# THE IMPACT OF COPING AND GENDER ON THE RELATIONSHIP BETWEEN

# COLLEGE STRESS AND EATING BEHAVIOR

THESIS

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high-fat foods than females, and that females would eat greater amounts of sweet high-fat foods than males. It was also hypothesized that females would use emotion-focused coping more than males and that under stress, the use of emotion-focused coping would be significantly related to salty high-fat intake and sweet high-fat intake. Regression analysis indicated that intake of salty high-fat foods increased as perceived stress increased, and that males were more likely to eat salty high-fat foods than females. Females were more likely to use emotion-focused coping than males. In addition, an interaction effect of sex and coping on sweet high-fat intake suggests that males are more successful than females at using coping strategies to prevent increased intake of sweet high-fat foods during stress. These findings support and extend the previous research done on the stress and eating behavior relationship. Future research should investigate differences in gender and coping on increased sugar, salt and fat in diet, under varying types of stressors.

## **CHAPTER I**

#### INTRODUCTION

Obesity rates in the United States increased from fifteen percent in 1976 to almost thirty-three percent in 2003 (CDC, 2007). Increases in cardiovascular diseases, cancer, and diabetes have accompanied this increased prevalence of obesity. Recently, the annual medical spending due to health care costs associated with obesity and being overweight in the United States increased from 51.6 billion dollars in 1995 to 78.5 billion dollars (92.6 billion dollars in 2002 dollars) in 1998, and is estimated to be in excess of 100 billion dollars today (Finkelstein, Fiebelkorn & Wang, 2003; NIDDK, 2007). There is an urgent need for prevention and intervention strategies to reverse this growing trend (Yach, Stuckler & Brownell, 2006). Prentice (2001) has purported that overeating is one of the major factors linked to the onset of obesity. Imbalances in energy intake and energy expenditure, through overeating, can place one at risk for obesity and its associated disorders (Prentice, 2001). As a result, much research has focused on diet as an influence on obesity and its related diseases and disorders (WHO, 2008).

Research has focused on the individual, social and environmental factors that may contribute to changes and differences in eating behavior so as to identify risk factors for obesity (Stice, 2002). Gender, age, and restraint are some of the factors that have been associated with differences in eating behavior (Glanz et al., 1998). In addition, stress has been linked to changes in eating behavior in eating disorder populations - persons with anorexia nervosa, bulimia nervosa, binge eating disorder or other eating disorder diagnosis; disordered eating populations – persons with eating disorder symptoms but who do not meet the full criteria for an eating disorder diagnosis; and persons without eating disorders or disordered eating (Ball & Lee, 2000; Bittinger & Smith, 2003; Burton, Smit & Lightowler, 2007; Ng & Jeffery, 2003; Torres & Nowson, 2007; Wallis & Hetherington, 2004).

The following review is therefore presented on the relationship of stress and eating. This examination encompasses the findings specific to the roles of gender and coping on this relationship. In addition, the review evaluated the possible reasons for the link between stress and eating behavior.

#### Stress and Eating

Stress has a profound influence on our health and, as a result, on our diet. A growing body of research has indicated an association between stress and changes in regular eating patterns (Greeno & Wing, 1994; Laitenen, Ek & Sovio, 2002; O'Connor, Jones, Conner & McMillan, 2008; Oliver & Wardle, 1999; Oliver, Wardle & Gibson, 2000; Pollard Steptoe, Canaan, Davies & Wardle, 1995; Torres & Nowson, 2007; Wansink, Cheney & Chan, 2003; Wardle, Steptoe, Oliver & Lipsey, 2000; Wells & Cruess, 2006; Zellner et al., 2006). Greater psychological stress has been associated with the greater likelihood of disordered eating attitudes in several studies (Freeman & Gil, 2004; Fryer, Walker & Kroese, 1997; Torres & Nowson, 2007). Research indicating changes in food intake during stress have generally reported two types of changes: changes in the quantity of food eaten and changes in the composition of food eaten. In a

study of college women, 81% of participants reported a change in appetite during stress (Kandiah, Yake, Jones & Meyer, 2006). Of those who had a change in appetite, 62% experienced increases in appetite, while the other 38% experienced decreases in appetite. Appetite directly influenced eating behavior and increases in appetite predicted increased food intake (Kandiah et al., 2006). Stress has been shown to affect eating in different ways – through changes in the amount consumed or changes in type of food consumed. The research on the changes in eating behavior associated with stress may be due to different reasons.

## **Reasons for Food Choice**

People also eat based on social factors such as life course, ideals, resources, social framework, food context, health, sensory appeal, natural content, price, weight control, familiarity, nutrition, and quality (Furst et al., 1996). However, during stress, eating behavior is based more on mood and on convenience and than on the above reasons (Wells & Cruess, 2006).

Research of the role of stress hormones on eating behavior provides some biological basis for the changes reported in normal eating behavior during stress. In the initial stage of stress, hormones - such as glucocorticoids - inhibit appetite and digestion, and later stimulate eating behavior to replenish the resources used during the stress response (Sapolsky, 2004; Taché, Martinez, Million & Wang, 2001). During chronic stress, glucocorticoids continue to stimulate appetite, and consequently food consumption, past what is needed (Dallman, LA Fleur, Pecoraro, Gomez, Houshyar & Akana, 2004; Sapolsky, 2004). Oversecretion of glucorticoids has been linked to hyperphagia (excessive eating) during stress. Conversely, under-secretion of glucorticoids has been linked to hypophagia (under eating) during stress (Epel, Lapidus, McEwen & Brownwell, 2001). In the presence of insulin, elevated glucocorticoids increased the drive for pleasurable or comfort foods (Dallman, Pecoraro, & la Fleur, 2005).

Eating during times of stress has been shown to be motivated by the need to decrease the negative emotions associated with stress. The influence of stress on mood is well-documented. Mood - which is stable, long-term and disconnected from an event influences and is influenced by emotion or affect - which is volatile, short-term and event-related (Lane, Beedle, & Terry, 2007). Stress has been shown to increase negative mood states and decrease positive mood states (DeLongis, Folkman & Lazarus, 1988; Macht, Haupt & Ellgring, 2005; van Eck, Nicolson & Berkhof, 1998). Ogden & Mtandabari (1997) found that during academic stress, which included an examination period, students reported deterioration in mood. Pollard et al. (1995) found that in a study assessing the impact of examination stress on eating behavior, the influence of mood on food choice rose at exam time for the exam group but not for the controls. A subsequent study reported similar findings (Zellner et al., 2006). Students during a stressful examination period chose foods based more on their mood and less on their nutritional value or on the needs of the body at the time (Zellner et al., 2006).

Research assessing emotional states and eating in everyday life in female college students found that subjective motivations to eat correlated with negative emotions than with positive emotions (Macht & Simons, 2000). Eating was based on attempts to regulate emotional state. College students, for example, reported that during negative emotions, they were most motivated to eat to provide distraction, to relax, and to feel better (Macht & Simons, 2000, Macht et al., 2005).

Convenience has also been linked to food choices. During stress, there is often a limit on time and resources that may be necessary to make a healthy food choice (Rappoport, Peters, Huff-Corzine, et al., 1992). In addition, health motives have been found to be negatively correlated with convenience. Convenient foods that are chosen tend to be pre-packaged meals or fast-food meals (Glanz et al., 1998). These findings highlight reasons for the relationship seen between stress and eating in research. Hormone regulation, mood, emotions, and convenience are associated with stress and seem to drive the intake of food during stressful times.

## Changes in the Quantity of Food Intake During Stress.

Research has reported both increases (hyperphagia) and decreases (hypophagia) in eating behavior during stress (O'Connor et al., 2008; Oliver et al., 2000; Polivy, Herman & McFarlane, 1994; Tanofsky-Kraff, Wilfley & Spurrell, 2000; Wardle et al., 2000; Zellner et al., 2006). Increases in food intake have been reported for males and females using different experimental designs – experimental manipulation of stress and measurement of food intake in the laboratory (Wallis & Hetherington, 2004), or quasi experimental designs which include self-reports of stress experienced and of food intake (Oliver et al., 2000). O'Connor et al. (2008) found that males and females snacked more when they experienced increases in stress, as reported in daily diary entries of stressors and food intake over a 4-week period. Wardle et al. (2000) discussed similar findings in which male and female workers reported eating greater amounts during weeks of high workload than weeks of low workload, as reported in a 24-hour recall over 6 months. Wallis and Hetherington (2004) reported that women who experienced laboratoryinduced ego threat, and who completed cognitive tasks ate more food than women who did not receive this manipulation. Zellner et al. (2006a) also reported more food intake in females who completed cognitive tasks, than in females who did not receive the manipulation.

