Overall, our female sample experienced a higher level of emotional eating behaviors than the women in the original Dutch Eating Behvaior Questionnaire (DEBQ) study, but lower amounts of emotional eating *(M* = 2.40, *SD* = 1.07) than some more recent studies among women such as Dutton and Dovey (2016; *M* = 2.56, *SD* = .85) and Dakanalis et al. (2013; *M* = 2.81, *SD* = .80). However, this difference between scores of emotional eating was minor (Difference = .16 - .41, on a 5-point scale) and may not be practically significant. Reported emotional eating was compared between racial/ethnic

groups. Overall, there were no significant differences among any of the racial/ethnic groups tested on emotional eating (using the final emotional eating subscale with 11 items. To the author's knowledge no current study, has compared emotional eating levels between racial/ethnic groups using these specific items.

Perceived stress levels. In addition, the averages for stress levels were slightly higher than what has been found in the literature with general norming samples (Cohen & Williamson, 1988), but still comparable to other college samples (Roberti et al., 2006). It should be noted however, that these comparison samples were also mostly comprised of Caucasians and may not be a direct comparison for the present study's ethnically/racially diverse sample. Thus, the current sample of college women reported higher perceived stress levels than a particular norming group, but comparable compared to another sample of college students. Future research should aim to establish norming and reference data among minority college students using the Perceived Stress Scale-10 for others looking to compare their more racially/ethnically diverse samples.

In addition, the current study did find differences between racial/ethnic groups in lack of perceived stress self-efficacy in that Caucasian women reported significantly lower levels of lack of perceived stress self-efficacy than did Asian women (i.e., Asian women felt more stressed than did Caucasian women). This is different from what has been reported in the literature regarding comparisons in perceived long-term stress experiences across racial/ethnic groups. Specifically, using the Student Stress Scale (adapted from the Holmes and Rahe's Social Readjustment Rating Scale; Insel & Roth, 1988) among a group of racially and ethnically diverse (61% White, 25% Hispanic/Latino, 24% African American/Black, 10% Asian) undergraduate students

(64% female), investigators reported that White/Caucasian students reported the highest stress scores and Asian women were the least stressed (Turner & Smith, 2015). Future studies should attempt to validate this information in other groups of Caucasian and Asian college students using other measure of perceived stress.

Avoidant coping levels. Finally, the current sample reported lower amounts of avoidant coping compared to what has been previously found other samples of college students. Specifically, this study reported low amounts of avoidant coping behaviors compared to a sample of French college students (Doron et al., 2014), which found that, on average, students had higher levels of avoidant coping *(M* = 2.82, *SD* = .96) behaviors than the current study *(M* = 1.68, *SD* = .53). Currently, no study using the Doron et al.'s (2014) version of the Brief COPE among U.S. college students reports the higher-level coping averages (e.g., avoidant coping). Future research should attempt to validate these comparisons in other diverse samples of American college students.

Discussion of Research Questions

Hypothesis 1. Interestingly, the current study found support for only one of the three hypotheses. The first hypothesis which predicted that stress would be related to dietary of intake of sweets was not supported. This finding is inconsistent from other studies reported an association between stress and intake of unhealthy foods including sweets (Errisuriz et al., 2016; Habhab, Sheldon, & Loeb, 2009; Kandiah et al., 2006; Torres & Nowson, 2007). A potential explanation for no significant relation might be due to limited and specific items of sweets used to determine sweet intake (i.e., ice cream/milkshakes, puddings, doughnuts/pastries, chocolate/candy bars, and other candy). Hence there were strong floor effects with these items as respondents reported eating

these sweet items infrequently. These sweet items may underestimate sweet intake and may not accurately reflect all the types of sweets this group of college women consumed resulting in a nonsignificant relationship. In addition, considering the strong floor effects and low frequency of eating the listed sweet items, the current study might not have been able to detect associations of stress with this construct. Another potential reason is that there are differences in samples of participants. Specifically, the current study had a racial/ethnically diverse sample of college women whereas previous studies used mostly Caucasian females. Future research should continue to investigate these research questions among a racially/ethnically diverse samples of college women, but should use a more varied group of sweet items that may be more reflective of college women diets.

