

THE RELATIONSHIP BETWEEN STRESS AND EMOTIONAL EATING AND THE  
INTAKE OF FOODS HIGH IN FAT AND SUGAR AMONG UNDERGRADUATE  
COLLEGE AGED FEMALE STUDENTS

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### **Abstract**

RESEARCH PAPER: The relationship between stress and emotional eating and the intake of foods high in fat and sugar among undergraduate college aged female students.

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The purpose of this study was to examine the relationship between stress and emotional eating and the intake of foods high in fat and sugar. The study used a convenience sample of female college students aged 18-24 years. Subjects were recruited from classes in Family and Consumer Sciences. Subjects were asked to complete two questionnaires, The Eating and Appraisal Due to Emotions and Stress questionnaire and a food frequency questionnaire. Results showed that there were no relationships between weight status and stress-related eating ( $\chi^2=.35$ ,  $df=3$ ,  $p=.95$ ) and the ability to cope and weight status ( $\chi^2=3.27$ ,  $df=3$ ,  $p=.35$ ). However, there were significant inverse correlations between ability to cope and combined intake of sweet and salty energy dense foods score ( $r = -.28$ ,  $df=92$ ,  $p=0.01$ ) and between ability to cope and intake of fast food ( $r = -.21$ ,  $df=93$ ,  $p=.04$ ). There was a highly significant positive correlation between intakes of sweet energy-dense foods and salty energy-dense foods ( $r = .40$ ,  $df=91$ ,  $p=.00$ ). The results of this study provided support for the relationship between stress and eating foods high in sugar and fat.

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## **Chapter 1- Introduction**

Obesity is a rising epidemic affecting all age groups and levels of society. Stress and obesity have been associated for years. For example, stress has a tendency to cause a person to gain unwanted weight by turning to food for psychological comfort instead of for physiological need (Kandiah, Yake, Jones, & Meyer, 2006). When stressed, eating behaviors change, including the amount and type of foods one consumes (Oliver, Wardle, & Gibson, 2000). Aversive states, such as stress, may cause individuals to partake in unhealthy behaviors, including stress eating, which brings pleasure to the individual (Steptoe, 1991). Eating, drinking, and exercise are some ways of coping with stress, however, in order to prevent stress induced eating/weight gain, the underlying cause of stress must be resolved. It is not stress itself that has unfavorable consequences, but failure to cope effectively in stressful situations (Smith & Renk, 2007). Therefore, it is important to use problem-focused coping in dealing with stressful situations.

The etiology of obesity is not well understood (Landsbergis et al., 1998), however, it is related to the interactions between biological and environmental factors (Goodrick, Poston, & Foreyt, 1996). The prevalence of obesity in the United States remains relatively high, surpassing 30% in most age and sex groups (Flegal, Carroll,

Ogden, & Curtin, 2010). Obesity is a risk factor for a variety of chronic health conditions. Higher grades of obesity are associated with excess mortality, primarily from cardiovascular disease (CVD), diabetes, and certain cancers (Flegal, Graubard, Williamson, & Gail, 2007). The prevention and treatment of obesity are challenging however, increased efforts to provide environmental interventions may show the way to improved health and to decrease obesity in the future (Flegal, Carroll, Ogden, & Curtin, 2010).

Many people today, especially young college students, are now living a hectic and stressful lifestyle. The transition from high school to college challenges young adults to live independently. Poor health choices have been linked with high levels of collegiate stress (Smith & Renk, 2007). Research has found that college students who report having higher levels of stress consumed more “junk foods”, are less likely to exercise, and less likely to get adequate sleep, all of which could lead to obesity (Hudd et al., 2000). Health choices have a strong implication for not only current health status, but overall health status in years to come.

### **Problem Statement**

The purpose of this study was to examine the relationship between stress and the intake of high fat, high sugar foods among underweight/normal weight and overweight/obese individuals.

### **Rationale**

A college environment is a perfect place to conduct a study on stress and obesity as college students face stressful situations every day. The myth of the “Freshman 15”

weight gain stems from the many stressors that college freshman come across as they leave for their first year of independence from their family (Hoffman, Policastro, Quick, & Lee, 2006). Not only are college students on their own for the first time, they also have the responsibility of going to class, getting homework completed on time, and social stress/peer pressure from friends and family. During the college years, students are establishing dietary patterns that could potentially affect their health for years to come (Brunt, Rhee, & Zhong, 2008). Poor dietary patterns could lead to health complications in the future.

### **Research Hypothesis**

1. Individuals who are overweight/obese will report greater emotion and stress related eating than individuals who are underweight/normal weight.
2. Individuals who are overweight/obese will report lower ability and resources to cope with stress than individuals who are underweight/normal weight.
3. Individuals who report greater emotion and stress-related eating will eat more high fat, high sugar foods.
4. Individuals who report lower ability and resources to cope with stress will eat more high fat, high sugar foods.

### **Limitations**

The current study had some limitations that could have affected the results. Limitations of the study included self reported height and weight, which could result in underreporting of weight and, in turn, could cause Body Mass Index (BMI) classifications to be incorrect. Participants may have also over-estimated or under-estimated intakes on the food frequency questionnaire, causing weekly average intakes to



be inaccurate. Other limitations of the study included the small sample size and the fact that the majority of the sample (70.5%) was described as normal weight. With the majority of the sample described as normal weight, the study lacked the power to detect differences in stress eating and intake of foods high in fat and sugar by BMI category.

### **Definitions**

For the purpose of this study, the following definitions were used:

1. **Body Mass Index:** Body Mass Index or BMI is a key index for relating body weight to height. It is calculated by a person's weight in pounds divided by his/her height in inches squared multiplied by 703 (Center for Disease Control and Prevention).
2. **Overweight:** An individual having a BMI between 25 and 29.9 is considered overweight (Puska, Nishidia, & Porter, 2003).
3. **Obesity:** An individual having a BMI of 30 or higher is considered obese (Puska, Nishidia, & Porter, 2003).
4. **Stress:** Physical, mental, or emotional strain or tension (The American Institute of Stress).
  - a. **Negatively-Perceived Stress:** Stress that has the potential to decrease performance (Pendleton et al., 2001).
  - b. **Positively-Perceived Stress:** Stress that may actually improve performance (Pendleton et al., 2001)
5. **Coping:** Refers to the thoughts and actions one uses to deal with stress (Park, & Alder, 2003).