Conversely, decreases in food intake also have been reported. Rutledge and Linden (1998) reported less food intake in females who completed cognitive tasks than those who did not complete the tasks. Findings were similar for studies that involved the completion of difficult cognitive tasks (Tanofsky-Kraff et al., 2000), the experience of interpersonal rejection (Rutledge & Linden, 1998), or of giving a speech (Polivy et al., 1994). Intake was less for females who were stressed than for females who were not stressed (Polivy et al., 1994; Tanofsky-Kraff et al., 2000). Studies that examined factors closely related to stress have also reported decreases in food intake. Wells and Cruess (2006) reported that decreased sleep, which they described as stress-inducing and closely related to stress, was associated with decreased food intake.

Inconsistencies in the findings presented may be influenced by dietary restraint. Females who exercised dietary restraint or who were chronic dieters were found to eat more during stress, while those who did not report dietary restraint experienced decreases in eating behavior (Polivy et al., 1994; Rutledge & Linden, 1998; Tanofsky-Kraff et al., 2000). Polivy and Herman (1980) suggested that during stress, restraint eaters are less able to control and restrict their eating behavior. However, only females participated in the studies examining restraint and its effect on the relationship between stress and eating behavior. The finding of increased intake reported in these studies may be due to the fact that females are more likely to be dietary restraint eaters than males (Paeratakul, York-Crowe, Williamson, Ryan & Bray, 2002). In addiction, not all of the studies who examined dietary restraint in females reported differences between restraint and nonrestraint eaters (O'Connor et al., 2008; Wallis & Hetherington, 2004). Dietary restraint may be related to hyperphagia (excessive eating) during stress as restraint eaters have been shown to increase their intake during stress (Greeno & Wing, 1994).

The reports in research of decreased intake during stress have only studied females. Therefore, it is difficult to compare these studies with the studies that used males. Research has been inconsistent in the findings on the changes in the amount of food eaten during stress. This inconsistency appears to be linked to methodological differences in experimental design and samples used.

*Gender differences in quantity of food intake*. The research on the link between gender and the amount of food eaten during and after stress showed interesting trends. Michaud, Kahn, Musse et al. (1990) reported that girls consumed more calories from fat on examination day or on a stressful day than other days. In addition, more women than men reported increased food consumption when stressed (Zellner et al., 2006). O'Connor et al. (2008) noted that the relationship between stress and snacking was higher and stronger in women than in men. Wardle, Haase, Steptoe et al. (2004) found that women were more likely than men to report avoiding high-fat foods and to be dieting under normal circumstances. This suggests that females may have higher scores for dietary restraint (Oliver et al., 2000; Pollard et al., 1995; Ptacek, Smith & Zanas 1992; Wardle et al., 2000; Zellner et al., 2006), which has been shown to predict stress-induced eating in a laboratory setting as well as in real life situations (Greeno & Wing, 1994; Wardle et al., 2000). Dietary restraint may also account for some of the differences seen between males and females in the amount of food they eat during stress. However, recent research has noted that stress may not influence the increases in eating seen in those who use dietary restraint as was previously believed. Restrained eaters have been reported to increase their intake under non-stress situations as well (Lowe & Kral, 2006). In summary, evidence for differences in males and females is reported in the quantity of food eaten during stress.

#### Changes in the Quality of Food Intake during Stress.

Research has been consistent in the area of types of foods eaten during stress. Findings have shown that persons increased their intake of sweet and high-fat foods during the stress (Gibson, 2006; Greeno & Wing, 1994). Research has also indicated that the preference for particular types of food was linked to a desire to reduce the negative emotions associated with times of stress (Dubé et al., 2005). These types of foods were also linked to being more effective at alleviating negative mood while low calorie foods were more effective at raising positive emotions (Dubé et al., 2005; Gibson, 2006).

Research on food type chosen after stress has found that individuals primarily eat sweet or high fat or sweet high-fat foods (Kandiah et al., 2006; Laitenen et al., 2002; Oliver & Wardle, 1999; Oliver et al., 2000; Rutledge & Linden, 1998; Wardle et al., 2000; Zellner et al., 2006). Zellner et al. (2006) noted that persons stressed in the lab ate more of the unhealthy high calorie sweet choice (i.e., M & M's) and less of the healthy sweet choices (i.e., grapes) than the unstressed. Participants ate food that they normally avoided when stressed such as sweet high calorie snacks and junk foods (Zellner et al., 2006). During stress in the laboratory, increases in the intake of sweet high-fat foods such as ice-cream (Tanofsky-Kraff et al., 2000), cookies (Polivy et al., 1994) and chocolate (Wallis & Hetherington, 2004; Zellner et al., 2006) have been reported. These increases have been reported after stress manipulations which included completing difficult cognitive tasks (Wallis & Hetherington, 2004), or preparing a speech (Polivy et al., 1994). Gibson (2006) reported research in which 212 students ate significantly greater amounts of sweets and chocolate during stress than before stress.

Stress is also related to an increase in fat or calorie intake (Ng & Jeffery, 2003). O'Connor et al. (2008) found that participants reported increased consumption of high fat and high sugar snacks between meals, and decreased vegetable intake after experiencing a large number of daily hassles. Wardle et al. (2000) reported higher intake of fat, saturated fat, carbohydrates, sugar and starch in a high-stress work session than in a lowstress work session. Few studies have integrated the examination of high-fat foods and the examination of sweet foods. Most studies have separated analyses of sweet foods and high-fat foods when examining relationships between stress and gender. However, an integration of these types of foods may allow for a more realistic examination of this phenomenon, as the foods that are often consumed during stress, such as chocolate and cookies, are high in both fat and sugar. These collective findings support the link between stress and changes in the types of foods eaten during stress. Specifically, increased sweet high-fat and salty high-fat intake has been reported.

Gender differences in quality of food intake. Studies that differentiated between male and female preferences during stress, have noted that males tend to eat salty high-fat foods while females chose sweet high-fat foods (Laitenen et al., 2002). Greeno and Wing (1994) reported that females ate twice the amount of sweet foods when experiencing a high stress condition as compared to a low stress condition. In another study, males ate more bland and salty foods than females, whereas females chose greater amounts of sweet foods (Oliver et al., 2000). Males reported eating more sausages, hamburgers and pizza than females and females reported eating more chocolate than their male counterparts, when driven by stress to eat (Laitinen et al., 2002). Dubé et al. (2005) reported that females had a preference for high calorie sweet foods whereas males had preferences for high calorie non-sweet and low calorie foods. There appears to be a distinct difference of food types that are preferred during stress by males and females. Specifically, females eat greater amounts of sweet high-fat foods during stress, and males eat greater amounts salty high-fat foods. During stress, both males and females tend to eat increased fat and calories.

Burton, Smit and Lightowler (2007) reported that overall, females craved sweeter fatty foods more than males. This study did not examine the role of perceived stress on food cravings. Nevertheless, differences between males and females in food cravings may provide some insight into the differences seen in eating behavior during stress. The food cravings discussed may be associated with changes in mood or perceived stress in participants. In addition, females experience cravings for high carbohydrates, high-fat and chocolate foods before menstruation as the metabolic rate in women rise during this time (Logue, 2004). Gender differences in cravings may be linked to the menstrual cycle.

The role of mood is important in the differences seen between males and females in the intake of sweet high-fat foods. Matud (2004) reported findings where females rated their life events more negatively than males, although there were no differences in the amount of life events reported between males and females. The negative mood that is associated with this perception of stress by females may influence their intake of sweet high-fat foods (Dubé et al., 2005). In summary these findings suggest that males and females may prefer different types of foods during stress, as a means to regulate the mood associated with stress.

## Stress and Coping Style

Coping has been described as the means of gaining mastery over, tolerating or reducing the internal and/or external demands associated with stress (Folkman & Lazarus, 1980). Cognitive strategies, as well behavioral strategies, are employed. Coping that is targeted at dealing with emotions and distress is known as emotion-focused coping. Coping that is targeted at taking care of the problem that is causing the distress is known as problem-focused coping. Both types of coping are used in different degrees dependant on how the situation is appraised (Carver, Scheier & Weintraub, 1989; Folkman, 1984). Effective appraisal of the stressor is critical to choosing the most effective coping strategies at the right time and in the right context (Folkman & Moskowitz, 2004). For example, Folkman and Moskowitz (2004) noted the example of coping with an examination by using both problem-focused coping to prepare for the examination and, distancing when awaiting results was proven to be an adaptive response (Folkman & Moskowitz, 2004).

Emotion-focused coping in particular has been linked to changes in eating behavior during stress, particularly for disordered eating (irregularities in eating that are not severe enough to be diagnosed) (NWHIC, 2000) and eating disorder (anorexia nervosa, bulimia nervosa and binge eating disorder) populations (APA, 2000). Research has shown that during stress, eating disordered populations that tend to use emotionfocused coping strategies have increased food intake in general, and increased sweet and high-fat intake in particular, during stress (Koff & Sangani, 1997). Scores on the Eating Attitude Test (EAT), which measures levels of eating disturbances, were positively correlated with emotion-focused coping and distraction during stress (Bittinger & Smith, 2003). In the study, stress was manipulated by exposing participants to previously recorded readings of stress-provoking scenarios. Similarly, Koff & Sangani (1997) reported a significant relationship between higher scores on the EAT and greater use of emotion-focused coping during stress. Ball and Lee (2000) found correlations between anorexia, bulimia and binge eating, and emotion-focused coping and avoidance. There is also an underutilization of problem-focused coping in disordered eating populations (Ball and Lee, 2000).