Hypothesis 2. The second hypothesis which predicted that higher levels of perceived stress predicting greater amounts of emotional eating was tentatively supported as the emotional eating model was only marginally acceptable. This was in accordance with the other studies who have found that more stress was related to more emotional eating (Bennett et al., 2013; Nguyen-Rodriguez et al., 2009; Spoor et al., 2007; Wilson et al., 2015). Specifically, only the perceived helplessness subscale was related to emotional eating. However, once all constructs were entered into the final combined model (i.e., stress, dietary intake, emotional eating, coping, and interactions) the perceived lack of self-efficacy factor was significant related to emotional eating. However, this relationship should be interpreted with caution as emotional eating model fit was only marginally acceptable.

Hypothesis 3. The third hypothesis which predicted that stress coping, specifically avoidant coping, would moderate the relation between stress and dietary

intake as well as stress and emotional eating. While avoidant coping was a significant predictor of emotional eating, the interaction of stress and coping was not and hence there was no support for a moderation effect. This interaction was also not significant of for dietary intake of sweets. One potential reason for insignificance may be the restricted range of responses on the sweet items with many respondents reporting little to no consumption of these specific sweet items. Another potential reason these interactions are not significant might be because of the specific type of coping. Avoidant coping is a more negative type of coping and is related to negative types of outcomes. Perhaps, in this sample, perceived stress and avoidant coping are main effects that separately predict emotional eating, and there are no combinations of the two lead women to engage in more emotional eating than others. Moreover, generally maladaptive strategies (i.e., those that tend to be more emotion-focused and result in a negative outcome because they do not tend to address the stressor directly, such as denial or venting; Broughman et al. 2009; Wichianson et al., 2009) have also been connected to adverse behaviors and feelings such as night-eating syndrome (Wichianson et al., 2009) as well as increased feelings of anxiety, depression and stress (Mahmoud et al., 2012). In addition, other more adaptive strategies and styles such as active coping (i.e., engaging in behaviors that directly address the stressor) have been found to mitigate the effects of specific types of stress (e.g. acculturative stress) on experiences anxiety and depression symptoms (Crockett et al., 2007). Furthermore, some studies have suggested that college women specifically tend to engage in more self-help (i.e. an adaptive type of strategy) and self-punishment (i.e. a maladaptive type of strategy) types of copings strategies compared to college men (Broughman et al., 2009). Future studies should examine other types of

adaptive coping such as problem-focused coping or self-help types of strategies and their relation to emotional eating as well as intake of sweets. These types of coping, which directly addresses the stressor may be more likely to have an impact.

Limitations

There are several limitations of the current study that should give caution when interpreting the results. First, the current study was a cross-sectional study that relied on a convenience sample of female undergraduate women from a public four-year university who were enrolled in psychology and education undergraduate courses. There could potentially be bias from sampling only at one time point, differences between men and women, differences between undergraduates and graduate students, and differences among students who attend a four-year university in the Southwest United States compared to other types of institutions in different regional locations across the United States. There could be both financial differences in the make ups of these universities as well as varying racial/ethnic breakdowns. As research had indicated, differences in financial backgrounds can influence dietary patterns (Satia, 2009); specifically those who are from lower income families tend to have poorer dietary quality (i.e., eat less fruits/vegetables, and eat more high fat/sugar foods). Thus, these results might not generalize to all female undergraduate students from varying financial backgrounds. Unfortunately, data on the student's financial background was not collected in the current study. Future studies should look to elicit a larger random sample of both undergraduate and graduate college students from different types of post-secondary educational institutions such as two-year institutions and private colleges across the United States. In addition, although this study was focused primarily on college women,

efforts should be made to continue to investigate the relationship between stress and eating behaviors among men because they are also at risk for overweight and obesity (Ogden et al., 2014) and many male college students still experience stress which adversely impacts their academic performance (ACHA, 2009).

A second limitation of the current study was the issues with factor structure of the Dutch Eating Behavior Questionnaire (DEBQ). Of the multiple tested factor structures, the single subscale of emotional eating with reduced items had improved but only marginally acceptable model fit over the others and was used in the final analysis. Using this specific subscale with a specific factor structure may make it more difficult to replicate in future studies. Future studies should continue to test and cross-validate the DEBQ's factor structure in racially/ethnically diverse samples of college students. In addition, future studies should investigate alternative measures of emotional eating that have been validated in more racially/ethnically diverse groups of college women.