- a. **Problem-Focused Coping**: Strategies that are used to tackle the problem directly (Smith & Renk, 2007).
  - b. **Emotion-Focused Coping**: Strategies that are used to handle feelings of distress, rather than the actual problem (Smith & Renk, 2007).
6. **Stress Eating**: Eating in response to stress (Oliver & Wardle, 1999).
7. **Eating and Appraisal Due to Emotions and Stress (EADES)**: Questionnaire used to assess the constructs of emotion and stress related to eating, appraisal of ability and resources to cope, and the appraisal of outside influences (Ozier et al., 2007).
8. **Food Frequency Questionnaire (FFQ)**: Questionnaire used to help determine dietary patterns of individuals (N. Miller, Kaiser Permanente Food Frequency Questionnaire, 1994).

## **Chapter 2 – Review of Literature**

There is increasing evidence that indicates stress affects health not only through direct psychophysiological process, but also through changes in individual health behaviors, such as smoking, physical activity, or food choices (Stephens, 1991). Stress has the ability to contribute to cardiovascular problems and cancer risk to the point that it creates harmful changes in the diet which could help maintain unhealthy eating behaviors, such as a diet high in fat or low in fiber and fruit/vegetables ( O'Connor, Jones, Conner, McMillan, & Ferguson, 2008). Stress and ways of coping with stress have been linked to weight change and eating behaviors (Fredman & Daly, 1997). During stressful times in a person's life, there is a higher tendency to overeat, especially foods high in fat and carbohydrates, causing an increase in overweight/obese individuals (Roberts, Troop, Connan, Treasure, & Campbell, 2007). By examining the relationship between stress and eating habits, information can be gained to learn how to cope with stress in a more positive way in order to help decrease the worldwide problem of obesity.

### **Obesity**

Obesity is a worldwide problem affecting all age groups and levels of society; it is currently described as a pandemic. An estimated 65% of US adults are currently

overweight or obese (Flegal, Carroll, Ogden, & Johnson, 2002), with overweight being defined as having a body mass index (BMI) of 25 or higher, while obesity is defined as a BMI of 30 or higher. These definitions are consistent with the World Health Organization (Puska, Nishidia, & Porter, 2003). Data from the 2007-2008 National Health and Nutrition Education Survey (NHANES) shows that an estimated 34.2% of U.S. adults aged 20 years and older are overweight, 33.8% are obese, and 5.7% are extremely obese (Ogden & Carroll, 2010). Between 1988-1994 and 2007-2008, the prevalence of obesity increased among women; from 22.9% to 33% among non-Hispanic White women, from 38.2% to 49.6% among non-Hispanic Black women, and from 35.3% to 45.1% among Mexican-American women (Ogden & Carroll, 2010). Although the changes from the most recent NHANES studies are somewhat small, the percent of overweight/obese people is too large to begin with. One of the *Healthy People 2010* national health objectives is to reduce the prevalence of overweight and obesity among adults to less than 15% (“Healthy People 2010,” n.d.). Being overweight and obese is far too common among the United States population and changes need to be made for healthy living.

Interest in the etiology of weight gain has been renewed because the pandemic has spread to younger populations as indicated by the National Collegiate Health Risk Survey, which revealed that one in five college students is overweight (U.S. Department of Health and Human Services, 1997). Researchers estimate the prevalence of obesity in US college-aged people to have increased from 12% in 1991 (Mokdad et al., 1999) to as high as 36% in 2004 (Ogden et al., 2006). According to Lowry et al. (2000), many of the nation’s undergraduate college students make unhealthy food choices and are not getting

enough physical activity, which is placing their health at risk and results in an abundance of overweight individuals. Most students are transitioning to independent living and are, thus, making their own food choices, which often results in poor eating habits. Many universities require freshmen students to live on campus and purchase a meal plan which is similar to an all-you-can-eat buffet. Female freshmen who lived on a university campus and had a mandatory meal plan gained weight faster than noncollegiate peers due to unlimited amount of food choices and increased portion sizes (Rolls, Morris, & Roe, 2002). Factors that contribute to the “Freshman 15” include overeating in buffet-style cafeterias, using free time to participate in activities other than physical exercise, increasing alcohol consumption, and making poor food choices (Hoffman, Policastro, Quick, & Lee, 2006).

Obesity is undoubtedly a rising trend within the population. As rates of overweight and obese individuals increase, so does the risk for developing a multitude of lifelong health complications. Overweight and obese individuals are at an increased risk for mortality and morbidity related to a wide range of chronic disease, including coronary heart disease, hypertension, dyslipidemia, diabetes mellitus, gallbladder disease, and some types of cancer (Pi-Sunyer, 1993; Puska, Nishidia, & Porter, 2003; Visscher & Seidell, 2001). Therefore, eating a sensible diet and maintaining a healthy weight is very important for individuals in order to avoid the complications associated with obesity.

### **Stress**

Stress is a persistent feature of human development throughout the lifespan. Studies show that stress plays an important role in the etiology of mental and physical disorders (Ilgen & Hutchison, 2005). Stress releases powerful neurochemicals and

hormones that prepare us for action (to fight or flee). If action is not taken, the stress response can lead to health problems. Prolonged, uninterrupted, unexpected, and unmanageable stresses are the most damaging types of stress (Stress, Anxiety, and Depression Resource Center, 2009). Many of the ways in dealing with stress -- drugs, pain medicines, alcohol, smoking, and eating -- actually are counterproductive in that they can worsen the stress and can make individuals more sensitive to further stress (Wang et al, 2008).

Stress can be divided into positively and negatively perceived stress (Apter, 1982). Negatively-perceived stress has the potential to decrease performance, while positively-perceived stress may actually improve performance. Negatively-perceived stress may occur as result of adverse events, such as the death of a loved one, whereas positively-perceived stress may be related to pleasant events, such as marriage (Apter, 1982).

