

THE EFFECTS OF STRESS ON EATING PATTERNS  
AND  
THE EFFECTS OF STRESS AND ATTACHMENT ON EATING  
BEHAVIOUR AND FOOD PREFERENCE IN STRESS UNDER-  
EATERS AND STRESS-EATERS

by

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A thesis submitted in partial fulfillment of the requirements  
for the degree of Master of Arts (MA) in Psychology

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## **ABSTRACT**

This article-based thesis examined the effects of stress and attachment style on eating. The first article explored the effects of stress on the eating patterns of undergraduate students. Results demonstrated that stress leads to reported unhealthy changes in eating habits. Specifically, stress led to increased reported preference for take-out food options. Findings showed that gender influenced stress-related snacking and loss of control over eating. The second article examined the influences of stress and attachment on eating in self-reported stress under-eaters and stress-eaters. The results demonstrated that attachment style uniquely influences the eating of these two distinct groups and that stress and attachment have differential effects on eating. These findings add to the paucity of research investigating the effects of stress on eating from a naturalistic approach. These results also identify various idiosyncrasies of these two novel groups and highlight the role of attachment in disordered eating behaviour.

Keywords: stress-eating, stress under-eater, attachment style

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## CHAPTER ONE

### Introduction

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## **Introduction**

In 2013, 23.0% (6.5 million) of Canadians aged 15 and older reported that they experience most days as ‘quite a bit or extremely stressful’ (Statistics Canada, 2014). Exposure to stress can contribute to a myriad of negative health consequences, including cardiovascular disease, ulcers, hypertension (Quick, Quick, Nelson & Hurrell, 1997), and mental health difficulties (Quick et al., 1997). Stress can also lead to negative changes in health-related behaviours such as smoking, alcohol consumption, and eating habits (Statistics Canada, 2001).

Factors that affect negative changes in eating habits are a concern in Canada, given that over 50% of adults (Statistics Canada, 2013a) and 20% of children (Statistics Canada, 2013b) are classified as either overweight or obese. It is well known that unhealthy eating can dramatically increase risk for major health issues such as coronary heart disease, diabetes, and even early mortality (The National Academies, 2005). Given that stress can negatively impact eating habits and that unhealthy eating can increase risk for major health issues, eating patterns and food choice are two important factors to consider when coping with stress.

In addition, since 2003, females have consistently reported more

perceived stress than males (Statistics Canada, 2013c). In 2013, the rate of perceived stress for females was 24.6%, while for males the rate was 21.3% (Statistics Canada, 2014). Furthermore, obesity and eating disorders are the second and third most common chronic conditions in adolescent females (Golden et al., 2003). Given the particularly high prevalence of stress and disordered eating in females, investigation of the stress-related changes in eating habits in this specific population is warranted. Therefore, in regard to how stress and unhealthy eating patterns manifest themselves differently in the two genders, this study is focused on females.

Changes in eating behaviour and food preference have been widely explored in experimental settings (Heatherton, Herman, & Polivy, 1991; Herman, Polivy, Lank, & Heatherton, 1987; Klein, Faraday, & Grunberg, 1996; Levine & Marcus, 1997; Schotte, Cools, & McNally, 1990), but much less commonly in field studies. As such, this study employed a field methodology to examine the changes in eating patterns that occur when people experience stress due to natural, daily living stressors. Using a naturalistic approach this study was able to capture a more naturalistic picture of how stress affects eating behaviour and food choice. Participants tracked their food intake using an application (My Fitness Pal) on their smartphone. This new method of data collection allowed

participants to quickly and easily enter a wide variety of nutrients in their daily food log. By increasing the convenience of food journaling it was our hope to increase the accuracy of food tracking, addressing a primary concern with regard this type of methodology.

The results from this study will have implications for laypeople and health care professionals alike. Findings could help highlight common stress-eating trends or various nutrient compositions that are frequently selected for when stressed. Awareness of common stress-related eating patterns and/or highly desired food options is the first step in making healthful changes. For instance, becoming aware of common trends with regard to stress eating patterns may help individuals reduce their susceptibility to engaging in various unhealthy eating patterns (e.g. snacking, take out food). Furthermore, highlighting specific nutrients that women and men are most prone to eating when stressed may lead to people making more informed and potentially healthier choices. Researchers and practicing healthcare professionals may also find this information useful whether in practice with regard to supporting clients who struggle with stress and healthy eating or to develop future studies.