A third limitation was that dietary intake was eventually based on a food frequency of five items, which experienced strong floor effects. These items may underestimate the actual sweet intake of college students as there may be other types of sweets being consumed that the current survey did not capture. College students may eat more comfort foods (e.g., pizza, burgers, etc.) or junk food (e.g., chips) when stressed as opposed to the specific sweet items measured. As mentioned above, cultural differences in dietary patterns may play a role when choosing which foods to eat when stressed. More ethnic specific foods, which may be savory or sweet, can be consumed when under stress (Kandiah et al., 2006; Kim et al., 2013).

A fourth limitation of this study was that neither student's body mass index (BMI) nor dieting practices were measured. The literature shows that healthy weight, overweight, and obese individuals as well as those currently dieting may have different patterns of eating (e.g., emotional eating) and difference in the types of foods they consume (Dutton & Dovey, 2016). Future studies should attempt to measure participants actual height and weight in order to determine BMI status as well as ask if they are currently dieting.

Finally, a fifth limitation, is that some of the models in the study may be underpowered due to limited sample size. For example, the dietary intake of sweets model is potentially underpowered. According to MacCallum et al.'s (1996) tables, with only 5 degrees of freedom this model mostly likely has a power between .324 -.449 for a not close to an exact fit, respectively. Similarly, Preacher and Coffman's (2006) online power and sample size calculators for RMSEA suggest that a much larger sample size (i.e. $\geq$ 12,525) is needed to have a power of .80 and be able to detect an RMSEA value of .05. However, more complex models (e.g., five higher order factors coping model) were more adequately powered with analysis indicating only a needed sample size of 298 (Preacher & Coffman, 2006) to reach a power of .80. Thus, these results of this study should be considered preliminary and future studies should attempt to recruit larger sample sizes so their studies are more adequately powered.

Strengths

Despite the identified limitations, this study had a number of strengths including: (1) simultaneously testing the relationships between stress, sweet intake, emotional eating, and avoidant coping and (2) testing these relationships among a group of

racially/ethnically diverse female college students. Previous studies have only tested one or just a few of these constructs and their hypothesized relationships and most of these previous studies were primarily among Caucasian females (Bennett et al., 2013; Errisuriz et al., 2016; Habhab et al., 2009; Kandiah et al., 2006; Oliver & Wardle, 1999; Torres & Nowson, 2007; Wilson et al., 2015).

Conclusion

Overall, this study's findings display preliminary evidence that increased amounts of perceived stress in terms of perceived helplessness as well as higher amounts of avoidant coping were related to a greater engagement of emotional eating in undergraduate women. Because emotional eating is risk factor for obesity and both perceived stress and an avoidant coping style are linked to other negative health outcomes, stress and avoidant coping are potential salient targets for future research and intervention in undergraduate women. Specifically, interventions for college women should be designed to reduced stress and identify other ways of coping with stress to help them avoid engaging in emotional eating.

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Appendix A

Survey

Demographic Questionnaire

From which University of Houston institution are you from:

a. UH-Main Campus

b. UH- Downtown

What is your date of birth? _____

What is your age? ____

What is your sex?

a. Male

b. Female

Are you of Hispanic, Latino, or Spanish origin?

a. No, not of Hispanic, Latino, or Spanish origin

b. Yes, Mexican, Mexican Am., Chicano

c. Yes, Puerto Rican

d. Yes, Cuban

e. Yes, another Hispanic, Latino, or Spanish origin –

Print origin, for example, Argentinean, Colombian, Dominican, Nicaraguan, Salvadoran, Spaniard, and so on: ___

What is your race? Mark (X) one or more boxes.

☐	White	☐	Filipino	☐	Native Hawaiian
☐	Black or African	☐	Japanese	☐	Guamanian or Chamorro
☐	Chinese	☐	Korean	☐	Samoan
☐	Asian Indian	☐	Vietnamese	☐	Other Pacific Islander – Print race, for example, Fijian, Tongan, and so on. C Some other race – Print race.
☐	Am. American Indian or Alaska Native - Print name of enrolled or principal tribe	☐	Other Asian – Print race, for example, Hmong, Laotian, Thai, Pakistani, Cambodian, and so on.		

What is your current student status?

a. Undergraduate

b. Graduate

c. Post-Bacc

d. other _____

What is your enrollment status?

a. Part time

b. Full time

What is your current major?