The link between emotion-focused coping and eating during stress can be linked to the nature of emotion-focused coping. As mentioned previously, eating can function as a means of comfort or as a way to improve negative emotions (Dube et al., 2005). Emotion-focused coping strategies target the emotions and seek to change them. Eating during stress may function as an emotion-focused strategy (Solomon, 2001).

An examination of coping style is also critical to the relationship between stress and eating behavior, since emotion-focused coping has been considered a risk factor for disordered eating (Ball & Lee, 2000). Research suggests that emotional-focused coping may also make students more vulnerable to binge eating (uncontrollable overeating) under stress (Freeman & Gil, 2004). Coping type has been shown to influences the relationship between stress and other health behaviors such as alcohol use in college students (Park et al., 2004). Lower problem-focused coping on stressful days was linked to increased alcohol use (Park et al., 2004). These findings illustrate the importance of coping as a possible mediator between stress and potentially harmful behaviors.

Gender differences have also been seen in coping behavior but findings have not been definitive (Miller & Kirsch, *as cited by* Matud, 2004). Women tend to utilize emotion-focused coping more than men while men tend to use emotional inhibition or problem-focused coping more than women (Matud, 2004; Ptacek et al., 1992). Matud (2004) examined stress and coping in a sample of 2816 people between 18 and 65 years old. The study found that females preferred to use emotion-focused coping over other forms of coping while males preferred to use active coping. Matud (2004) suggested that this preference may be due to how males and females are socialized or to the different stressful events that males and females report greater experiences of stress in relationships. Matud (2004) noted that the different events would necessitate different types of coping and the differences in coping may be a reflection of what males and females find more stressful.

In summary, the literature therefore shows that emotion-focused coping has been associated with disordered eating populations during stress. In addition, emotion-focused coping has been linked to increases in intake during stress. Coping style may therefore be another factor worth examining in the relationship between stress and eating. The preference of females to use emotion-focused coping may place them at greater risk for increased intake in general, or increased intake of sweet, and salty and high-fat foods in particular, during stress. The above literature reviewed the relationship between stress and eating behavior, which has been considered valuable in understanding precursors to obesity and its related disorders. Research has shown that stressful situations influence the quantity and type of food consumed. Specifically during stress, there was a change in food intake, as well as an increase in the amounts of fat, sweet high-fat and salty high-fat foods (Greeno & Wing, 1994; Laitenen, Ek & Sovio, 2002; O'Connor, Jones, Conner & McMillan, 2008). Many of the studies done in this area have involved females only and some have reported a difference in food intake during stress for restraint eaters and non-restraint eaters. Gender may also play a role that has not been thoroughly investigated (e.g. Greeno & Wing, 1994).

It has been speculated that during stress, eating behavior is stimulated to replenish depleted energy reserves (Sapolsky, 2004). Therefore, increased intake of food during stress may not be an unhealthy behavior, especially if intake includes important depleted nutrients. However, intake during stress may be considered unhealthy when most of the foods consumed are high in fat, salt and sugar. Increased intake of fat, salt and sugar has the potential to place persons at risk for coronary heart disease, high blood pressure, diabetes and obesity (Elliot, 2005; Hu, Manson & Willet, 2001). Therefore, research on stress and eating should include an examination of the factors related to increased intake of sweet, salty and high-fat foods. Gender, in particular, may be one of the factors that are related to differences in increased intake of sweet, salty and high-fat foods during stress.

One factor that has been neglected in the research of the relationship between stress and intake of fat, sweet or salty foods is the use of coping strategies. Coping strategies play an important role in mediating the effects of stress (Folkman & Lazarus, 1984). Therefore, an investigation of coping would be important to understanding the relationship between stress and eating behavior. Emotion-focused coping tends to be used more by disordered eaters during stress (Ball & Lee, 2000). Research examining this trend supports the possibility that emotion-focused coping can be a risk factor for the development of future disordered eating (Freeman & Gil, 2004). Therefore investigation into links between emotion-focused coping and eating irregularities and changes, would add to this body of research.

Females tend to use emotion-focused coping more than males during stress (Matud, 2000), and also tend to experience increased sweet high-fat intake during stress (Laitenen et al., 2002). Emotion-focused coping may place females at risk for increased sweet high-fat intake. There may be an unexamined pathway between stress, coping, gender and eating behavior where the interaction between gender and coping influences the stress-eating relationship.

It is the belief of the author that this area still has room for investigation. Much of the data collected on eating behavior have been predominantly from females and persons with disordered eating. Few studies have sought to investigate the nature of the relationship between stress and eating in males and females in non-disordered eating populations. Such an investigation can provide information to further prevention strategies against obesity in healthy adults. In addition, greater research in male populations is necessary as prevalence rates for obesity in men are rising (Ogden, Carroll, Curtin, McDowell, Tabek & Flegel, 2006).

The intent of this study was to more thoroughly examine the relationships between stress, food intake, gender and coping strategies. Specifically, this study tested four hypotheses. First, it was hypothesized that there would be a significant relationship between perceived stress and salty high-fat intake and a significant relationship between perceived stress and sweet high-fat intake. Intake of both sweet high-fat and salty fat foods would increase as perceived stress increased. Second, given that this relationship is supported, it was further hypothesized that males would eat more salty high-fat foods than females, and that females would eat more sweet high-fat foods than males. Third, it was also hypothesized that there would be a significant relationship between sex and emotion-focused coping. Finally, during stress there would be a significant relationship between emotion-focused coping and salty high-fat intake, and between emotion-focused coping and sweet high-fat intake. So females would use emotion-focused coping more than males. In addition, increased use of emotion-focused coping during stress would be related to increased intake of both salty high-fat and sweet high-fat foods.

## **CHAPTER II**

#### METHODS

## **Participants**

The participants were recruited from an undergraduate introductory psychology course at Texas State University. Two hundred and forty-three adult students (18 years and older) participated in the study during a regularly scheduled class session in exchange for course extra credit. The sample consisted of ninety-four males, one hundred and forty-four females and five participants who did not indicate a gender. Seventy-eight percent of the sample was ages 18 - 20 years. In this study, 57.6% of the student sample were Freshman, 22.6% were Sophomores, 13.7% were Juniors, and 6.2% were Seniors. Approval for data collection was obtained from the Institutional Review Board at Texas State University prior to the start of the study.

#### Measures

## Perceived stress.

The Gadzella's Student –Life Stress Inventory (Gadzella, 1991) assessed students' perceived academic stress in five categories (frustrations, conflicts, pressures, changes and self-imposed) and four reactions to stressors (physiological, emotional, behavioral and cognitive). Summed scores from the nine categories of the 51-item Likert response inventory, from the subsections Stressors and Reactions to Stress, produced a

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rating of perceived stress. Each item is rated on a scale from 1 (Never) to 5 (Most of the time). A sample item from the scale is "I experienced pressures as a result of competition (on grades, work, relationships with and/or spouse)". Participants responded to the items based on their experiences over the previous seven (7) days. Stress scores were summed ratings (1 - 5) of all of the items on the measure which produced a maximum score of 255. This inventory has moderate to good internal validity and reliability with comparable stress inventories (Gadzella & Baloglu, 2001). Cronbach's alpha for the measure was .92 (Gadzella & Baloglu, 2001).

#### Coping style.

Coping style was assessed with a subset of scales from the COPE inventory (Carver et al., 1989). COPE is a multidimensional inventory consisting of thirteen subscales which include problem-focused, emotion-focused and undesirable methods of coping. Seven of the scales were used in the present study. The three subscales used for emotional-focused coping were positive reinterpretation and growth; emotional social support; and instrumental social support. The four subscales used for problem-focused coping were, active coping, restraint, suppression of competing activities and planning. The emotion-focused coping subscales of denial, acceptance and religious coping were not used in this study due to the difficulty in characterizing these subscales as emotionfocused coping (Carver et al., 1989). Research comparing these subscales with other subscales of emotion-focused coping has been inconsistent. In early work, these subscales summed to create an emotion-focused coping scale. This practice was later discouraged in favor of creating second-order factors from among the subset of scales by grouping factors that correlated highly (Carver, 2007). The items on this measure are rated from 1 (I usually don't do this at all) to 4 (I usually do this a lot). A sample item from the measure is "I get upset, and am really aware of it". Scores for emotional-focused coping and problem- focused coping were summed ratings for all of the items on the relevant scales. This measure was chosen based on its moderate to high reliability and validity (Carver et al., 1989). Cronbach's alphas ranged from .62 to .85 for each subscale (i.e. active coping).