In addition to exploring the impacts that stress has on eating patterns in general, this study will also look at the specific stress-eating



patterns of two distinct groups: stress under-eaters and stress-eaters. There is a wealth of research that demonstrates that stress can have a bidirectional effect on eating behaviour, causing hyperphagia in some individuals and hypophagia in others (Kandiah, Yake, Meyer & Jones, 2006; Kandiah, Yake and Willett, 2008; Oliver & Wardle 1999; Wallis & Hetherington, 2009; Wellenbring, Levine & Morely, 1986;). Although this effect has been found consistently across studies, the differences between these two groups are still largely unknown. Therefore, findings from this aspect of the research may provide novel information to further understand how stress affects the food intake in these two populations.

Research has also linked stress to changes in food preference. For instance, many studies demonstrate a shift toward unhealthy food options when stressed. More specifically, studies show a trend toward highly palatable, snack-type foods when stressed. (Oliver & Wardle, 1999; Wansink, Cheney & Chen, 2003; Zellner et al., 2006). In particular, stress has been associated with increased consumption of sweet, high fat snack foods whereas more meal-type foods were consumed less frequently under conditions of stress (Oliver & Wardle, 1999; Wansink et al., 2003; Zellner et al., 2006). This study will therefore also examine the differences in food preference between stress under-eaters and stress-eaters with the aim of

further characterizing the stress-related eating habits of these two distinct groups.

Also emerging from the research is evidence indicating that attachment style impacts individual physiological responses to stress. Attachment style refers to an internal schema of relating and is the framework from which a child learns how to engage in relationship with others throughout their lifespan. A child develops an attachment style from repeated early interactions with their primary attachment figure (e.g. mother). This learned pattern of relating creates a template, which remains fairly consistent into adulthood (Maunder & Hunter, 2001; Shorey & Snyder, 2006). Adult-attachment style has been linked with various mental health illnesses such as depression, anxiety and eating disorders (Dozier, 1999). Although the influence of attachment style on eating behaviour in nonclinical populations has been less extensively explored, researchers have found there to be a link between these two factors as well. For instance, Koskina and Giovazolias (2010) found that as avoidant attachment increased disordered eating behaviour increased as well (e.g. increased food restriction, preoccupation with losing weight and impulses to vomit). This finding was significant for both males and females. Bryony and Halliwell (2009) also found that attachment avoidance directly influenced disordered eating. In fact, they found that increased attachment

avoidance predicted increased eating disorder pathology. Similarly, Wilkinson et al. (2010) found increased attachment anxiety significantly predicted disinhibited eating in both male and female university students. Most recently, Troisi and Gabriel (2014) investigated the relationship between attachment style and ability to reduce feelings of loneliness by having male and female university students write about comfort foods. Their findings revealed that writing about comfort foods significantly reduced feelings of loneliness in participants with secure attachments but not in those who were insecurely attached.

Therefore, this study also explored the possibility of a complex interaction between stress, eating behaviour, and attachment style. Given the paucity of research investigating the relationship between daily life stresses, attachment, and eating behaviour, the potential paradigm between these three factors is worth exploring. Examining the impact that stress and attachment have on eating may lead to a better understanding of the underlying psychological factors that are potentially contributing to eating behaviours. This knowledge may prove helpful for health care professionals working with clients who struggle with healthy eating. Elucidating the potential influence that attachment may have on eating behaviour may help health care practitioners not only more comprehensively understand the unique impacts of attachment on eating

behaviour, but may also promote interventions that focus on targeting these underlying psychological factors as a means to help individuals develop a healthy relationship with food.

Findings pertaining to this aspect of the study may also provide valuable information of the differential effects of attachment styles and daily life stressors on eating behaviours in two different groups of individuals: stress under-eaters and stress-eaters. Additionally, this research may help to further understand the complex relationship between daily life stress, adult-attachment style, stress-eating style, and stress-eating behaviour. This study will explore the likely complex interrelationship between these factors, something that to our knowledge has not been done before.