What is your current relationship status?

a. Single, never married

b. Married or domestic partnership

c. Widowed

d. Divorced

e. Separated

f. Dating/In a relationship

g. Other _____

What is your current employment status: Are you currently…? (you may mark more than one)

a. Employed for wages

b. Self-employed

c. Out of work and looking for work

d. Out of work but not currently looking for work

e. A homemaker

f. A student

g. Military

h. Retired

i. Unable to work

Food Frequency Questionnaire (FFQ)

CEREALS, BREADS, SNACKS

	How often did you eat these foods?										Amount		
Food Type	Never or less than once per month	1 per month	2-3 per month	1 per week	2 per week	3-4 per week	5-6 per week	1 per day	2+ per day	Medium Serving Size	S	M	L
1. Cold cereals	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
2. Cooked cereals and grits	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
3. Milk on cereals	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐
4. Pancakes, French toast, and waffles	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 pieces	☐	☐	☐
5. Muffins, scones, croissants, and biscuits	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 medium	☐	☐	☐
6. White breads, including bagels, rolls and English muffins	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 slices or 1 medium	☐	☐	☐

7. Whole grain breads and rolls	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 slices or 1 medium	☐	☐	☐
8. Plain tortillas as a side dish (include flour and corn)	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 small or 1 medium	☐	☐	☐
9. Cornbread and corn muffins	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 slices or 1 medium	☐	☐	☐
10. Butter or margarine on breads, cereals, pancakes, etc.	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 pats or 2 teaspoons	☐	☐	☐
11. Jam, jelly, honey, syrup and sugar (including in coffee, tea and cereal)	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 Tbsp.	☐	☐	☐
12. Granola bars and cereal bars such as Nutr-Grain Bars®	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 bar	☐	☐	☐
13. Sports or meal replacement bars such as Power Bars® and Clif Bars®	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 bar	☐	☐	☐
14. Low or nonfat potato chips, tortilla chips, corn chips and pretzels	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 handfuls or 1 sm. Bag	☐	☐	☐

15. Regular potato chips, tortilla chips, corn chips and puffs	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 handfuls or 1 sm. Bag	☐	☐	☐
16. Plain popcorn (no butter) or low-fat microwave popcorn	☐	☐	☐	☐	☐	☐	☐	☐	☐	4 handfuls	☐	☐	☐
17. Buttered or regular microwave popcorn	☐	☐	☐	☐	☐	☐	☐	☐	☐	4 handfuls	☐	☐	☐
18. Low or nonfat crackers such as saltines	☐	☐	☐	☐	☐	☐	☐	☐	☐	6 medium	☐	☐	☐
19. Whole grain crackers such as Triscuits® and rye crispbread	☐	☐	☐	☐	☐	☐	☐	☐	☐	6 medium	☐	☐	☐
20. Regular crackers such as Ritz® and club crackers	☐	☐	☐	☐	☐	☐	☐	☐	☐	6 medium	☐	☐	☐
21. Peanut butter, peanuts and other nuts and seeds	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 Tbsp. (spreads) or ¼ cup (nuts	☐	☐	☐

MEAT, FISH AND EGGS

	How often did you eat these foods?									Medium Serving Size	Amount		
Food Type	Never or less than once per month	1 per month	2-3 per month	1 per week	2 per week	3-4 per week	5-6 per week	1 per day	2+ per day		S	M	L
22. Eggs (egg substitute, mark "NEVER")	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 eggs	☐	☐	☐
23. Bacon and breakfast sausage	☐	☐	☐	☐	☐	☐	☐	☐	☐	3 strips or 2 links	☐	☐	☐
25. Regular hot dogs and sausage such as bratwurst and chorizo	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 hot dog or 2 ounces	☐	☐	☐
26. Lunch meats such as ham, turkey and lowfat bologna	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 slices	☐	☐	☐
27. All other lunch meat such as bologna, salami and Spam®	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 slices	☐	☐	☐
28. Canned tuna, tuna salad and tuna casserole	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ can tuna or 1 cup casserole	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐	☐	4 ounces	☐	☐	☐