Although college can be a rewarding experience, it can also be a time of anxiety and stress for many students (Dyson & Renk, 2006). Numerous researchers have recognized that perceived stress is a prevalent health issue among college students. Adlaf, Gliksman, Demers, & Newton-Taylor (2001) found that stress levels among Canadian college students exceeded the stress levels among the general population in Canada. Chronic illness, academic load, degree of comfort in residence halls, conflicts with staff/faculty, sexual life events, and family life events are associated with stress in college (Dusselier, Dunn, Wang, Shelley, & Whalen, 2005). College students' reports of being frequently overwhelmed increased from 16% in 1985 to 27% in 2002 (Sax, 1997,

2003). Past studies also reported that 75% to 80% of college students are moderately stressed and 10% to 12% are severely stressed (Abouserie, 1994). High levels of stress have been reported for 52% of college students during a typical semester at college (Hudd et al., 2000). Clearly, stress among college students has been widely occurring with some cases being severe.

### **Coping with stress**

Getting stress under control involves identifying the causes of stress in life, looking for ways to reduce the amount of stress, and learning healthy ways to relieve stress or reduce its harmful effects. Although it may not be possible to eliminate exposure to stress, the effect of stress on health may be moderated by the way in which people deal with stress (Hanninen & Aro, 1996). People have different ways of dealing with stress, both positive and negative. According to Wang et al. (2008), exercising regularly, doing something enjoyable, focusing on the present, talking with others, solving the problem, and seeking spiritual help are all ways of dealing appropriately with stress. Trying to reduce stress by such activities as eating, drinking alcohol, smoking, or using drug are not effective long term strategies for managing stress. Coping with stress correctly can lead to a healthier lifestyle.

Choosing an appropriate coping strategy may decrease the negative effect of stress on well-being. Coping strategies have been classified into two categories: problem-focused and emotion-focused. Problem-focused strategies employ behavioral activities, such as action and planning to alter the source of stress, while emotion-focused strategies involve expressing emotion and modifying expectations in efforts to alleviate negative emotions (Stanton, Kirk, Cameron, & Danoff-Burg, 2000). Among college

students, the use of problem-focused strategies to handle stress has been associated with positive outcomes such as better health and reduced negative affect (Dunkley, Blankstein, Halsall, Williams, & Winkworth, 2000). College students typically use emotion-focused strategies, which is mainly the use of avoidance. This, however, was associated with negative outcome, such as poorer health and increased negative effects (Pritchard, Wilson, & Yamnitz, 2007).

Coping strategies appear to differ among males and females. In a study conducted by Sims et al. (2008), it was suggested that females in the sample experienced a greater degree of perceived stress than their male peers. Also, females were more likely to engage in cultural/lifestyle changes, like snacking on sweets. According to a survey conducted by Wang et al. (2008), men were more likely to drink or use medication to deal with stress, while women were more likely to eat more/less or talk to others about the problem. Within the college population, college women reported greater use of emotion-focused coping strategies including expressing feelings, seeking emotional support, denial, acceptance, and positive reframing than college men (Stanton, Kirk, Cameron, & Danoff-Burg, 2000). However, college men reported greater use of some types of emotion-focused strategies, such as mental disconnection through the use of alcohol than college women (Kieffer, Cronin, & Gawet, 2006). Some people appear to be resilient in difficult conditions, whereas others react negatively to such challenges. When it comes to coping with stress, men and women typically handle it differently. Both lead stressful lives, but both handle it in their own way.



## **Stress Eating**

The impact of stress may be on the types of food selected as well as the amount of food consumed, which could possibly play a role in obesity. Recent findings suggest that high levels of stress can be associated with both increased (saturated fat consumption) and decreased (overall calories) food intake (Wardle, Steptoe, Oliver, & Lipsey, 2000). Other research has found stress to be associated with an increase in food consumed as snacks in adults (Conner, Fitter, & Fletcher, 1999). Grunberg & Straub (1992) found that when stressed, women were more likely to select foods high in calories and fat. Oliver et al. (2000) found an increase in consumption of sweet high fat food and more energy-dense foods. In a separate study, Steptoe, Lipsey, & Wardle (1998) found that 'fast food' was eaten more frequently when individuals reported greater number of events, thoughts, or situations which produce negative feeling such as annoyance, irritation, worry or frustration. Taken together, these results suggest that individuals, when stressed, may shift their preference to more palatable and energy-dense snack foods. These foods are less healthy and higher in fat, thus potentially increasing their risk of CVD and cancer. One important variable is how individuals use food to cope with stress and emotions. Eating has been recognized as a coping mechanism for improving and dealing with stress and emotions (Solomon, 2001) by either under eating or overeating (Geliebter & Aversa, 2003). According to Wardle et al. (2000), there are various kinds of psychological stress that can contribute to overeating/poor eating choices. Things such as stress at work, social stress, and perceived stress are all associated with an increased consumption of foods that are high in fat and sugar as well as being more energy-dense. High calorie

dense foods that individuals tend to consume during stressful times contribute to the increasing trend of obesity.

Past research concluded that stress-induced eaters are consuming foods higher in sugar and fat content, as well as greater portion sizes, within the adult population. In a study conducted by Laitinen, Ek, & Sovio (2002), stress-driven eaters and drinkers ate sausages, pizza, hamburgers, and chocolate more often than those who were not stress-driven eaters. Repeated consumption of these foods and alcoholic beverages can account for long-term weight gain (McCrory et al., 1999). It was also found that chocolate cravings were more common among women during times of stress (Bruinsma & Taren, 1999). In the prevention of obesity it is important to distinguish the reason behind consumption of these foods.

## **Chapter 3 - Methods**

Past and present research has shown that individuals who are stress-induced eaters have a tendency to eat foods that are more energy-dense and higher in fat and sugar. Stress may compromise the health of at risk individuals through harmful stress-related changes in food choice. The purpose of this research study was to compare the effects of stress on one's dietary habits. This chapter describes the methodology that was used for this particular study. It includes the sample population, the instruments that were used, and the data analysis methods.