Given the prevalence of stress in society today as well as the innumerable detrimental impacts that stress can have on physical and mental health, this area of study warrants further attention from researchers and health care practitioners alike. Furthermore, given that for the past 10 years females have been more likely than males to report higher levels of stress as well as the fact that the second and third most common chronic conditions in adolescent females are eating related disorders (Golden et al., 2003), this study focused specifically on the

female population.

The first research study used a survey design to examine the stress-related changes in the eating patterns of 155 undergraduate University students (128 women and 27 men). The purpose of this study was to elucidate perceptions of how eating patterns change when individuals are experiencing stress compared to when they are not stressed. This was done through the research questions: 1) how do individuals alter their food intake when stressed; 2) how do individuals change their flavour preferences (sweet, salty, savory, bitter, and sour) when stressed; 3) how do individuals change their food-type preference when stressed (snack vs. meal); 4) how they change their food preparation preferences when stressed (homemade vs. take out) and lastly 5) do individuals experience a change in loss of control over eating when stressed compared to when relaxed? Based on the wealth of research that demonstrates individuals both increase and decrease their food intake when stressed (Grunberg & Straub, 1992; Heatherton et al., 1991; Klein et al., 1996; Schotte et al., 1990; McKenna, 1972; Pine, 1985), it was predicted that some individuals would exhibit a hyperphagic response while others would exhibit a hypophagic response when stressed. Based on past findings (Kandiah et al., 2006; Kandiah et al., 2008; ; Wansink et al., 2003,; Wardle, Steptoe, Oliver, & Lipsey,

2000; Wellenbring et al., 1986) it was also predicted that individuals would increase preference for sweet, salty foods, snack-type and take out food options when stressed. Participants were given questionnaires, pertaining to their typical eating habits as well as their eating habits when stressed. McNemar chi-square tests were then used to analyze the data and determine if there were significant differences between typical eating patterns and eating patterns when stressed.

The second research study examined stress-related eating patterns of two novel groups: stress under-eaters and stress-eaters. The purpose of this study was to explore the impacts of stress and adult-attachment style on eating behaviour and food preference of 58 female undergraduate students who self-identified in one of these two groups. This was done through the primary research question: how do stress and adult-attachments style impact food intake and preference in stress under-eaters and stress-eaters. This study employed an experimental design, whereby participants tracked their daily food intake once a week for 10 weeks, using an electronic application on their smart phone. This methodology allowed participants to quickly and easily input the food they consumed into their food diaries by simply scanning the bar code on the food packaging. Not only did this method reduce human error by eliminating the manual transcription of information, but also allowed

researchers to investigate a wide variety of nutrients (e.g. sugar, sodium, carbohydrates, fiber, protein). Furthermore, participants tracked their food intake 1 day per week, for a total of 10 weeks. This repeated measures approach was used to capture a more reliable picture of individuals' eating patterns. A multi-level model was then used to predict eating behaviour and food preference in both groups using their level and attachment style.

## CHAPTER TWO

### The Effects of Stress on Eating Patterns

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**Abstract**



It is well established that stress is related to changes in eating patterns. The individual differences model has been widely used to examine the effects of stress on eating behaviour in experimental settings. Common trends for gender, dietary restraint, and BMI have been established. The current study investigates the effects of stress on eating patterns in everyday living, while also examining the role of individual differences: gender, dietary restraint, and BMI. Results support past findings that stress leads to changes in food consumption, increased preference for salty flavours, and increased preference for take-out food options. Findings also showed evidence that gender significantly influences stress-related eating patterns with regard to frequency of snacking and loss of control over eating. Collectively, findings provide valuable information for health care professionals and suggest potential key targets for stress-related food consumption interventions.