29. Beef, pork, ham and lamb	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 medium patty or 3 ounces	☐	☐	☐
30. Ground meat, including hamburgers and meatloaf	☐	☐	☐	☐	☐	☐	☐	☐	☐	4 ounces	☐	☐	☐
31. Live, chicken liver and organ meats	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 large piece or 6 nuggets	☐	☐	☐
32. Fried chicken, including nuggets and tenders	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 large or 2 small pieces	☐	☐	☐
33. Chicken and turkey (roasted, stewed, grilled or broiled)	☐	☐	☐	☐	☐	☐	☐	☐	☐	3 ounces or 1 sandwich	☐	☐	☐
34. Fried fish, fish sandwich and fried shellfish (shrimp and oysters)	☐	☐	☐	☐	☐	☐	☐	☐	☐	3 ounces or ½ cup	☐	☐	☐
35. Shellfish, not fried (shrimp, lobster, crab and oysters)	☐	☐	☐	☐	☐	☐	☐	☐	☐	4 ounces	☐	☐	☐
36. White fish (broiled or baked) such as sole, halibut, snapper and cod	☐	☐	☐	☐	☐	☐	☐	☐	☐	4 ounces	☐	☐	☐
37. Dark fish (broiled or baked) such as salmon, mackerel and bluefish	☐	☐	☐	☐	☐	☐	☐	☐	☐	4 ounces	☐	☐	☐

SPAGHETTI, MIXED DISHES, SOUPS

	How often did you eat these foods?										Amount		
Food Type	Never or less than once per month	1 per month	2-3 per month	1 per week	2 per week	3-4 per week	5-6 per week	1 per day	2+ per day	Medium Serving Size	S	M	L
38. Stew, pot pie, curries and casseroles with meat or chicken	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
39. Chili with meat and beans	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
40. Spaghetti, lasagna and other pasta with tomato and meat sauce	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
41. Spaghetti and pasta with tomato sauce (no meat)	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
42. Pasta with oil, cheese, or cream sauce, including macaroni and cheese	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
43. Asian-style (stir-fried) noodles and rice such as chow mein,	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐

fried rice and Pad Thai													
44. Pizza	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 slices	☐	☐	☐
45. Tofu, tempeh and products such as tofu hot dogs, soy burgers and tofu cheese	☐	☐	☐	☐	☐	☐	☐	☐	☐	3 ounces, 1 hot dog or 1 burger	☐	☐	☐
46. Burritos, tacos, tostadas and quesadillas	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 medium	☐	☐	☐
47. Enchiladas and tamales	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 medium	☐	☐	☐
48. Vegetable, minestrone and tomato soup	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
49. Cream soups such as chowders, potato and cheese	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
50. Bean soups such as pea, lentil and black bean	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
51. Miso soup	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
52. Ramen noodle soup	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
53. Other soups such as chicken noodle	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐

DAIRY PRODUCTS

	How often did you eat these foods?										Amount		
Food Type	Never or less than once per month	1 per month	2-3 per month	1 per week	2 per week	3-4 per week	5-6 per week	1 per day	2+ per day	Medium Serving Size	S	M	L
54. Cottage cheese and ricotta cheese	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐
55. Low or reduced fat cheese, including cheese used in cooking	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 slice or ¼ cup shredded	☐	☐	☐
56. All other cheese (American, cheddar or cream), including cheese used in cooking	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 slice, ¼ cup shredded or 2 Tbsp. cream	☐	☐	☐
57. Yogurt, all types except frozen	☐	☐	☐	☐	☐	☐	☐	☐	☐	6 ounces	☐	☐	☐

VEGETABLES and GRAINS

	How often did you eat these foods?										Amount		
Food Type	Never or less than once per month	1 per month	2-3 per month	1 per week	2 per week	3-4 per week	5-6 per week	1 per day	2+ per day	Medium Serving Size	S	M	L
Mark all vegetables you ate, including in salads, mixed dishes, sandwiches and stir-fries.													
58. Green salad (lettuce or spinach)	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
59. Salad dressing (all types)	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 Tbsp.	☐	☐	☐
60. Fresh tomatoes	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 medium or 4 slices	☐	☐	☐
61. Carrots	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐
62. Green peppers and green chilies	☐	☐	☐	☐	☐	☐	☐	☐	☐	¼ cup	☐	☐	☐
63. Red peppers and red chilies	☐	☐	☐	☐	☐	☐	☐	☐	☐	¼ cup	☐	☐	☐
64. Broccoli	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐

65. Cauliflower, cabbage and Brussels sprouts	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐
66. Green or string beans	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐
67. Green peas	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐
68. Corn and hominy	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐
69. Summer squash and zucchini	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐
70. Winter squash such as acron, butternut and pumpkin	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐
71. Yams and sweet potatoes	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 medium	☐	☐	☐
72. Cooked greens such as spinach, mustard greens and collards	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐

73. Onions and leeks	☐	☐	☐	☐	☐	☐	☐	☐	☐	¼ cup	☐	☐	☐
74. Fresh garlic, including in cooking	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 clove	☐	☐	☐
75. Avocado and guacamole	☐	☐	☐	☐	☐	☐	☐	☐	☐	¼ medium or ¼ cup	☐	☐	☐
76. French fries, fried potatoes and hash browns	☐	☐	☐	☐	☐	☐	☐	☐	☐	¾ cup	☐	☐	☐
77. Potatoes (boiled, baked or mashed)	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 medium or ¾ cup	☐	☐	☐
78. Refried beans	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐
79. All other beans (baked, lima or chili without meat)	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐
80. Coleslaw	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐
81. Potato, macaroni and pasta salads made	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐

with mayonnaise or oil													
82. Brown rice, whole wheat pasta and other whole grains (as a side dish)	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
83. White rice, noodles and other grains (as a side dish)	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
84. Butter, margarine, sour cream and other fat added to vegetables, potatoes and rice	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 pat or 1 teaspoon	☐	☐	☐

SAUCES AND CONDIMENTS

	How often did you eat these foods?										Amount		
Food Type	Never or less than once per month	1 per month	2-3 per month	1 per week	2 per week	3-4 per week	5-6 per week	1 per day	2+ per day	Medium Serving Size	S	M	L
85. Cheese sauce and cream sauce	☐	☐	☐	☐	☐	☐	☐	☐	☐	¼ cup	☐	☐	☐
86. Meat gravies	☐	☐	☐	☐	☐	☐	☐	☐	☐	¼ cup	☐	☐	☐
87. Ketchup	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 Tbsp.	☐	☐	☐
88. Salsa (as dip or on foods)	☐	☐	☐	☐	☐	☐	☐	☐	☐	¼ cup	☐	☐	☐
89. Mayonnaise and mayonnaise-type spreads	☐	☐	☐	☐	☐	☐	☐	☐	☐	2 Tbsp.	☐	☐	☐

FRUITS

	How often did you eat these foods?										Amount		
Food Type	Never or less than once per month	1 per month	2-3 per month	1 per week	2 per week	3-4 per week	5-6 per week	1 per day	2+ per day	Medium Serving Size	S	M	L
90. Apples, applesauce and pears	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 medium or ½ cup	☐	☐	☐
91. Bananas	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 medium	☐	☐	☐
92. Peaches, nectarines and plums	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 medium or ½ cup	☐	☐	☐
93. Apricots (fresh, canned or dried)	☐	☐	☐	☐	☐	☐	☐	☐	☐	¼ cup	☐	☐	☐
94. Oranges, grapefruit and tangerines (not juice)	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 orange or ½ grapefruit	☐	☐	☐
95. Berries such as strawberries and blueberries	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐
96. Cantaloupe, orange melon and mango	☐	☐	☐	☐	☐	☐	☐	☐	☐	¼ melon or ½ mango	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐	☐	☐

97. Watermelon and red melon										1 medium slice			
98. Any other fruit such as grapes, fruit cocktail, pineapple and cherries	☐	☐	☐	☐	☐	☐	☐	☐	☐	½ cup	☐	☐	☐

SWEETS

	How often did you eat these foods?										Amount		
Food Type	Never or less than once per month	1 per month	2-3 per month	1 per week	2 per week	3-4 per week	5-6 per week	1 per day	2+ per day	Medium Serving Size	S	M	L
99. Low or nonfat frozen desserts such as low-fat ice cream, frozen yogurt and sherbet	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 scoop	☐	☐	☐
100. Ice cream and milkshakes	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 scoop or 1 shake	☐	☐	☐
101. Pudding, custard and flan	☐	☐	☐	☐	☐	☐	☐	☐	☐	¾ cup	☐	☐	☐
102. Doughnuts, pies and pastries	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 medium piece or slice	☐	☐	☐
103. Chocolate, candy bars and toffee	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 regular bar or 2 pieces	☐	☐	☐
104. Other candy such as Lifesavers®, licorice and jelly beans	☐	☐	☐	☐	☐	☐	☐	☐	☐	4 pieces or 12 jellybeans	☐	☐	☐