## Food Type.

Participants were asked to rate the frequency with which they ate foods represented by six categories - bland high fat, bland low fat, sweet high fat, sweet low fat, salty high fat and salty low fat. Ratings ranged from 1 (Never ate this type of food) to 7 (Always ate this type of food) with a rating of 4 meaning that participants occasionally ate this type of food. For each category of food, examples were given based on food checklist used by Oliver et al. (2000) and from checklists based on the six food groups based on sugars (g), sodium (mg) and energy (kcal) and energy from fat (%) (Oliver et al., 2000). Participants rated how representative this trend of eating was similar to their normal eating behavior or diet on a scale from 1 (Not at all representative) to 7 (Very representative).

#### Procedure

Mid-semester, one week prior to midterm examination, questionnaires including the above measures were distributed to participants in an introductory psychology class (see Appendix). The researcher told the participants that the questionnaire was intended to gather information on food choice, styles of coping and stress experience of students. The researcher instructed the participants on correct completion of the scantron form. Confidentiality and the voluntary nature of the study were explained. The participants were thanked for their participation. After completing the questionnaire, the participants were given the researcher's contact information if they were interested in the findings of the study.

## **CHAPTER III**

#### RESULTS

#### Initial Analyses

The reliability coefficients were calculated for the perceived stress measure and the subscales of the COPE. Cronbach's alpha for the Student-Life Stress Inventory was .92. Cronbach's alphas were .74 for the emotion-focused coping scale and .87 for the problem-focused coping scale. All variables to be used in multiple regression analyses, perceived stress, sex, emotion-focused coping, problem-focused coping, salty high-fat intake and sweet high-fat intake, were centered by subtracting the calculated mean from each individual score so that the mean of the variables were zero. This was done to reduce the effects of multicollinearity in which the correlation between two predictor variables may result in unstable coefficients and large standard errors that make interpretation difficult (Aiken & West, 1991).

#### **Descriptive Statistics**

Table 1 presents the mean levels of the main study variables, separated by biological sex (sex). On perceived stress, the mean score for females was not significantly different from males, t(236) = -1.52, p = .13. The mean score for males and females was significantly different on emotion-focused coping, t(236) = -3.09, p < .01 and not significantly different on problem-focused coping, t(236) = -.45, p = .65. The mean

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difference on salty high-fat foods was marginally significant for males and females, t(236) = 1.92, p = .06, whereas sweet high-fat intake for males was equal to that for females, t(236) = .47, p = .96.

# Table 1

Mean of Main Variable Scores of Males and Females

	Males		Females		T – Test
			Significance		
	Mean	SD	Mean	SD	(t-value)
Perceived stress score	132.4	22.7	137.4	26.4	-1.52
Problem-focused coping	49.8	9.4	50.4	10.4	45
Emotion-focused coping	20.9	4.4	22.8	4.8	-3.09**
Sweet high-fat	3.5	1.6	3.5	1.8	.47
Salty high-fat	4.4	1.6	3.5	1.6	1.92

\*\*p<.01

Table 2 presents the correlations between the independent variables. Perceived stress correlated positively with both emotion-focused coping (r = .31) and problem-focused coping (r = .31). Emotion-focused coping was positively correlated with problem-focused coping (r = .67). Salty high-fat intake and sweet high-fat intake were positively correlated (r = .46). This moderate correlation did not justify combining the two categories of high-fat foods to create a composite score for high-fat intake.

Table 2

Intercorrelations Between Independent Variables

Independent Variables	1	2	3
1. Stress		.307(**)	.313(**)
2. Problem		-	.668(**)
3. Emotion			

\*\*. Correlation is significant at the 0.01 level (2-tailed).

#### Main Analyses

Hypothesis 1 predicted that there would be a significant relationship between perceived stress and salty high-fat intake, and between perceived stress and sweet highfat intake. Hypothesis 2 predicted that males would eat more salty high-fat foods than females, and that females would eat more sweet high-fat foods than males. These hypotheses were tested using the same multiple linear regression analyses. Two regressions were conducted, one for sweet and one for salty foods. For each regression analysis, the centered variables of perceived stress and sex were entered at step one of the regression. A cross product variable of perceived stress and sex (Stress X Sex) was entered at step two to test the interaction.

In hypothesis 3, it was predicted that there would be a significant relationship between sex and emotion-focused coping. Hypothesis 3 was tested using Independent *t*test comparing males and females on emotion-focused coping. Sex was entered as the group variable and emotion-focused coping was entered as the dependent variable.

Hypothesis 4 was tested using two multiple linear regression analyses – salty high-fat intake as the dependent variable and one with sweet high-fat intake as the dependent variable for the other. For each analysis, the centered variables of emotionfocused coping, stress and sex were entered at step one. Cross product variables of emotion-focused coping and sex (Emotion X Sex), perceived stress and sex (Stress X Sex), and emotion-focused coping and stress (Emotion X Stress) were entered at step two to test the interactions. A cross product variable of perceived stress, emotion-focused coping, and stress (Stress X Emotion X Sex) was entered at step three.

Hypothesis 1: Impact of Sex and Perceived Stress on Salty and Sweet High-Fat Intake.

It was hypothesized that there would be a significant relationship between perceived stress and salty high-fat intake and a significant positive relationship between perceived stress and sweet high-fat intake. As levels of perceived stress increased, both salty high-fat intake and sweet high-fat intake would increase. As seen in Table 3, regression analyses indicated a significant relationship between perceived stress and salty high-fat intake,  $\beta = .17$ , t = 2.45, p < .05. Salty high-fat intake increased significantly as perceived stress increased. As seen in Table 4, regression analyses of the dependent variable sweet high-fat intake failed to indicate a significant relationship with perceived stress,  $\beta = .09$ , t = 1.29, p = .18.

# Table 3

regression An	arysis for	variables r	reducing Sarry	riigii-rai iiia	<u>KC</u>	
Variable	R	$\mathbf{R}^2$	Adjusted	В	SE B	β
			$R^2$			
Step 1	.20	.04	.03			
Sex				- 0.47	0.22	14*
Stress				0.01	0.00	.16*
Step 2	.21	.04	.03			
Sex				- 0.49	0.22	14*
Stress				0.01	0.00	.17*
Stress X Sez	K			- 0.01	0.01	07

Regression Analysis for Variables Predicting Salty High-Fat Intake

\**p* < .05.

Table	4
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Regression Analysis for Variables Predicting Sweet High-Fat Intake								
Variable	R	$\mathbb{R}^2$	Adjusted	В	SE B	β		
			<u> </u>					
Step 1	.08	.01	00					
Sex				- 0.39	0.23	01		
Stress				0.01	0.00	.08		
Step 2	.09	.01	01					
Sex				- 0.47	0.23	01		
Stress				0.01	0.00	.09		
Stress X Se	x			- 0.01	0.01	03		

\**p* < .05.

Hypothesis 2: Moderating Effect of Sex. Given that the relationship between perceived stress and salty high-fat intake, it was further hypothesized that males would eat more

salty high-fat foods than females, and that females would eat more sweet high-fat foods than males. The interaction of perceived stress and sex should therefore significantly relate with sweet high-fat intake and with salty high-fat intake. Females who were experiencing higher levels of stress would report higher intake of high-fat sweet foods than males who were experiencing higher levels of stress. The interaction between sex and perceived stress (Stress X sex) did not demonstrate a significant relationship with salty high-fat intake,  $\beta = -.07$ , t = -1.14, p = .26, or with sweet high-fat intake,  $\beta = -.03$ , t =-.50, p = .62. Analyses did indicate that there was a significant relationship between sex and salty high-fat intake,  $\beta = -.14$ , t = -2.16, p < .05. The significant negative correlation showed that, males were generally more likely to report higher levels of salty high-fat intake than females.

#### Hypothesis 3 & 4: The Role of Coping on Sweet/Salty High-Fat Intake.

It was also hypothesized that there would be a significant relationship between sex and emotion-focused coping. A *t*-test indicated significant differences in the emotionfocused coping scores for males and females, t(236) = -3.09, p < .01. Females used emotion-focused coping significantly more than males. Conversely, a similar test did not show a relationship between sex and problem-focused coping, t(236) = -.453, p = .653.

It was further hypothesized that under stress, the use of emotion-focused coping would be significantly related to salty high-fat intake and sweet high-fat intake. Therefore, the interaction between emotion-focused coping and perceived stress would be significantly related to both salty high-fat intake and sweet high-fat intake. Analyses did not indicate significance for the relationships between the interaction of emotion-focused coping and perceived stress (Emotion X Stress), and salty high-fat intake or emotionfocused coping and perceived stress (Emotion X Stress), and sweet high-fat intake.