#### Keywords

Stress-eating, stress-eating patterns, stress-related food preferences

## **Introduction**

Stress is a ubiquitous factor in daily living (Statistics Canada, 2012). Cardiovascular disease, ulcers, hypertension, (Quick, Quick, Nelson & Hurrell, 1997), obesity (Rand & Stunkard, 1978), bulimic episodes (Lingswiler, Crowther & Stephens, 1989) anxiety disorders, sexual dysfunction, and depression (Quick et al., 1997) are just some of the unwanted health consequences that can emerge from or be exasperated by stress. How one chooses to manage stress can be an important determinant of one's medical and psychological health outcomes. Therefore, food choice and eating patterns are two important factors to consider when dealing with stress, as healthful eating can dramatically reduce risk for major health issues such as coronary heart disease, diabetes, obesity, and even early mortality (The National Academies, 2005). With obesity recognized as a global epidemic (World Health Organization, 2014), unhealthy changes in eating patterns in response to stress are of concern. In Canada alone, it is estimated that over 50% of adults (Statistics Canada, 2013a) and 20% of children (Statistics Canada, 2013b) are either overweight or obese. Moreover, obesity and eating disorders are the second and third most common chronic conditions in adolescent females (Golden et al., 2013). These facts, as well as the pervasive nature of stress make the stress-eating paradigm an important avenue of investigation.

Two distinct models of stress and eating have been empirically tested. The “general effects” model posits that stress leads to an increase in food consumption in all organisms. This model has been primarily tested on animals and focuses on the physiological explanations of stress induced eating. The “individual differences” model predicts that factors such as learning history, biology and perspective will affect whether an individual increases food consumption when stressed. This model has been tested on humans and in contrast to the viewpoint of the general effects model, which posits that physiological changes induce changes in eating; the individual differences model postulates that psychological and environmental factors are the fundamental mechanisms of change (Greeno & Wing, 1994). Three methods of identifying whether individuals are predisposed to stress induced eating have been proposed. The first method is based on weight. It is suggested that individuals of normal-weight will decrease their eating when stressed and the eating of individuals who are obese will remain unaffected (Schachter, Goldman, & Gordon, 1968). The second method involves dietary restraint. It is proposed that individuals who work to control their eating when not stressed, will increase their eating when stressed whereas individuals who do not normally control their eating will remain unaffected (Herman & Polivy, 1975). Lastly, the third method is based on gender. It is postulated that women are more

likely than men to increase their eating when stressed, especially toward particular foods (Grunberg & Straub, 1992). The individual differences model will be used as the theoretical framework for the basis of this study, in which the links between various aspects of eating behaviour and stress will be examined in order to illustrate some of the underlying themes of the stress-eating paradigm.

The individual differences model has been extensively examined in experimental settings (Cools, Schotte, & McNally, 1992; Heatherton, Herman, & Polivy, 1991; Herman, Polivy, Lank, & Heatherton, 1987; Klein, Faraday, & Grunberg, 1996; Levine & Marcus, 1997; Schotte, Cools, & McNally, 1990). Results from laboratory research investigating stress and eating behaviours in humans have shown remarkable consistency across studies. A stress hyperphagic response has been shown by women (Grunberg & Straub, 1992; Klein et al., 1996), restrained eaters (Heatherton et al., 1991; Schotte et al., 1990), and individuals who are overweight or obese (McKenna, 1972; Pine, 1985). In contrast, a stress hypophagic response or no change in eating, has been shown in men (Grunberg & Straub, 1992; Klein et al., 1996), non-restrained eaters (Heatherton et al., 1991; Schotte et al., 1990) and individuals of average weight (McKenna, 1972; Pine, 1985). A commonality among studies investigating changes in food preferences due to stress is that stress results

in a shift toward more unhealthy food choices, particularly highly palatable, snack-type foods (Kandiah, Yake, Meyer, & Jones, 2006; Kandiah, Yake, & Willet, 2008; Wellenbring, Levine, & Morley, 1986). More specifically, studies show increased preferences for sweet (Kandiah et al., 2006), salty (Wardle, Steptoe, Oliver, & Lipsey, 2000), and high fat food options when stressed (Kandiah et al., 2006; Wansink, Cheney, & Chan, 2003). However, very little research has attempted to generalize these laboratory findings to everyday eating behaviour.