### **Methods/Subject Selection**

The current study was approved by Ball State's Institutional Review Board as an exempt study. It used a convenience sample of female college students. The subjects were recruited from departmental core classes (FCS 103 and 403) in Family and Consumer Sciences using a prepared script. Subjects were given online access, through InQsit, to the study questionnaires for one week. All students who completed the survey within the study period were given five extra credit points.

## **Participants**

Undergraduate female students were recruited from Ball State University. To be eligible for inclusion, subjects had to be female, aged 18-24 years, and enrolled in one of the participating courses.

## **Instruments**

Each participant anonymously completed a survey on stress and stress-induced eating (Eating and Appraisal Due to Emotions and Stress-EADES-questionnaire (Appendix 1), (Ozier et al., 2007). The EADES questionnaire assessed the constructs of emotion and stress related to eating, appraisal of ability and resources to cope, and the appraisal of outside influences. The EADES questionnaire had previously undergone preliminary validation using exploratory factor analysis in a university population (Ozier et al., 2007). Questions were written so that individuals responded in the first person and determined their level of agreement with the questions by answering Strongly Disagree to Strongly Agree on a scale of 1-5. Twenty-four questions measured Emotion and Stress Related Eating (Factor 1), which addressed the extent to which individuals use food to cope with emotions and/or stressors, and included questions related to eating behavior along with self-efficacy in regards to eating behavior. The possible cumulative scoring range for Factor 1 was 24-120, with lower scores representing greater Emotion and Stress Related Eating. Twenty questions measured Appraisal of Ability and Resources to Cope (Factor 2), which is one's perception in relation to his personal well-being, of resources, including skills to cope with stress and emotions. The possible scoring range for Factor 2 was 20-100, with lower scores representing more compromised appraisal skills and resources to cope. Five questions measured Appraisal of Outside Stressors and

Influences (Factor 3), which is one's perception, in relation to his personal well-being, of how one copes with external stressors such as other individuals. The possible scoring range for Factor 3 was 5-25, with lower scores representing a more compromised ability of how one perceives stressors. Age, sex, ethnicity, height, and weight were also gathered from participants. A food frequency questionnaire (FFQ) (Appendix 2) was used to help determine usual dietary patterns and to quantify intake of foods high in sugar, fat and are energy-dense (N. Miller, Kaiser Permanente Food Frequency Questionnaire, 1994).

### **Data Collection**

Data was anonymous. The electronic data was stored on a desktop computer with a back-up copy on a flash drive. No individual data was ever released. The 'BSU Blind Study' authentication method protected anonymity while crediting students for taking the survey. The View Results page showed only anonymous sign-in IDs, but the Grade Book page listed the BSU account name for each respondent that submitted their survey answers.

### **Data Analysis**

Data were analyzed using the Statistical Package for the Social Sciences (version 17.0 for Windows, 2008, SPSS Inc., Chicago, IL). Chi-square analysis was used to assess the relationships between categorical variable and Pearson's correlation coefficient was calculated to describe the relationships between continuous variables.

Self-reported height and weights were used in the calculation of BMI. BMI was categorized as underweight (BMI <18.5), normal weight (BMI 18.5-24.9), overweight

(BMI 25-29.9), and obese (BMI >30.0), then collapsed to underweight/normal weight (BMI <24.9) and overweight/obese (BMI >25.0) for chi-square analysis.

Scores were calculated for Factors 1, 2, and 3 of the EADES questionnaire, then converted into categorical variables by quartiles for chi-square analysis. Cronbach's alpha was computed to assess internal consistency of questions used to calculate Factors 1, 2, and 3 of the EADES questionnaire.

Data from the FFQ was used to calculate weekly intake for the following categories of foods – protein-rich foods, dairy products, fruits and vegetables, grain products, sweet energy-dense foods and salty energy-dense foods. In addition, weekly consumption of alcoholic beverages and frequency of fast food intake were also quantified. Weekly intakes of sweet energy-dense foods and salty energy-dense foods were converted into categorical variables by quartiles for chi-square analysis.

## **Chapter 4 - Results**

Stressful times are associated with over eating and stress-eating/over eating is associated with weight gain, in turn causing obesity. Obesity is no doubt a growing disease among the American population, and stress is something that occurs in all lives. The purpose of this study was to examine the relationship between stress and the intake of foods high in fat and sugar. It is suggested that individuals who are overweight/obese tend to stress eat more than individuals who are underweight/normal weight. This chapter highlights the results that were found during the data analysis, including both significant and non-significant findings.

### **Results**

Of the 107 total surveys completed, a total of six did not meet the age criteria (four were older than 24 years and two did not provide their age) and were excluded from the study. A total of six did not complete all questions needed for calculations of Factors 1, 2, and 3 of the EADES Questionnaire; therefore, data from these subjects were also excluded from analysis. Data from 95 subjects were included in the analysis (Table 1). A majority of the participants were White (94.7%, n=95), with a mean age of  $20.1 \pm 1.5$

**Table 1****Demographic and Anthropometric Characteristics of Participants**

| <b>Characteristics</b> | <b>N</b> | <b>Percentage</b> | <b>Mean(<math>\pm</math>SD)<sup>A</sup></b> | <b>Range</b> |
|------------------------|----------|-------------------|---|--------------|
| <b>Age (years)</b>     | 95       |                   | 20.1 $\pm$ 1.5                              | 18-23        |
| <b>Height (in)</b>     | 95       |                   | 64.8 $\pm$ 3.1                              | 57-72        |
| <b>Weight (lbs)</b>    | 95       |                   | 135.5 $\pm$ 23.1                            | 87-215       |
| <b>BMI<sup>B</sup></b> | 95       |                   | 22.7 $\pm$ 3.6                              | 15.4-35.8    |
| <b>Underweight</b>     |          | 6.3               |   |              |
| <b>Normal weight</b>   |          | 70.5              |   |              |
| <b>Overweight</b>      |          | 17.9              |   |              |
| <b>Obese</b>           |          | 5.3               |   |              |
| <b>Ethnicity</b>       | 95       |                   |   |              |
| <b>Asian</b>           |          | 2.1               |   |              |
| <b>Black</b>           |          | 1.1               |   |              |
| <b>Hispanic/Latino</b> |          | 2.1               |   |              |
| <b>White</b>           |          | 94.7              |   |              |

<sup>A</sup> SD= Standard Deviation

<sup>B</sup> BMI= Body mass index; calculated as pounds/inches<sup>2</sup> x 703



years. Mean BMI for the sample was  $22.7 \pm 3.6$ , with a range of 15.4-35.8; overall, 6.3% were considered underweight, 70.5% normal weight, 17.9% overweight, and 5.3% obese.