PLEASE ANSWER THESE THREE IMPORTANT QUESTIONS

Food Type	Never or less than once per month	1-2 per week	3-4 per week	5-6 per week	1 per day	2 per day	3 per day	4 per day	5+ per day
105. How often did you eat foods that were cooked in fat (pan-fried, sautéed, or deep fried)? Count all fat such as margarine, butter, oil or lard	☐	☐	☐	☐	☐	☐	☐	☐	☐
106. How often did you eat a serving of vegetables? Do not count potatoes, salad or beans.	☐	☐	☐	☐	☐	☐	☐	☐	☐
107. How often did you eat a serving of fruit? Do not count juices.	☐	☐	☐	☐	☐	☐	☐	☐	☐

BEAVERAGES

	How often did you eat these foods?										Amount		
Food Type	Never or less than once per month	1 per month	2-3 per month	1 per week	2 per week	3-4 per week	5-6 per week	1 per day	2+ per day	Medium Serving Size	S	M	L
108. Milk(all types) as a beverage	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
109. Latte, cappuccino, mocha or hot chocolate	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
110. Tea, unsweetened or diet	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
111. Tea, presweetened, bottle or instant	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
112. Milk, cream or creamer added to tea and coffee	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 Tbsp.	☐	☐	☐
113. Tomato juice, V-8® and other vegetable juices	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
114. Orange juice and grapefruit juice	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐

115. Other 100% fruit juice such as apple, grape and cranberry	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
116. Fruit drinks fortified with Vitamin C such as Hi-C®, and Kool-Aid®	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
117. Meal replacement drinks and shakes such as Slim-Fast® and Ensure®	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
118. Diet soft drinks (include energy drinks)	☐	☐	☐	☐	☐	☐	☐	☐	☐	12 ounces or 1 can	☐	☐	☐
119. Regular soft drinks (include energy drinks)	☐	☐	☐	☐	☐	☐	☐	☐	☐	12 ounces or 1 can	☐	☐	☐
120. Water (tap, bottled or sparkling)	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 cup	☐	☐	☐
121. Beer (all types)	☐	☐	☐	☐	☐	☐	☐	☐	☐	12 ounces or 1 bottle	☐	☐	☐
122. Red wine	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 medium glass (6 oz.)	☐	☐	☐
123. White or rose wine	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 medium glass (6 oz.)	☐	☐	☐
124. Liquor and mixed drinks	☐	☐	☐	☐	☐	☐	☐	☐	☐	1 shot (1½ oz.) or 1 mixed drink	☐	☐	☐

Dutch Eating Behavior Questionnaire (DEBQ)

Never (1)	Seldom (2)	Sometimes (3)	Often (4)	Very often (5)	
1.	If you have put on weight, do you eat less than you usually do?*				
2.	Do you try to eat less at mealtimes than you would like to eat?				
3.	How often do you refuse food or drink offered because you are concerned about your weight?				
4.	Do you watch exactly what you eat?				
5.	Do you deliberately eat foods that are slimming?				
6.	When you have eaten too much, you you eat less than usual the following days?*				
7.	Do you deliberately eat less in order not to become heavier?				
8.	How often do you try not to eat between meals because you are watching your weight?				
9.	How often in the evening do you try not to eat because you are watching your weight?				
10.	Do you take into account your weight with what you eat?				
11.	Do you have the desire to eat when you are irritated?*				
12.	Do you have a desire to eat when you have nothing to do?*				
13.	Do you have a desire to eat when you are depressed or discouraged?*				
14.	Do you have a desire to eat when you are feeling lonely?*				
15.	Do you have a desire to eat when somebody lets you down?*				

16.	Do you have a desire to when you are cross?*	
17.	Do you have a desire to eat when you are approaching something unpleasant to happen?	
18.	Do you get the desire to eat when you are anxious, worried or tense?	
19.	Do you have a desire to eat when things are going against you or when things have gone wrong?	
20.	Do you have a desire to eat when you are frightened?*	
21.	Do you have a desire to eat when you are disappointed?*	
22.	Do you have a desire to eat when you are emotionally upset?*	
23.	Do you have a desire to eat when you are bored or restless?*	
24.	If food tastes good to you, do you eat more than usual?	
25.	If food smells and looks good, do you eat more than usual?	
26.	If you see or smell something delicious, do you have a desire to eat it?	
27.	If you have something delicious to eat, do you eat it straight away?	
28.	If you walk past the baker do you have the desire to buy something delicious?	
29.	If you walk past a snack bar or a café, do you have the desire to buy something delicious?	
30.	If you see others eating, do you also have the desire to eat?	
31.	Can you resist eating delicious foods?***	
32.	Do you eat more than usual, when you see others eating?	
33.	When preparing a meal are you inclined to eat something?	