The present study was therefore developed to examine the associations between stress and eating in everyday living, while also evaluating the role of individual differences; weight, restraint, and gender. A novel component of this study that further differentiates it from past research is the more detailed exploration of how stress affects eating behaviour through the investigation of changes in specific eating patterns, which include flavour preferences, food type preferences (meal vs. snack), and food preparation preferences (homemade vs. takeout). Using a design similar to Wallis and Hetherington (2009) and Zellner et al., (2006) this study sought to gather information regarding self-reported eating patterns for both perceived non-stressful and stressful periods in a free-living context. On the basis of previous work (Baucom & Aiken, 1981; Kandiah et al., 2006), it was predicated that participants would report preferring

sweet and salty flavours, as well as snack-type food options and take-out food options, significantly more when stressed compared to when relaxed. Furthermore, according to the theory of individual differences and past findings regarding individual differences (Grunberg & Straub, 2003; McKenna, 1972), it was predicted that women, retrained eaters, and individuals who are overweight or obese would prefer the abovementioned options significantly more than their counterpart groups. This survey study will help develop a more comprehensive understanding of the stress-eating paradigm by elucidating some of the underlying links between stress and eating patterns. Furthermore, information gained from this research may identify potential target areas for intervention in stress-related consumption.

## **Method**

### **Participants and Procedures**

A random sample of students from a university was selected to complete the 54-item Typical Eating and Stress Eating Survey. Participants included 154 undergraduate students (127 females; 27 males). They were recruited through sign-up sheets posted in the Psychology department. Participants were informed that they would be asked questions about their typical eating patterns as well as their eating patterns when stressed.

Questionnaires were completed in person on campus. The average age of participants was 20 years, ranging from 18-38 years. The average weight of female participants was 147 pounds, ranging from 102-235 pounds. The average weight for male participants was 170 pounds, ranging from 127-300 pounds. In total 10 participants' data was excluded from the analyses of this study. Seven participants' data was excluded due to previous diagnosis of an eating disorder, anxiety disorder, depression or because they were currently pregnant or nursing and three additional participants requested to be removed from the study.

## **Measures**

**Demographic Questionnaire (Eycke, 2010).** A demographic questionnaire designed by Dr. Michael Emond and Kayla Ten Eycke for a previous Master's thesis (Eycke, 2010) asked participants to report their current age and sex. Participants were also weighed and measured for their height. These measurements were used to calculate BMI. Participants were asked to report if they were currently dieting. This question was used to measure dietary restraint, which entails restricting and/or controlling eating. Restrained eaters were identified as those who were currently dieting, whereas unrestrained eaters were those who were not dieting.

### **The Typical Eating and Stress Eating Questionnaire (Eycke, 2010).**

The Typical Eating and Stress Eating questionnaire, designed by Dr. Michael Emond and Kayla Ten Eycke for a previous Master's thesis (Eycke, 2010) was administered to participants to identify how their eating patterns change in response to stress. The questionnaire was designed to assess how participants alter certain eating patterns when stressed compared to in a relaxed state. The questionnaire was approximately 40 questions regarding participants typical eating patterns and their eating patterns when stressed. More specifically, the eating patterns that were analyzed were: 1) eating behaviour (under-eat, eat the same, overeat); 2) flavour preferences (sweet, salty, bland, bitter, savory, sour); 3) food-type preferences (snack-type, meal-type); 4) food-preparation preferences (homemade, take-out); and 5) loss of control of eating (yes or no). Each of these items were assessed with regard to usual preference and preference when stressed to assess changes in preferences when stressed compared to not stressed.

### **Data Analyses**

This questionnaire has been tested in the laboratory to determine if self-reported under-eaters and stress eaters consume less and more calories, respectively, when under stress compared to in a relaxed state. The



expected conclusions were validated for both groups. Intra-test reliability was tested for stress-eating style, self-reported stress under-eater stress-eater. Items "stress-eating style in general," "stress-eating style under chronic stress," and "stress-eating style under episodic stress" were all significantly moderately correlated,  $r=.68$ ,  $p=.01$ . Test-retest reliability of the "stress-eating style in general" item was checked. Participants completed the item on two occasions, 10 weeks apart. Test-retest reliability for the item was  $.48$ ,  $p=.01$ . Due to the selection of response items on a non-continuous scale, McNemar tests were used to evaluate the differences in responses to flavour preferences, food-type preferences (meal/snack), food preparation preferences, and loss of control when eating under stress compared to in a relaxed state. Chi-square tests were conducted to assess the significance of effects of restraint, BMI and gender for each of these factors.