### **Results -- EADES**

Cronbach's alpha was used to measure the internal consistency of the three factors within the EADES questionnaire. High internal consistency was observed for Factor 1: Emotion and Stress Related Eating (24 items;  $\alpha = .92$ ) and Factor 2: Appraisal of Ability and Resources to Cope (20 items;  $\alpha = .89$ ). Because low internal consistency was observed for Factor 3: Appraisal of Outside Stressors and Influences (5 items;  $\alpha = .52$ ), this factor was eliminated from further analysis.

Overall factor scores from the Eating and Appraisal Due to Emotions and Stress questionnaire were  $87.1 \pm 14.1$  for Factor 1 and  $74.0 \pm 10.1$  for Factor 2. There was no relationship between weight status (underweight/normal weight versus overweight/obese) and quartile classification for Factors 1: Emotion and Stress Related Eating ( $\chi^2 = .35$ ,  $df = 3$ ,  $p = .95$ ), or Factor 2: Appraisal of Ability and Resources to Cope ( $\chi^2 = 3.27$ ,  $df = 3$ ,  $p = .35$ ) scores.

### **Results -- Food Frequency Questionnaire**

Individual items within the food frequency questionnaire were grouped together to quantify subjects' weekly intake of various food categories. Intakes of these foods, along with alcoholic beverages and fast food, are provided in Table 2. Based on the data analysis, there was no relationship between intake of salty energy-dense foods and weight status ( $\chi^2 = 3.69$ ,  $df = 3$ ,  $p = .30$ ), intake of sweet energy-dense foods and weight status ( $\chi^2 = 1.12$ ,  $df = 3$ ,  $p = .77$ ), or combined intake of sweet and salty energy-dense foods and weight status ( $\chi^2 = 2.70$ ,  $df = 3$ ,  $p = .44$ ).

**Table 2****Weekly Average Intakes from Food Frequency Questionnaire**

| <b>Food Choices (Serving)</b> | <b>Mean(<math>\pm</math> SD)<sup>A</sup></b> | <b>Range</b> |
|-------------------------------|--|--------------|
| Meat/Fish/Poultry             | 9.9 $\pm$ 6.3                                | 0-28         |
| Dairy Products                | 8.4 $\pm$ 5.3                                | 0-28         |
| Fruits and Vegetables         | 14.8 $\pm$ 8.9                               | 0-43         |
| Grain Products                | 11.8 $\pm$ 5.9                               | 2-26         |
| Sweet EDF <sup>B</sup>        | 4.9 $\pm$ 4.8                                | 0-31         |
| Salty EDF                     | 4.5 $\pm$ 3.5                                | 0-15         |
| Alcoholic Drinks              | 1.4 $\pm$ 1.7                                | 0-7          |
| Fast Food                     | 1.3 $\pm$ 1.3                                | 0-6          |

<sup>A</sup>SD=Standard Deviation

<sup>B</sup>EDF= Energy-Dense Foods

### **Results –Correlations**

Correlations among food choices and measure of stress/emotional eating are shown in Table 3. There was a significant inverse correlation between Factor 2 scores and combined intake of sweet and salty energy-dense foods ( $r = -.03$ ,  $df=92$ ,  $p=.01$ ) and Factor 2 score and intake of fast food ( $r = -.21$ ,  $df=93$ ,  $P=.04$ ). There was also a highly significant positive correlation between intake of sweet energy-dense foods and salty energy-dense foods ( $r = .40$ ,  $df=91$ ,  $P=.00$ ).

**Table 3****Correlations<sup>A</sup> Between Food Choices and Measures of Stress/Emotional Eating**

| Variable                       | Factor 1<br>Correlation<br>P-value | Factor 2<br>Correlation<br>P-value | Sweet EDF <sup>B</sup><br>Correlation<br>P-value | Salty EDF<br>Correlation<br>P-value | Sweet and<br>Salty EDF<br>Correlation<br>P-value | Fast Food<br>Correlation<br>P-value |
|--------------------------------|------------------------------------|------------------------------------|--|-------------------------------------|--|-------------------------------------|
| <b>Factor 1</b>                | 1                                  | .504***                            | -.157  | -.071                               | -.137  | -.179                               |
| <b>Factor 2</b>                | .504***                            | 1                                  | -.281**  | -.164                               | -.277**  | -.209*                              |
| <b>Sweet EDF</b>               | -.157                              | -.281**                            | 1  | .396***                             | .889***  | .275**                              |
| <b>Salty EDF</b>               | -.071                              | -.164                              | .396***  | 1                                   | .773***  | .420***                             |
| <b>Sweet and<br/>Salty EDF</b> | -.137                              | -.277**                            | .889***  | .773***                             | 1  | .392***                             |
| <b>Fast Food</b>               | -.179                              | -.209*                             | .275**   | .420***                             | .392***  | 1                                   |

<sup>A</sup>Pearson's correlation coefficient.

<sup>B</sup>Energy dense food.

\*P  $\leq$  .05; \*\*P  $\leq$  .01; and \*\*\*P  $\leq$  .001.