As shown in Table 5, analyses revealed no significance for the main effect of emotional-focused coping on salty high-fat intake,  $\beta = .00$ , t = -.09, p = .98. Regression analyses again indicated a significant relationship between sex and salty high-fat intake,  $\beta$ = -.14, t = -2.11, p < .05, and between perceived stress and salty high-fat intake,  $\beta = .17$ , t= 2.34, p < .05. These relationships remained significant even after the effects of emotion-focused coping and the interactions between perceived stress, sex and emotionfocused coping were accounted for in the analyses. Analyses did not indicate significance of the relationships between any of the two-way interactions (Emotion X Stress, Stress X Sex, and Emotion X Sex) or the three-way interaction (Stress X Emotion X Sex), with salty high-fat intake.

# Table 5

Regression Analysis for Emotion-Focused Coping, Sex and Stu	ress Predicting Salty High-
Fat Intake	

Variable	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	В	SE B	β
Step 1	.20	.04	.03	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · ·	
Sex				- 0.47	0.22	14*
Stress				0.01	0.00	.16*
Emotion				- 0.00	0.02	01
Step 2	.21	.04	.02			
Sex				- 0.49	0.22	14*
Stress				0.01	0.00	.17*
Emotion				- 0.00	0.02	00
Stress X Emotion				0.00	0.00	.02
Emotion X Sex				- 0.01	0.05	01
Stress X Sex				- 0.01	0.01	07
Step 3	.21	.05	.17			
Sex				- 0.47	0.23	14*
Stress				0.01	0.01	.17*
Emotion				0.00	0.00	.03
Stress X Emotion				0.00	0.00	.03
Emotion X Sex				- 0.01	0.05	02
Stress X Sex				-0.01	0.01	08
Stress X Sex X				- 0.00	0.00	03
Emotion						

\*p < .05

Table 6 shows the regression analysis for sweet high-fat intake. Analyses revealed no significance for the main effect of emotion-focused coping on sweet high-fat intake,  $\beta$ = .01, t = .35, p = .94. Regression analyses again indicated no significant relationship between sex and sweet high-fat intake,  $\beta$  = .00, t = -.23, p = .99, and between perceived stress and salty high-fat intake,  $\beta$  = .09, t = -2.11, p = .21. Analyses indicated significance for the interaction of sex and emotion-focused coping (Emotion X Sex) on sweet high-fat intake,  $\beta$  = .164, t = 2.31, p < .05. Analyses did not indicate significance of the relationships between two-way interactions (Emotion X Stress, and Stress X Sex) or the three-way interaction (Stress X Emotion X Sex), with sweet high-fat intake.

# Table 6

Variable	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	В	SE B	β
Step 1	.09	.01	01			
Sex				- 0.05	0.23	02
Stress				0.01	0.01	.08
Emotion				- 0.01	0.03	02
Step 2	.18	.03	.01			
Sex				- 0.00	0.23	00
Stress				0.01	0.01	.09
Emotion				- 0.00	0.03	00
Stress X Emotion				- 0.00	0.00	04
Emotion X Sex				0.13	0.05	16*
Stress X Sex				- 0.01	0.01	08
Step 3	.18	.03	.00			
Sex				- 0.00	0.24	00
Stress				0.01	0.01	.09
Emotion				0.00	0.03	.01
Stress X Emotion				0.00	0.00	.03
Emotion X Sex				-0.13	0.06	16*
Stress X Sex				- 0.01	0.01	08
Stress X Sex X Emo	otion			- 0.00	0.00	01

Regression Analysis for Emotion-Focused Coping, Sex and Stress Predicting Sweet High-Fat Intake

\*p < .05

Further analyses were conducted to examine the nature of the interaction effect (Emotion X Sex) on sweet high-fat intake. Separate correlations were conducted for males and females on emotion-focused coping. The relationship between sweet high-fat intake and emotion-focused coping was not significant for either males (r = -.14) or

females (r = .15). Examination of the direction of these correlations may suggest that sweet high-fat intake tends to decrease as scores on emotion-focused coping increase for males. Conversely, sweet high-fat intake may tend to increase as scores on emotionfocused coping increase for females. However, these correlations are not significant and patterns suggested here are speculative.

Using two regression analyses, additional analyses were conducted to examine any possible effects of problem-focused coping on the relationship between perceived stress and salty high-fat intake, and perceived stress and sweet high-fat intake. Regression analyses were similar for emotion-focused coping where two analyses were conducted – salty high-fat intake was the dependent variable in one and sweet high-fat intake was the dependent variable the other. For each regression analysis, the centered variables of problem-focused coping and sex were entered at step one. Cross product variables of problem-focused coping and sex (Problem X Sex), perceived stress and sex (Stress X Sex), and problem-focused coping and stress (Problem X Stress) were entered at step two to test the interactions. A cross product variable of perceived stress, problem-focused coping, and stress (Stress X Problem X Sex) was entered at step three. Sex and perceived stress were again significantly related to salty high-fat intake.

As seen in Table 7, analyses revealed no significance for the main effect of problem-focused coping on salty high-fat intake,  $\beta = -.01$ , t = -.07, p = .88. Regression analyses again indicated a significant relationship between sex and salty high-fat intake,  $\beta = -.15$ , t = -2.15, p < .05, and between perceived stress and salty high-fat intake,  $\beta = .16$ , t = 2.34, p < .05.

# Table 7

Regression Analysis for Problem-Focused Coping, Sex and Stress Predicting Salty High-Fat Intake  $\mathbf{R}^2$ Adjusted Variable R В SE B В  $\mathbb{R}^2$ .20 .04 .03 Step 1 Sev 0 47 14\* 0 22

DCA				-0.47	0.44	+
Stress				0.01	0.00	.16*
Problem				- 0.01	0.01	00
Step 2	.22	.05	.02			
Sex				- 0.48	0.22	14*
Stress				0.01	0.01	.16*
Problem				- 0.00	0.01	01
Stress X Problem				0.00	0.00	04
Problem X Sex				0.01	0.02	.03
Stress X Sex				- 0.01	0.01	07
Step 3	.22	.05	.02			
Sex				- 0.50	0.23	15*
Stress				0.01	0.01	.16*
Problem				- 0.00	0.01	01
Stress X Problem				0.00	0.00	05
Problem X Sex				0.01	0.02	.03
Stress X Sex				- 0.01	0.01	07
Stress X Sex X				- 0.00	0.00	03
Problem						

\**p* < .05

These relationships remained significant even after the effects of problem-focused coping and the interactions between perceived stress, sex and problem-focused coping were accounted for in the analyses. Analyses did not indicate significance of the

relationships between any of the two-way interactions (Problem X Stress, Stress X Sex, and Problem X Sex) or the three-way interaction (Stress X Problem X Sex), with salty high-fat intake.

Table 8 shows the regression analyses completed for sweet high-fat intake. Analyses revealed no significance for the main effect of problem-focused coping on sweet high-fat intake,  $\beta = -.03$ , t = -.29, p = .71. Regression analyses again indicated no significant relationship between sex and sweet high-fat intake,  $\beta = .01$ , t = -.17, p = .93and between perceived stress and salty high-fat intake,  $\beta = .10$ , t = 1.31, p = .16. Analyses indicated significance for the interaction of sex and problem-focused coping on sweet high-fat intake,  $\beta = .14$ , t = 1.95, p < .05. Analyses did not indicate significance of the relationships between two-way interactions (Problem X Stress, and Problem X Sex) or the three-way interaction (Stress X Problem X Sex), with sweet high-fat intake.

# Table 8

Variable	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	В	SE B	β
Step 1	.09	.01	01	********		······
Sex				- 0.40	0.23	01
Stress				0.01	0.01	.09
Problem				- 0.00	0.01	02
Step 2	.16	.03	.00			
Sex				- 0.42	0.23	01
Stress				0.01	0.01	.10
Problem				-0.01	0.01	03
Stress X Problem				0.00	0.00	05
Problem X Sex				0.05	0.03	.14*
Stress X Sex				- 0.01	0.01	07
Step 3	.18	.03	.00			
Sex				0.02	0.23	.01
Stress				0.01	0.01	.10
Problem				- 0.00	0.01	03
Stress X Problem				0.00	0.00	04
Problem X Sex				0.05	0.03	.13
Stress X Sex				- 0.01	0.01	09
Stress X Sex X				- 0.00	0.00	08
Problem						

Hierarchical Regression Analysis for Problem-Focused Coping, Sex and Stress Predicting Sweet High-Fat Intake

\*p < .05

Further analyses were conducted to examine the nature of the interaction effect (Problem X Sex) on sweet high-fat intake. Separate correlations were conducted for males and females on problem-focused coping. The relationship between sweet high-fat intake and problem-focused coping was not significant for either males (r = -.15) or females (r = .08). Examination of the direction of these correlations may suggest that sweet high-fat intake tends to decrease as scores on problem-focused coping increase for males. Conversely, sweet high-fat intake may tend to increase as scores on problemfocused coping increase for females. However, like correlations for emotion-focused coping, these correlations are not significant and patterns suggested here are speculative and are based only on the direction of the relationship in males and in females.