## **Results**

### **Changes in Eating Behaviour under Stress**

Of all participants ( $n=154$ ), 83.8% reported that they alter their eating behaviour in response to stress. Forty eight percent of participants reported they overeat when stressed (51.6% of the women, 33.3% of the men), 35.6% reported they under-eat when stressed (38.3% of the women

and 18.5% of the men), and 16.2% reported they eat the same when stressed (9.4% of the women and 48.1% of the men). A chi-square test revealed that there is a relationship between gender and changes in food preference; women report altering their eating behaviour in response to stress significantly more often than do men [ $\chi^2 = (1, N = 154) = 24.52, p \leq .001$ ].

Table 1.

*Change in Eating Behaviour by Gender*

	Change in Eating Behaviour	
	Yes	No
Male	51.9% (14)	48.1% (13)
Female	90.6% (115)	9.4% (12)
Chi Square	24.52**	
**	.001	

## Changes In Flavour Preferences Under Stress

The two most preferred tastes when stressed were sweet and salty. Eighty percent of participants reported that when stressed they prefer sweet foods (82.0% of the women and 70.4% of the men) and 76.6% prefer salty (77.3% of the women and 70.4% of the men). A McNemar chi-square test indicated that there was no significant change in preference for sweet flavoured foods when relaxed compared to when stressed [ $\chi^2 (1, N=154) = 1.24, p=.27$ ]. However, a McNemar chi-square test indicated that there was a significant change in preference for salty flavoured foods when relaxed compared to when stressed, indicating that participants reported to prefer salty flavours significantly more when stressed compared to when relaxed [ $\chi^2 (1, N=154) = 6.56, p\leq.01$ ]. There was no effect for dietary restraint, gender, or BMI.

Table 2.

*Preferences for Salty Flavour When Stressed Compared to When Relaxed*

		Prefer Salty When Stressed		
		No	Yes	Total
Prefer Salty When Relaxed	No	16.2% (25)	18.2% (28)	34.4% (53)
	Yes	7.1% (11)	58.4% (90)	65.6% (101)
Total		23.4% (36)	76.6% (118)	100% (154)
Chi Square		6.56*		
		*.01		

A binomial test showed that participants reported to prefer bitter flavours significantly less when stressed ( $p \leq .05$ ). Further chi-square analyses revealed an effect of gender, which indicated that men reported preferring bitter significantly more than women, when stressed [ $\chi^2$  (1,  $N=154$ ) = 5.40,  $p \leq .05$ ]. An effect for dietary restraint was also found. Participants who reported currently dieting also reported preferring bitter

flavours significantly more than participants who were not dieting [ $\chi^2$  (1,  $N=154$ ) = 6.45,  $p \leq .01$ ].

Table 3.

*Preferences for Bitter Flavour When Stressed Compared to When Relaxed*

		Prefer Bitter When Stressed		
		No	Yes	Total
Prefer Bitter When Relaxed	No	94.2% (145)	0% (0)	94.2% (145)
	Yes	3.9% (6)	1.9% (3)	5.8% (9)
	Total	98.1% (151)	1.9% (3)	100% (154)
Binomial		$p \leq .05$		

A chi-square test revealed that participants reported preferring savory flavours significantly less when stressed compared to when relaxed [ $\chi^2$  (1,  $N=154$ ) = 20.08,  $p \leq .001$ ]. Further chi-square analyses indicated that when stressed, males who were not on a diet reported preferring savory flavours significantly more than females who were not on a diet [ $\chi^2$  (1,  $N=131$ ) = 3.73,  $p \leq .05$ ]. There was no significant difference for preference of savory flavours between males and females who were currently dieting. There was no effect for BMI.

Table 4.

*Preferences for Savory Flavour When Stressed Compared to When Relaxed*

		Prefer Savory When Stressed		
		No	Yes	Total
Prefer When Relaxed	No	24.0% (37)	5.8% (9)	29.9% (46)
	Yes	27.3% (42)	42.9% (66)	70.1% (108)
	Total	51.3% (79)	48.7% (75)	100% (154)
Chi Square		20.08*		
		*.001		

**Changes in Food-Type Preferences Under Stress**

A McNemar chi-square test indicated that participants reported preferring snack-type foods significantly more when stressed compared to when relaxed [ $\chi^2$  (1,  $N=117$ ), 37.96,  $p \leq .001$ ]. Further chi-square analyses indicated that women reported preferring snack-type food options

significantly more than men when stressed [ $\chi^2$  (1,  $N=117$ ), 10.57,  $p \leq .001$ ].