## **Chapter 5 - Discussion**

The current study aimed to examine the relationship between stress and stress-eating and the intake of foods high in fat and sugar. Results from the current study, similar to those reported by Kandiah et al. (2006) and Habhab, Sheldon, & Loeb, (2009), support the relationship between coping with stress and consumption of sweet and salty energy-dense foods and fast foods. A study that was conducted in London, UK, on health behaviors indicated that greater perceived stress was associated with more unhealthy dietary practices, such as eating more high fat energy-dense foods and snacks and less fruits and vegetables (Cartwright et al., 2003). Another study, using a Finnish adult population, noted that individuals who used food to cope with stress ate more high fat energy-dense foods and had a higher BMI (Laitinen, Ek, & Sovio, 2002). In the current study, individuals who reported difficulty coping with stressful situations and the resulting emotions, as evidence by lower Factor 2 scores, were more inclined to have increased consumption of sweet energy-dense foods and fast foods. In addition, intake of sweet energy-dense foods was closely related to intake of salty energy-dense foods. Together, these findings lend strong support to previous research reporting elevated

consumption of foods high in fat and sugar with stress, especially among stress-induced eaters.

Eating when hungry is both pleasurable and rewarding. Research has shown that neural substrates are triggered when eating in a manner similar to drugs, although with important differences (Grigson, 2002). Food and emotion can influence foods choice through physiological effects that change appetite or by changing other behavior that constrains or alters food availability (Gibson, 2006). According to Drewnowski & Greenwood (1983) and Macht & Mueller (2007), humans' food preference for sweet, high fat items appears to be related to palatability. These "comfort foods" tend to reduce negative moods and stress in individuals (Dallman, Pecoraro, & la Fleur, 2005; Macht & Mueller, 2007). It is hypothesized that adults choose foods high in fat and sugar for opioid-mediated relief of stress. However, repeated intakes of these foods high in fat and sugar have been found to decrease control of an opioid pathway that was found in rats, suggesting an adaptation to chronic activation of this pathway (Kelley, Will, Steininger, Zhang, & Haber, 2003). Likewise, increased consumption of foods high in sugar and fat may reduce the number of dopamine receptors, since their availability in the striatum (inside part of the forebrain) has been shown to be inversely associated to BMI (Davis, Strachan, & Berkson, 2004). This study's findings suggested that chronic overeating could ultimately provoke an inability to experience pleasure from normally pleasurable life events, such as eating (Gibson, 2006).

Stress in daily life can affect food choices made by individuals. Due partially to increased levels of cortisol, the stress hormone, stressed people tend to crave foods high in fat, sugar and salt (Gibson, 2006). According to Oliver et al. (2000), stress-induced

eaters eat more foods high in fat and sugar, such as chocolate and cake. They also eat a more energy-dense meal compared to nonstress-induced eaters. Furthermore, it is suspected that stress-induced eaters may be more susceptible to the effects of stress. For example, women who ate more of the snack foods after a stressful assignment showed the greatest release of cortisol, the stress-sensitive hormone (Epel, Lapidus, McEwen, & Brownell, 2001) and more negative effects stimulated by stress. These high reactors also showed a preference for sweet foods. Therefore, it appears that, when challenged, stress-induced eaters tend to experience mood disturbances and thus, seek comfort from food in these situations. At the same time, nonstress-induced eaters can alter eating via cognitive routes.

Stress, fast food and obesity can be a lethal combination for millions of Americans. Fast food is eaten every day by US adults, according to Schlosser (2001 and 2003). It has been reported that in 2001 there were nearly 186,000 fast food restaurants in the United States (Spurlock, 2005). According to Spears (2003), fast food is defined as a restaurant in which an individual can order, purchase, and receive food in about 10 minutes. In the past 20 years, calories consumed from fast food have increased from 3% of total calories to 12% in the United States (Nielsen & Popkin, 2003). In the current study, fast food consumption by college students was reported to be a weekly average of one, well below the average of six to eight times per week reported by Driskell, Kim, & Goebel (2005). This low intake was likely a misunderstanding of what was considered “fast food” in the current study, since most of the participants ate in campus cafeterias. In the study conducted by Morse & Driskell (2009), it was reported that college students ate breakfast, lunch, and dinner in the university cafeteria 43% to 50% of the time.

Eating at fast food restaurants seems to be part of college students' lifestyle (Driskell, Meckna, & Scales, 2006).



## **Chapter 6 – Conclusion**

Stress may result in negative health outcomes because of stress-induced food choices and their effects on the body. The results of the current study provided support for the relationship between stress and eating foods high in fat and sugar. There was a strong inverse correlation between Factor 2 scores and combined sweet and salty energy-dense foods and fast food scores, indicating poor coping skills. Despite the potential limitations of the study, the intention of the study is particularly important for gaining further understanding of such a common issue in a part of the obesity trend. Dietitians and other health care professional can use this research in daily practice by trying to deal with the underlying cause of stress in individuals in a more positive manner, as well as teaching individuals the potential hazards of stress-induced eating and obesity. Educating individuals, in addition to decreasing stress levels and stress-induced eating, will promote healthful food choices.

There is still much research that can be done on the connection between stress and emotional eating. Since fast food seems to be a part of people's everyday life, it would be beneficial for future research to concentrate on the consumption of fast food and how

it plays a part in stress eating. In conclusion, the findings from the current study suggest that stress-induced eaters, choose more foods that are higher in sugar and fat.