## **CHAPTER IV**

#### DISCUSSION

The current research explored the relationship between perceived stress and eating behaviors, particularly relating to the relationship of perceived stress and the types of foods eaten, and to the impact of biological sex and coping style on this relationship. The findings of these relationships in this study are discussed.

In support of the first hypothesis predicting a significant positive correlation between perceived stress and salty high-fat and a significant positive correlation between perceived stress and sweet high-fat intake, the results show evidence that increases in perceived stress are associated with increased salty high-fat intake (Laitenen et al., 2002; Oliver et al., 2000). This result is of concern as research has shown the link between high consumption of fat and higher likelihood of being overweight, higher risk for coronary heart disease (CHD) and higher cholesterol levels (Hu, Manson & Willet, 2001; Krauss, Deckelbaum, Ernst, Fisher, Howard et al., 1996). In addition, high salt intake has been linked to high blood pressure or hypertension as consistently high levels of salt can cause a need for increased blood pressure to regulate equilibrium in the body (Elliot, 2005; Krauss et al., 1996). The findings seen in this study may support a possible link between stress and health risk. Moreover, these findings represent a step towards a greater understanding of the relationship between stress and eating. Increased intake of salty high-fat foods during stressful times may be related to an attempt by students, to reduce

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the negative mood associated with stress reaction (Macht & Simons, 2000; Macht et al., 2005). This intake may also be linked to a desire of students to feel comfort during times of stress (Dallman et al., 2005; Dubé et al., 2005; Laitinen et al., 2002).

Previous studies looked predominantly at the difference in intake of salty highfat-foods between males and females (Laitenen et al., 2002; Oliver et al., 2000). In both studies, males ate more salty high-fat foods than women. However, Oliver et al. (2000) did not find a significant relationship between salty high-fat intake and stress, as was the finding in the current study. The current research shows that the link between perceived stress and salt high-fat intake can be applicable to both males and females. This study therefore is one of the first of its kind to support a relationship between perceived stress and salty high-fat intake when gender is taken into account. Differences seen between the previous studies and the current study may be due to differences in the designs of the studies. Oliver et al. (2000) measured the amount of food eaten following a stress manipulation while Laitenen et al. (2002) compared daily eating behavior and stress as reported by participants over a six month period. The current study measured food intake based on seven day recall ratings during mid-semester period. These varied means of manipulating and assessing stress and food intake variables may have contributed to the differences in findings. Further research integrating the different experimental designs may produce more consistent findings related to the influence of stress on salty high-fat intake.

Although the current study indicated a relationship between perceived stress and salty high-fat intake, no such relationship was found between perceived stress and sweet high-fat intake. One explanation for this is that previous studies that have reported changes in sweet intake or high-fat intake under stress (Kandiah et al., 2006; Laitenen et al., 2002; O'Connor et al., 2008; Oliver et al., 2000; Rutledge & Linden, 1998; Wardle et al., 2000; Zellner et al., 2006) analyzed food intake differently. First, the current study measured and analyzed sweet intake and high-fat intake as one food category (sweet high-fat intake) while the studies that found main effects of stress on sweet foods and high-fat foods measured and analyzed the food categories separately (O'Connor et al., 2008; Wardle et al., 2000). It is possible that integration of sweet intake and high-fat intake in analyses of the current study may have produced results contrary to that which was found previously

Second, methodological differences were present between the current study and previous research. For example, O'Connor et al. (2008) used daily recall to examine both stress and food intake and Wardle et al. (2000) calculated approximate sugar and fat consumption based on recall of daily intake for non-stressed and stressed groups. Both studies asked participants to provide a detailed recollection of food intake. However, the current study asked participants to rate the frequency with which they ate foods found in different categories (Bland Low-Fat, Bland High-Fat, Salty Low-Fat, Salty High-Fat, Sweet Low-Fat and Sweet High-Fat). Wardle et al. (2000) calculated the mass consumption of sugar and fat, while O'Connor used coding to differentiate between highfat snacks and sweet snacks, no calculation or coding was done in the current study. This difference in quantifying food intake, may have influenced the differences in findings between the current and previous studies.

Third, several studies which showed a significant relationship between stress and sweet high-fat intake included females only (Laitenen et al., 2002; Rutledge & Linden,

1998; Zellner et al., 2006. Furthermore, several of these studies found a stronger relationship between stress and sweet high-fat intake in dietary restraint eaters (Rutledge & Linden, 1998; Zellner et al., 2006). While the current study did not examine the role of dietary restraint, but concentrated on coping and gender effects, further research is needed in this area. Previous research tends to show a strong relationship for stress and sweet high-fat intake in populations of female restraint eaters (Greeno & Wing, 1998). The failure of the current study to produce similar findings may be due to the failure of the study to compare restraint and non restraint eaters. There may also be some difference bases on menstrual cycle in eating and food craving, a factor that should be taken into consideration in the future. The difference associated with restraint may be linked to physiological regulation of stress hormones (glucocorticoids) as seen in hyperphagia during stress. In addition, this study differs from other studies that find significant relationship between sweet intake or sweet high-fat intake in both restraint and non restraint eaters (O'Connor et al., 2008; Wallis & Hetherington, 2004). The current study adds to the body of work in the area and challenges further exploration of the effect of restraint on the stress-eating relationship.

In summary, it is difficult therefore to compare the findings of the current study with the findings of previous studies given these methodological differences. Further research examining the pathway from stress to changes in sweet high-fat intake is needed. For instance, restraint may moderate the impact of stress on intake of sweet high-fat. In addition it is possible that different types and sources of stress may result in different levels of sweet high-fat intake. This is important in identifying the risk factors for increased intake of sweet high-fat foods during times of stress.

The second hypothesis predicted that sex would males would eat more salty highfat foods than females, and that females would eat more sweet high-fat foods than males. Although the interaction of sex and perceived stress did not relate to either salty high-fat intake or sweet high-fat intake, sex was related to salty high-fat intake. Specifically, males were more likely than females to eat salty high-fat foods, regardless of stress. Moreover, the finding may support research showing general differences in eating behavior between males and females (Rozin, Fischler, Imada, Sarubin & Wrzesniewski, 1999; Wardle et al., 2004). Females reported avoidance of high-fat in their diet and are more likely to avoid adding salt to their food than males (Wardle et al., 2004). In addition, females had a different attitudes to food than males - they associated food more with health and less with pleasure (Rozin et al., 1999.) The relationship between sex and salty high-fat intake found in the current study may suggest that college male students may be more likely than college female students to eat foods high in fat and salt. Such eating behaviors over an extended period of time may place male students at greater risk of developing coronary heart disease, high blood pressure and obesity (Hu, Manson & Willet, 2001; Krauss, Deckelbaum, Ernst, Fisher, Howard et al., 1996).

The relationship found in the present study may also be a reflection of the differences between males and females in how they choose food. It has been shown that male college students are less likely than female college students to read labels before eating a meal (Levi, Chan & Pence, 2006). They are also less likely to choose food based on quality and healthiness. The study suggested that males may be prone to ignoring educational interventions on eating and weight management. In their sample, 34.8 percent of male students were overweight and obese whereas 14.5 percent of female students

were overweight and obese (Levi et al., 2006). Females are more likely than males to attempt to diet and control their food intake, thus females may be less likely to eat this type of food based on its convenience (Wardle et al., 2004). The nature of college campuses have been shown to attributed to weight gain during the first semester in college (Levitsky, Halbmaier & Mrdjenovic, 2004). Levitsky et al. (2004) found that the environmental stimuli found on campuses such as all-you-can-eat dining halls and snacking and eating high-fat "junk foods" accounted significantly for weight gain in students. Future research into the role of college living and the stress associated with completing a degree should be examined to determine if risk factors exist for the onset or maintenance of unhealthy eating behaviors.

In support of the third main hypothesis predicting a relationship between sex and emotion-focused coping, sex was significantly related to emotion-focused coping. Females in particular reported greater use of emotion-focused coping than males. This finding adds to the body of research on gender differences in coping. Particularly it verifies previous findings that showed that females preferred to use emotion-focused coping (Matud, 2004, Ptacek et al., 1992). Research has also shown that both males and females use varied types of coping at various times. Differences in patterns of coping in various situations may exist for males and females (Folkman & Lazarus, 1980). Females for instance have been shown to use social support, a form of emotion-focused coping, more than men (Turner, 2004). Social support was a key component of the emotionfocused measure used in the current study (Carver et al., 1989). The differences reported here may be an indication of the tendency of females to use emotion-focused coping and may support the research on gender differences in social support. Another possible reason for the significant relationship between sex and emotionfocused coping could be linked to the research on coping styles and disordered eating. Females have been predominantly diagnosed with eating disorders and dietary restraint (Hudson, 2007). In addition, previous research has shown a relationship between disordered eating and emotion-focused coping (Ball & Lee, 2000; Bittinger & Smith, 2003; Koff & Sangani, 1997). The tendency of females to use emotion-focused coping in the current study may be an indication of this relationship between disordered eating and use of emotion-focused coping. Future research should apply these findings to other areas of health behavior. In addition research should focus on under what circumstances do males and females differ in their coping style preference.