Perceived Stress Scale (PSS-10)

Instructions:

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling how often you felt or thought a certain way.

	Never (0)	Almost Never (1)	Some times (2)	Fairly Often (3)	Very Often (4)
1. In the last month, how often have you been upset because of something that happened unexpectedly?					
2. In the last month, how often have you felt that you were unable to control the important things in your life?					
3. In the last month, how often have you felt nervous and "stressed"?					
4. In the last month, how often have you felt confident about your ability to handle personal problems?					
5. In the last month, how often have you felt that things were going your way?					
6. In the last month, how often have you found that you could not cope with all the things that you had to do?					
7. In the last month, how often have you been able to control irritations in your life?					
8. In the last month, how often have you felt that you were on top of things?					
9. In the last month, how often have you been angered because of things that were outside of your control?					
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?					

Brief COPE

Instructions: These items deal with ways you've been coping with the stress in your life. There are many ways to try to deal with problems. These items ask what you've been doing to cope. Each item says something about a particular way of coping. Don't answer in the basis of what seems to be working or not—just whether or not you're doing it. Use these response choices. Try to rate each item separately in your mind from the others. Make your answers as true FOR YOU as you can.

(1) I haven't been doing this at all
(2) I've been doing this a little bit
(3) I've been doing this a medium amount
(4) I've been doing this a lot

1. I've been turning to work or other activities to take my mind off things.
2. I've been concentrating my efforts on doing something about the situation I'm in.
3. I've been saying to myself "this isn't real.".
4. I've been using alcohol or other drugs to make myself feel better.
5. I've been getting emotional support from others.
6. I've been giving up trying to deal with it.
7. I've been taking action to try to make the situation better.
8. I've been refusing to believe that it has happened.
9. I've been saying things to let my unpleasant feelings escape.
10. I've been getting help and advice from other people.
11. I've been using alcohol or other drugs to help me get through it.
12. I've been trying to see it in a different light, to make it seem more positive.
13. I've been criticizing myself.
14. I've been trying to come up with a strategy about what to do.
15. I've been getting comfort and understanding from someone.
16. I've been giving up the attempt to cope.
17. I've been looking for something good in what is happening.
18. I've been making jokes about it.
19. I've been doing something to think about it less, such as going to movies, watching TV, reading, daydreaming, sleeping, or shopping.
20. I've been accepting the reality of the fact that it has happened.
21. I've been expressing my negative feelings.
22. I've been trying to find comfort in my religion or spiritual beliefs.
23. I've been trying to get advice or help from other people about what to do.
24. I've been learning to live with it.
25. I've been thinking hard about what steps to take.
26. I've been blaming myself for things that happened.
27. I've been praying or meditating.
28. I've been making fun of the situation.

Appendix B

IRB Letter

UNIVERSITY of HOUSTON

DIVISION OF RESEARCH
Institutional Review Boards

STUDY CLOSURE

May 31, 2018

Alexandria Posada

amheysquierdo@uh.edu

Dear Alexandria Posada:

On 5/31/2018, the IRB reviewed the following submission:

Type of Review:	Continuing Review
Title of Study:	Stress and Eating Behaviors in College Students
Investigator:	Alexandria Posada
IRB ID:	CR00000724
Funding/proposed funding:	Name: Unfunded
Award ID:	None
Award Title:	
IND, IDE, or HDE:	None
Documents Reviewed:	None
Review Category:	Expedited
Committee Name:	Not Applicable
IRB Coordinator:	Danielle Griffin

The IRB closed the study effective 5/31/2018. This action was taken because:

- Collection of private identifiable information is complete OR not applicable (no subjects were enrolled)
- All subjects have completed all study-related interventions OR not applicable (e.g. study did not include interventions, no subjects were enrolled)
- Study is permanently closed to enrollment OR was never open for enrollment
- Analysis of private identifiable information is complete OR not applicable (no subjects were enrolled

Sincerely,

Research Integrity and Oversight (RIO) Office

UNIVERSITY of HOUSTON
DIVISION OF RESEARCH
Institutional Review Boards

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http://www.uh.edu/research/compliance/irb-cphs/

cc: Margit Wiesner