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## Appendix A

### The EADES (Eating and Appraisal Due to Emotions and Stress) Questionnaire

|     |   | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|-----|---|-------------------|----------|---------|-------|----------------|
| 1.  | My family supports me when I have problems.                                       |                   |          |         |       |                |
| 2   | I am confident I can control my eating when I feel happy.                         |                   |          |         |       |                |
| 3.  | I overeat when I am stressed.   |                   |          |         |       |                |
| 4.  | I can usually work out a solution to my problems.                                 |                   |          |         |       |                |
| 5.  | I am capable of handling my own problems.   |                   |          |         |       |                |
| 6.  | I do NOT feel secure in my life.  |                   |          |         |       |                |
| 7.  | I try to find alternative solutions to my problems.                               |                   |          |         |       |                |
| 8.  | I overeat when I socialize.   |                   |          |         |       |                |
| 9.  | I weigh the pros and cons of situations before I make decisions about what to do. |                   |          |         |       |                |
| 10. | I worry about what people think of me.  |                   |          |         |       |                |
| 11. | I comfort myself with food.   |                   |          |         |       |                |
| 12. | I eat when I am upset with myself.  |                   |          |         |       |                |
| 13. | I feel the need to make others happy.   |                   |          |         |       |                |
| 14. | I am confident I can control my eating when I am tired.                           |                   |          |         |       |                |
| 15. | My friends support me when I have problems.                                       |                   |          |         |       |                |
| 16. | I feel sad often.   |                   |          |         |       |                |
| 17. | I am confident I can control my eating when I am angry.                           |                   |          |         |       |                |
| 18. | I am able to meet my emotional needs.   |                   |          |         |       |                |
| 19. | It is hard for me to stop eating when I am full.                                  |                   |          |         |       |                |
| 20. | I am able to say no when I need to.   |                   |          |         |       |                |
| 21. | I try to think positive when times are tough.                                     |                   |          |         |       |                |
| 22. | I am confident I can control my eating when I am sad.                             |                   |          |         |       |                |
| 23. | I have control over my emotions.  |                   |          |         |       |                |
| 24. | I eat to avoid dealing with problems.   |                   |          |         |       |                |
| 25. | I talk about my feelings.   |                   |          |         |       |                |
| 26. | I am confident I can control my eating when I am upset with myself.               |                   |          |         |       |                |
| 27. | Other people influence how I handle problems.                                     |                   |          |         |       |                |

|     |  |  |  |  |  |  |
|-----|--|--|--|--|--|--|
| 28. | I deal with problems sooner rather than later.                                   |  |  |  |  |  |
| 29. | I try to resolve a problem when I know there is something wrong in my life.      |  |  |  |  |  |
| 30. | I am confident I can control my eating when I feel upset.                        |  |  |  |  |  |
| 31. | I feel out of control when I eat.  |  |  |  |  |  |
| 32. | I eat when I am frustrated.  |  |  |  |  |  |
| 33. | I am capable of dealing with stressful situations.                               |  |  |  |  |  |
| 34. | I am confident I can control my eating when I am frustrated.                     |  |  |  |  |  |
| 35. | I use food to cope with my emotions.   |  |  |  |  |  |
| 36. | I am able to meet my spiritual needs.  |  |  |  |  |  |
| 37. | I eat when I am tired.   |  |  |  |  |  |
| 38. | I do NOT allow people to change my mind.   |  |  |  |  |  |
| 39. | I eat when I am angry.   |  |  |  |  |  |
| 40. | I eat when I am sad.   |  |  |  |  |  |
| 41. | When a problem arises, it is hard for me to make a plan of action and follow it. |  |  |  |  |  |
| 42. | I am confident I can control my eating when I am anxious.                        |  |  |  |  |  |
| 43. | I do NOT see challenges as stressful.  |  |  |  |  |  |
| 44. | I am confident I can control my eating when I am relieved.                       |  |  |  |  |  |
| 45. | I eat when I am anxious.   |  |  |  |  |  |
| 46. | I have control over my life.   |  |  |  |  |  |
| 47. | I eat when I am relieved.  |  |  |  |  |  |
| 48. | I try to analyze a problem in order to better understand it.                     |  |  |  |  |  |
| 49. | I do NOT have control over how much I eat.                                       |  |  |  |  |  |

50. What is your sex?
- Male
  - Female
51. How do you describe yourself?
- American Indian of Alaska Native
  - Asian
  - Black or African American-Not Hispanic
  - Hispanic or Latino
  - Native Hawaiian or Other Pacific Islander
  - White-Not Hispanic

52. How old are you?

Age in Years \_\_\_\_\_

53. How much do you weigh without your shoes on?

Weight in Pounds \_\_\_\_\_

54. How tall are you without your shoes on (Ex: 5' 5")?

\_\_\_Feet \_\_\_\_\_Inches

## Appendix B

### Food Frequency Questionnaire

Please put one of the following choices in the answer box depending on how many times you eat the specific food item base on the average serving size:

1. < 1 time per week
2. 1 time per week
3. 2 times per week
4. 3 times per week
5. 4 times per week
6. 5 times per week
7. 6 times per week
8. 1 time per day
9. 2 or more times per day

| Food Item  | Size of average serving                  | Answers |
|--|--|---------|
| Red Meat (beef, pork and ham, veal, lamb)  | 4 ounces                                 |         |
| Meat dishes (casseroles, tacos, meat sauce)  | 1 cup casserole<br>1 taco or pizza slice |         |
| Pizza  | 1 piece                                  |         |
| Chicken or turkey  | 1lg or 2sm pieces                        |         |
| Fish or shellfish including fish canned in water                                       | 4 ounces or ½ can                        |         |
| Bacon, sausage   | 2 pieces                                 |         |
| Luncheon meats (salami, bologna, hot dogs etc. including turkey and chicken varieties) | 1 piece                                  |         |
| Low fat luncheon meats ( at least 95% fat free)  | 1 piece                                  |         |
| Whole eggs or egg yolks  | 1 egg or yolk                            |         |
| Milk, yogurt or cottage cheese   | 1 cup (8ounces)                          |         |
| Cheese or cream cheese   | 1 ounce/slice                            |         |
| Ice cream  | ½ cup (1 scoop)                          |         |
| Chocolate/candy bars   | 1 candy bar                              |         |