There were no significant differences for dietary restraint or BMI.

Table 5.

*Food-Type Preferences When Stressed Compared to Relaxed*

		Food-Type Preference		
		When Stressed		
		Snack-type	Meal-type	Total
Food-Type	Snack-type	45.3% (53)	2.6% (3)	47.9% (56)
Preference	Meal-type	41.0% (48)	11.1% (13)	52.1% (61)
When Relaxed				
	Total	86.3% (101)	13.7% (16)	100% (117)
	Chi Square	37.96*		
		*.001		

**Changes in Food Preparation Preferences Under Stress**

A McNemar test indicated that there was a significant change in food preparation preference when relaxed compared to when stressed, which showed that participants reported preferring takeout food significantly more when stressed compared to when relaxed [ $\chi^2$  (1,  $N=89$ ),

38.03,  $p \leq .001$ ]. There were no significant differences in food preferences for gender, dietary restraint or BMI.

Table 6.

*Food Preparation Preferences When Stressed Compared to Relaxed*

		Food Preparation Preference		
		When Stressed		
		Homemade	Take-out	Total
Food Preparation Preference When Relaxed	Homemade	43.8% (39)	44.9% (40)	88.8% (79)
	Take-out	0.00% (0)	11.2% (10)	11.2% (10)
	Total	43.8% (39)	56.2% (50)	100% (89)
Chi Square		38.03*		
		*.001		

**Losing Control over Eating When Stressed Compared to When Relaxed**

A McNemar test indicated that participants reported losing control over eating significantly more when stressed compared to when relaxed [ $\chi^2$  (1,  $N=151$ ), 7.23,  $p \leq .01$ ]. Additional chi-square analyses revealed that



women reported losing control over eating significantly more than men, when stressed [ $\chi^2 (1, N=151) = 5.04, p \leq .05$ ]. No differences were found for dietary restraint or BMI.

Table 7.

*Losing Control Over Eating When Stressed Compared to When Relaxed*

		Lose Control Over Eating		
		When Stressed		
		No	Yes	Total
Lose Control Over	No	51.3% (79)	18.8% (29)	70.1% (108)
Eating When	Yes	7.1% (11)	22.7% (35)	29.9% (46)
Relaxed				
	Total	58.4% (90)	41.6% (64)	100% (154)
	Chi Square	7.23*		
	*.01			

## Discussion

The results of this survey study support and extend laboratory findings that stress appears to be linked to reported unhealthy changes in eating behaviour and food preferences. Findings from this research showed that the vast majority of individuals reported altering their eating behaviour

(increasing or decreasing consumption) in response to everyday stress. Individuals also reported increased preference for salty flavoured foods, decreased preference for bitter and savory flavoured foods, increased snacking, and increased consumption of take-out food in response to stress in everyday living. This study also provides preliminary evidence that women may be more prone than men to alter certain eating patterns in response to stress. This was shown by results that indicated that women were more likely than men to report adjusting their food consumption in response to stress, as over fifty percent of women reported that they increase their food intake and over thirty percent reported that they decrease their food intake when stressed. Women were also more likely than men to report losing control over eating when stressed and only women reported increased preference for snack-type food options when stressed. Collectively, these confirm that stress is associated with self-reported unhealthier eating patterns and suggest that gender may influence some stress-eating patterns.

Findings from this survey study concur with previous findings (e.g. Grunberg & Straub, 1992; Klein et al., 1996) that women are more likely to exhibit a stress hyperphagic response whereas men more commonly show no change in eating behaviour when stressed. However, contrary to past research (e.g. Heatherton et al., 1991; McKenna, 1972; Pine, 1985;

Schotte et al., 1990) neither dietary restraint nor BMI were related to stress-eating consumption in this study. These results support the notion that women appear to perceive themselves to be more susceptible than men to stress-related changes in food consumption and extend this finding from the laboratory to an everyday-living context.