It was hypothesized that emotion-focused coping would moderate the relationship between perceived stress and salty high-fat intake and perceived stress and sweet high-fat intake. Although these hypotheses were not supported, interesting relationships were shown. The interaction of sex and emotion-focused coping was significantly related to sweet high-fat intake. The present findings may suggest that males benefit, more than females, from the use of emotion-focused coping. The direction of the correlations showed that males seemed to eat less sweet high-fat foods when using emotion-focused coping whereas females ate more sweet high-fat foods when using emotion-focused coping. However, these relationships were not significant males or females however and are speculative at best. The findings however support further speculation and provide basis for further study. Holm-Denoma, Joiner, and Vohs (2008) found in their study of weight gain in freshman college students that parental relationship significantly related to weight gain. Specifically, the study reported that negative relationships with parents predicted weight gain in male students while positive relationships with parents predicted weight gain in females (Holm-Denoma et al., 2008). It is possible that parental relationship, which can be considered to be part of emotional social support, may have different effects on eating behavior in males and females. In the current study emotion-focused coping may have had a different effect on sweet high-fat intake. The use of emotion-focused coping may contribute to female college student being more susceptible to poor adjustment after leaving home. The poor adjustment may be linked to high-fat intake. The current study and the study cited may show new patterns in the relationship between stress and eating behavior (Holm-Denoma et al., 2008).

While all the hypotheses were not supported, the current study has some important implications. Perceived stress was found to be related to salty high-fat intake – higher levels of stress were linked to greater intake of salty high-fat. In addition sex was found to also be related to salty high-fat intake – males ate more salty high-fat foods. Sex was also related to coping – females used more emotion-focused coping than males. Although emotion-focused coping was not associated with salty high-fat intake or with sweet high-fat intake, the interaction of emotion-focused coping and sex related significantly to sweet high-fat intake. Previous studies have highlighted the importance of examining the relationship of sex and eating behaviors (Laitenen et al., 2002; O'Connor et al. 2008; Oliver et al., 2000), but none have examined the association of coping with eating behaviors in normal populations, and the interaction of sex and coping with eating behaviors.

The findings of the current study have far-reaching implications for the theoretical understanding of eating behavior. This study supports the previously researched

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relationship between stress and food intake and strengthens the research on gender differences in coping. In addition, it presents new findings on the interplay between coping and gender and their impact on food intake. Theory has mostly focused on risk factors for unhealthy eating behaviors in disordered eating populations (Burton, Smit & Lightowler, 2007; Ng & Jeffery, 2003; Striegel-Moore & Bulik, 2007). The current study highlights the importance of examining eating behaviors in non-disordered populations. Such emphasis may provide greater understanding into the precursors of disordered eating and unhealthy eating.

The research on stress and eating has used varied methods of measuring and manipulating perceived stress, and measuring food behavior. As previously reviewed, these differences may contribute to the inconsistencies seen in research. While the current study replicated previous methods of measuring coping and perceived stress, a new way of measuring eating behavior was developed that may have implications for future study. The measure of food intake used in this study allowed respondents to assess the frequency with which they ate different types of foods. Although this measure does not have internal consistency, it provided respondents to quickly assess their eating behavior. An extension of this measure would be useful for future examination of the intake of different food types. Researchers in past studies have either measured food eaten after a stress manipulation (Polivy et al., 1994; Rutledge & Linden, 1998; Tanofsky-Kraff et al., 2000; Wallis & Hetherington, 2004; Zellner et al., 2006), or have assessed past eaten by using questionnaires or diary-format recall (Kandiah et al., 2006; Laitenen et al., 2002; Pollard et al., 1995; Wardle et al., 2000). Measurement of food intake can be limited to a particular food and recall of large amount of information may cause error in reporting of

findings. The measure used in the current study focused specifically on food type. It evaluated intake of food types based on fat and taste. An expanded validated version of the measure of food behavior would be useful for future research.

Perceived stress was not associated with intake of sweet high-fat foods. In addition, females did not tend to eat sweet high-fat foods more than males. The prediction that there would be a relationship between emotion-focused coping and food intake during stress was not supported. One possibility is that the measure used to assess perceived stress is a measure of student stress and reactions to stress (Gadzella & Baloglu, 2001). The focus on stressors particular to students may have limited the ability of the measure to fully assess perceived stress. It is more likely, however, that stress was not elevated sufficiently. The highest score on the stress measure was 207 out of a possible 255. This suggests that there may not have been a strong effect of stress at the time in which the measures were administered, in spite of the fact that the mid-semester time is a time of tests and deadlines for assignments. However, tests and assignments are scattered throughout a two week period. Finals on the other hand takes place during one week at the end of semester and can be more stress-provoking as a result. Pollard et al. (1995) found that students who had end of semester examinations reported higher levels of perceived stress than students who did not have end of semester examinations. Future studies should seek to assess eating during these high-stress times by using measures that are not time-consuming to allow for high response rates. Any assessment of students must take into consideration the constraints students are under during high-stress times.

The measures used to assess coping style though internally valid may have been limited in its scope. The COPE is a well researched measure, however. The sub-scales that are often combined to form indices of problem-focused and emotion-focused coping were not intended to be used for this purpose (Carver, 2007). It is possible that the alteration of the measure may have weakened its effectiveness at identifying emotionfocused coping. This may have contributed to the weak relationship seen between emotion-focused coping and perceived stress. In the current study, emotion-focused coping related to sweet high-fat intake only when emotion-focused coping interacted with sex. The failure to find a significant moderating effect of emotion-focused coping on the relationship between perceived stress and sweet high-fat intake here may be related to this limitation.

The lack of main effect for emotion-focused coping may be linked to the role of coping style in eating behavior is limited to disordered eating populations. Research with these populations has indicated that persons with disordered eating are more likely to use emotion-focused coping than other forms of coping (Ball & Lee, 2000; Bittinger & Smith, 2003; Koff & Sangani, 1997). Coping may not moderate the relationship between perceived stress and eating in normal populations. However the role of coping is critical given the present findings showing some gender differences in how coping impacts food intake. Coping may factor into the impact sex has in differentiating the differences seen in eating behavior in normal populations.

It was difficult to assess the reliability and validity of the measures used to assess the food intake. Recall measures were not used, since these measures often require subjective rating and categorization of foods listed by a committee of psychologists or nutritionists (Wardle et al., 2000). Biases associated with self-report must be considered when evaluating the findings of the study. There may be a social desirability bias associated with reporting eating behavior, which could be considered a personal and sensitive topic. Error may also occur due to the fact that during stress people may not pay attention to what they eat (Levi et al., 2006). The measure of food types remains a significant limitation of the current study. There yet remains to be a comprehensive measure for eating behavior. Validation of the measure used in the present study or similar measures would require an extension of the measure where list of foods or food items are individually rated. Given the variety of diet that people may have, such a measure would need to be comprehensive to include meals or groups of meals instead of food items.

The study focused on college student and stress associated with college life. As a result the generalizability of the study is limited to this group of persons. It is also difficult to extend the results to persons older than 23 years old as persons 23 years and older represented only 5 % of the sample. Future directions would need to include research sampling from a more diverse population.

The current study contributes to the body of research on stress and eating behavior. Findings reiterate the relationship between perceived stress and eating behavior – specific to intake of salty high-fat foods. The study extends research on the relationship between stress and eating behavior to males – often neglected in the area of eating behavior (Kandiah et al., 2006; Rutledge & Linden, 1998; Wallis & Hetherington, 2004; Zellner et al., 2006). Furthermore the study indicates a relationship between sex and salty high-fat intake. Future research should examine this interaction further. In addition, support was provided for the research that shows that females use emotion-focused coping more than males. This further understanding of factors associated with stress and eating will allow for informed development of strategies in the promotion of healthy eating behaviors and the prevention of stress-related disorders.

# APPENDIX

#### Questionnaire Administered With Measures Used

This questionnaire seeks to gather information on food choice, styles of coping and stress of students around midterm. This survey is part of a Master's thesis in Health Psychology. There are no "right" or "wrong" answers, so choose the most accurate answer for YOU. Respond to each of the following items by blackening one number on your answer sheet for each number using a #2 pencil. Fill in the bubble completely or if you change your answer, erase completely. Do not place your name or identification number or any identifying mark on the scantron or questionnaire. Please answer every item. <u>Your responses will be kept in strictest confidence, and your participation is entirely voluntary.</u> When you are finished, just turn over your questionnaire and it will be collected at the very end. This questionnaire will take approximately 15 minutes to complete. **Thank you for your participation**.