|  |                                     |  |
|--|-------------------------------------|--|
| Other candies  | 1 piece                             |  |
| Fruits, fresh or dried   | 1 whole piece or 1 cup cut-up fruit |  |
| Fruit juice  | ½ cup (4 ounces)                    |  |
| Sweetened beverages, not including diet drinks (soft drinks, fruits drinks, etc) | 1 large glass, 1 can                |  |
| Vegetable salads or raw vegetables   | 1 cup                               |  |
| Cooked vegetables (fresh, frozen, or canned)                                     | ½ cup                               |  |
| Chips  | 1 cup                               |  |
| French fries   | 1 cup                               |  |
| Other salty snacks   | 1 cup                               |  |
| Spaghetti, noodles or other pastas   | 1 cup                               |  |
| Dried beans, split peas or lentils   | ¾ cup                               |  |
| Potatoes, rice or bulgur   | ¾ cup or 1 potato                   |  |
| Baked desserts and pastries (cake, cookies, etc.)                                | 1 slice or 2 cookies                |  |
| Bread, bagels, roll, tortillas, English muffins, homemade low fat muffins        | 1 piece                             |  |
| Biscuits, bakery muffins, croissants, flaky rolls                                | 1 piece or slice                    |  |
| Cold or hot breakfast cereals  | 1 med. Bowl                         |  |
| Donuts or sweet rolls  | 1 piece                             |  |
| Salad dressing   | 2 Tbsp                              |  |
| Mayonnaise   | 1 Tbsp                              |  |
| Nuts, nut butters (like peanut butter)   | 2 Tbsp                              |  |
| Alcoholic drinks   | 1 drink, 1 can beer, 1 glass wine   |  |
| How many times do you eat fast food? (McDonalds, Burger King, Wendy's etc)       |                                     |  |

## Appendix C

### Informed Consent

#### **The relationship between stress and emotional eating and intake of high fat, high sugar foods.**

This study is being conducted to examine the relationship between perceived stress and dietary behaviors. It will specifically look at the relationship between emotional eating and the intake of high fat, high sugar foods. If you agree to participate you will be asked to complete an online survey over stress during certain time periods and eating patterns. This survey will take approximately 15 minutes.

All data collected in this research will be anonymous. Your name will not be associated with any of your data. The electronic data will be stored on a desktop computer with a back-up copy on a flash drive. No individual data will ever be released.

The foreseeable risks for this study are minimal. The only potential risk of the study would be feeling of some anxiety when completing the questionnaires. If you feel at uncomfortable, you may choose to stop your participation in this study at any time.

One benefit that you main obtain from participation in the study is a better awareness of your current eating patterns.

Your participation in this study is completely voluntary and you are free to withdraw from the study at anytime for any reason without penalty. Please feel free to ask any questions of the investigator before signing the Informed Consent form and beginning the study, and at any time during the study.

There are no costs to you or any other party to participate in this study.

All data collected in this study will be confidential. All person-identifiable data will be coded so that you cannot be identified.

For one's rights as a research subject, the following person may be contacted: Amy Boos, Research Compliance Administrator, Office of Academic Research and Sponsored Programs, Ball State University, Muncie, IN 47306, (765) 285-5034.

This project has been reviewed according to Ball State University's procedures governing your participation in this research.

#### **Researcher Contact Information**

Principal Investigator:

Aimee Keusch  
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## **Appendix D**

### **Letter from Ball State IRB**

Please note that Ball State University IRB has published the following Board Document on IRBNet:

Submission: [126137-1] Relationship between stress and emotional eating and intake of high fat, high sugar foods.

Document: Exempt Letter

Publish Date: September 23, 2009

Should you have any questions you may contact Amy Boos at [akboos@bsu.edu](mailto:akboos@bsu.edu).

Thank You,

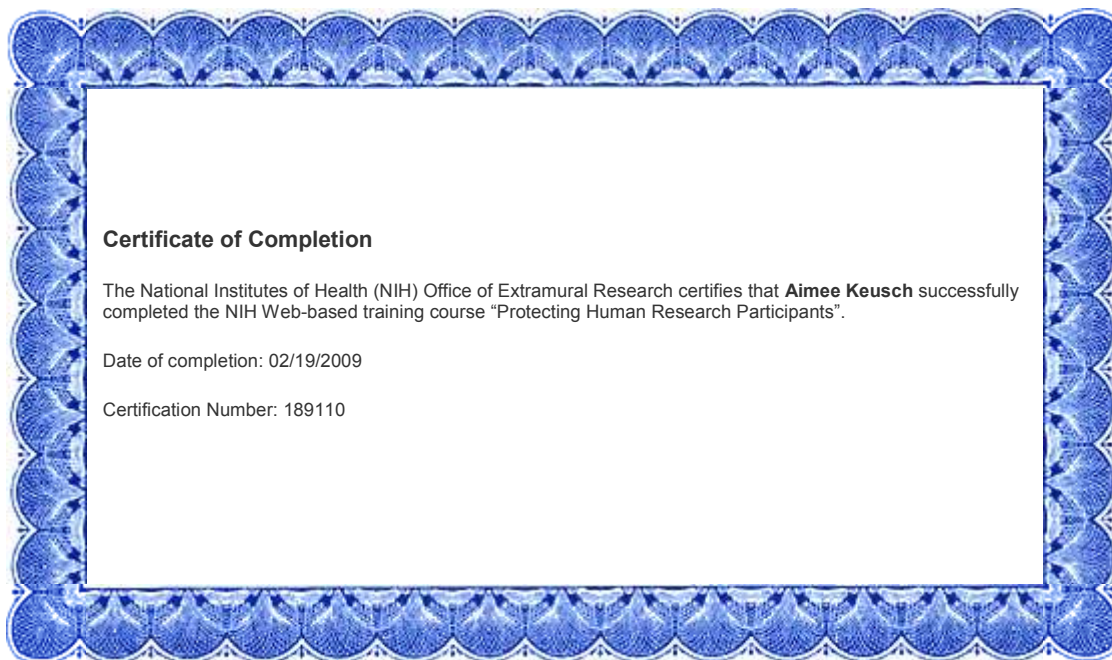
The IRBNet Support Team

[www.irbnet.org](http://www.irbnet.org)



## Appendix E

### NIH Tutorial Certificate



**Appendix F**  
**IRB Final Report Letter**

Please note that Ball State University IRB has taken the following action on IRBNet:

Project Title: [126137-2] Relationship between stress and emotional eating and intake of high fat, high sugar foods.

Principal Investigator: Aimee Keusch

Submission Type: Closure/Final Report

Date Submitted: June 17, 2010

Action: CLOSED

Effective Date: June 23, 2010

Review Type: Exempt Review

Should you have any questions you may contact Bryan Byers at [bbyers@bsu.edu](mailto:bbyers@bsu.edu).

Thank you,

The IRBNet Support Team

[www.irbnet.org](http://www.irbnet.org)