This section asks you to rate how much your diet over the past seven (7) days included foods listed or that are similar to those listed in each category. The foods listed are <u>only examples</u> of foods in the given category. Use the response choices listed below:

1 2	3 4 5	6 7
Never ate this type of food	Occasionally ate this type of food	Always ate this type of food
1. <u>Bland Low Fat</u>	3. <u>Salty Low Fat</u>	5. <u>Sweet Low Fat</u>
Steamed rice Boiled/Baked Potatoes Bread Raw Carrot Raw Tomato Steam fish Beans Tortillas	Pretzels Popcorn Crackers Soup	Honey Banana, Grapes and other sweet fruit Frozen yogurt
2. <u>Bland High Fat</u> Eggs Peanuts, unsalted Peanut Butter Butter French Fries Bagels Avocado	4. <u>Salty High Fat</u> Cheddar Cheese Potato chips, salted Salted Peanuts Bacon Chili Pizza	6. <u>Sweet High Fat</u> Milk chocolate Ice cream Fudge Doughnuts Cookies Cake Syrup
	D	0

This section asks about different stressors, reactions to stress as well as stress level that you may have experienced over the last seven (7) days. Use the response choices listed below:

1	2	3	4	5
Never	Seldom	Occasionally	Often	Most of the time

As	a student:					
7	I have experienced frustrations due to delays in reaching my goals.	1	2	3	4	5
8	I have experienced daily hassles which affected me in reaching my goals.	1	2	3	4	5
9	I have experienced lack of sources (money for auto, books, etc.).	1	2	3	4	5
10	I have experienced failures in accomplishing the goals that I set.	1	2	3	4	5
11	I have not been accepted socially (became a social outcast).	1	2	3	4	5
12	I have experienced dating frustrations.	1	2	3	4	5
13	I feel I was denied opportunities in spite of my qualifications.	1	2	3	4	5
I ha	we experienced conflicts which were:					
14	Produced by two or more desirable alternatives.	1	2	3	4	5
15	Produced by two or more undesirable alternatives.	1	2	3	4	5
16	Produced when a goal had both positive and negative alternatives.	1	2	3	4	5
I ex	perienced pressures:					
17	As a result of competition (on grades, work, relationships with spouse	1	•	7	4	=
1/	and/or friends).	1	4	3	4	Э
18	Due to deadlines (papers due, payments to be made, etc.).	1	2	3	4	5
19	Due to an overload (attempting too many things at one time).	1	2	3	4	5
20	Due to interpersonal relationships (family and/or friends, expectations,	1	2	2	A	5
ļ	work responsibilities).	L	4	3	4	3
I ha	ve experienced:					
21	Rapid unpleasant changes.	1	2	3	4	5
22	Too many changes occurring at the same time.	1	2	3	4	5
23	Change which disrupted my life and/or goals.	1	2	3	4	5
As	a person:					
24	I like to compete and win.	1	2	3	4	5
25	I like to be noticed and be loved by all.	1	2	3	4	5
26	I worry a lot about everything and everybody	1	2	3	4	5
27	I have a tendency to procrastinate (put off things that have to be done).	1	2	3	4	5
28	I feel I must find a perfect solution to the problems I undertake.	1	2	3	4	5
29	I worry and get anxious about taking tests.	1	2	3	4	5

1	2	3	4	5
Never	Seldom	Occasionally	Often	Most of the time
1	2		3	4

Dur	ing stressful situations, I have experienced the following:					
30	Sweating (sweaty palms, etc.).	1	2	3	4	5
31	Stuttering (not being able to speak clearly).	1	2	3	4	5
32	Trembling (being nervous, biting fingernails, etc.).	1	2	3	4	5
33	Rapid movements (moving quickly, from place to place).	1	2	3	4	5
34	Exhaustion (worn out, burned out).	1	2	3	4	5
35	Irritable bowels, peptic ulcers, etc.	1	2	3	4	5
36	Asthma, bronchial spasm, hyperventilation.	1	2	3	4	5
37	Backaches, muscle tightness (cramps), teeth-grinding.	1	2	3	4	5
38	Hives, skin itching, allergies.	1	2	3	4	5
39	Migraine headaches, hypertension, rapid heartbeat.	1	2	3	4	5
40	Arthritis, over-all pains.	1	2	3	4	5
41	Viruses, cold, flu.	1	2	3	4	5
42	Weight loss (can't eat).	1	2	3	4	5
43	Weight gain (eat a lot).	1	2	3	4	5
Wh	en under stressful situations, I have experienced:					
44	Fear, anxiety, worry.	1	2	3	4	5
45	Anger.	1	2	3	4	5
46	Guilt.	1	2	3	4	5
47	Grief, depression.	1	2	3	4	5
Wh	en under stressful situations. I have					
48	Cried.	1	2	3	4	5
49	Abused others (verbally and/or physically).	1	2	3	4	5
50	Abused self (used drugs, etc.).	1	2	3	4	5
51	Smoked excessively.	1	2	ູ3	4	5
52	Was irritable towards others.	1	2	3	4	5
53	Attempted suicide.	1	2	3	4	5
54	Used defense mechanisms.	1	2	3	4	5
55	Separated myself from others.	1	2	3	4	5
Wit	h reference to stressful situations, I have:					
56	Thought about and analyzed how stressful the situations were.	1	2	3	4	5
57	Thought and analyzed whether the strategies I used were most effective.	1	2	3	4	5

**58.** My stress level during the last seven (7) days has been:

1 2	Mild Moderate		
3	Severe		
I usually don't do this at all	I usually do this a little bit	I usually do this a medium amount	I usually do this a lot

There are lots of ways to try to deal with stress. This section asks you to indicate what you generally do and feel when you experience stressful events. Think about what you usually do when you are under a lot of stress. Using the response choices listed below, indicate what YOU usually do when YOU experience a stressful event.

<u> </u>				
59. I try to grow as a person as a result of the experience	1	2	3	4
60. I get upset and let my emotions out.	1	2	3	4
61. I try to get advice from someone about what to do.	1	2	3	4
<b>62.</b> I concentrate my efforts on doing something about it.	1	2	3	4
<b>63.</b> I say to myself "this isn't real."	1	2	3	4
64. I restrain myself from doing anything too quickly.	1	2	3	4
65. I discuss my feelings with someone.	1	2	3	4
66. I talk to someone to find out more about the situation.	1	2	3	4
67. I keep myself from getting distracted by other thoughts or activities.	1	2	3	4
68. I get upset, and am really aware of it.	1	2	3	4
	1			
<b>09.</b> I make a plan of action.		2	3	4
70. I hold off doing anything about it until the situation permits.		2	3	4
71. I try to get emotional support from friends of relatives.		4	3	4
72. I take additional action to try to get rid of the problem. 73. I let my feelings out.		2	3 3	4
				. <u></u>
74. I try to see it in a different light, to make it seem more positive.	1	2	3	4
75. I talk to someone who could do something concrete about the problem.	1	2	3	4
76. I try to come up with a strategy about what to do.	1	2	3	4
77. I focus on dealing with this problem, and if necessary let other things slide a little.	1	2	3	4
78. I get sympathy and understanding from someone.	1	2	3	4

1	2	3	4
I usually don't	I usually do	I usually do	I usually do
do this at all	this a little bit	this a medium amount	this a lot

79. I look for something good in what is happening.	1	2	3	4	
80. I think about how I might best handle the problem.	1	2	3	4	
81. I make sure not to make matters worse by acting too soon.	1	2	3	4	
82. I try hard to prevent other things from interfering with my efforts at dealing with this.	1	2	3	4	
83. I ask people who have had similar experiences what they did.	1	2	3	4	
94. I feel a lot of emotional distance and I find musclf armanging those feelings a	1				
<b>84.</b> I feel a lot of emotional distress and I find myself expressing those feelings a lot.		L	3	4	
85. I take direct action to get around the problem.	1	2	3	4	
86. I force myself to wait for the right time to do something.	1	2	3	4	
87. I talk to someone about how I feel.	1	2	3	4	
<b>88.</b> I put aside other activities in order to concentrate on this.	1	2	3	4	
89. I think hard about what steps to take.	1	2	3	4	
90. I do what has to be done, one step at a time.	1	2	3	4	
91. I learn something from the experience.	1	2	3	4	

Kindly complete these demographic questions:

1	> 18
2	18-20
3	21 - 23
4	24 - 30
5	31 - 40
6	41 - 50
7	51 - 60
8	61 +
1	Male
2	Female
1	Freshman
2	Sophomore
3	Junior
4	Senior
5	Graduate
	1 2 3 4 5 6 7 8 1 2 1 2 3 4 5

,

95. How much is this diet representative of your normal diet.

1	2	3	4	5	6	7
Not at all						Very
representative						representative

Thanks again for your participation! If you will like to learn more about this research you are free to email me at jw1497@txstate.edu.

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