This research also supports past findings (e.g. Willenbring et al., 1986) that stress is associated with reported increased preference for salty flavours when stressed compared to when relaxed. This change in flavour preference was not effected by gender, dietary restraint or BMI in this study. Individuals also reported preferred bitter and savory flavours less when stressed than when relaxed. This reported decreased preference for bitter foods may be a possible reflection of stress driving flavour preference to foods higher in palatability (e.g. salty). In addition, reports for both bitter and savory flavour preferences appeared to be influenced by gender and restraint. When stressed, males reported preferring bitter flavours more than females, and individuals on a diet reported preferring bitter flavours more than individuals who were not on a diet. In contrast, men who were not on a diet reported preferring savory flavours significantly more than women who were also not dieting. However, there were no difference in reported preferences for savory flavours between men and women who were on a diet. These findings suggest that although

reports for salty, bitter and savory flavour preferences are all associated with stress, reports for bitter and savory preferences appear to be uniquely impacted by gender and dietary restraint when stressed. These relationships are particularly interesting as they have yet, to our knowledge, been examined or explained in previous research.

Results from this study also support past findings (e.g. Oliver & Waddle, 1999) that individuals report choosing snack-type food options more when stressed compared to when relaxed. In addition, further analyses revealed that this effect was only significant for women. In this study, men were not found to report increasing their preference for snack-type food options when stressed. These results support findings from a survey study conducted by Wansink et al. (2003), which showed that when stressed, preference for snack-type food options increased in women but not in men. These differential effects of stress on food-type preferences between women and men further support the theme that gender is an individual difference that influences stress-related eating patterns in a variety of ways. Specifically, this preliminary evidence suggests that gender appears to increase the likelihood of reports for some unhealthy eating patterns in women more than men when stressed; namely, consumption, controlled-eating, and snacking. Yet gender does not appear to impact reports of stress-related flavour preferences.

Another aim of this study was to extend past research investigating associations between stress and eating by evaluating novel aspects of eating patterns such as preference for take-out versus homemade food options. According to this study, stress is associated with reported increased preference for take-out food. There was no evidence suggesting that gender, restraint or BMI influence reported preferences for method of food preparation. These findings suggest that although women appear to have perceived themselves to be more susceptible than men to unhealthy changes in stress-eating patterns with regard to consumption, control, and snacking, they do not appear to perceive themselves to be more vulnerable than men to increasing their frequency of selecting take-out food options when stressed.

Results also indicated that both men and women report being more likely to lose control over their eating when stressed compared to when relaxed. This finding is particularly concerning considering the high prevalence rates of stress in Canada (Statistics Canada, 2014), especially when taken into consideration with the aforementioned perceived changes in eating patterns that demonstrate people report choosing higher caloric food options when stressed. In addition, women were found to report being more likely than men to lose control over eating when stressed. Therefore, stress appears to affect individuals' perception of their ability

to regulate their behaviour and this dysregulation appears to be more significant in females. This finding is especially concerning as well, given that obesity and eating disorders are the second and third most common chronic conditions in adolescent females (Golden et al., 2003) and that eating disorders are the most lethal of all psychiatric illnesses (Harris & Barraclough, 1998).

Overall, this survey study supports the notion that both men and women perceive that stress leads to unhealthy changes in eating patterns through reports of increased preference for highly palatable (salty) foods, increased preference for take-out food options, and greater likelihood for loss of control over eating. The present investigation also provides preliminary evidence suggesting that women perceive themselves to be more susceptible than men to making unhealthy changes in stress-related eating patterns. Not only were women more likely to report increasing preferences for salt and take-out food options when stressed compared to relaxed, they were also more likely than men to report increasing snacking and lose control over eating when stressed.

Findings from this study suggest that flavour preferences, frequency of snacking, and choice of food preparation may be potentially important targets for interventions for stress-related food consumption. These results also provide valuable information to health care professionals whose

patients struggle with weight and eating-related concerns. A greater consideration of individual differences may help health care professionals tailor eating-related advice to address the specific vulnerabilities of the individual patient.

### **Limitations and Future Research**

A primary limitation of this study was the limited number of male participants. Given that 82% of the sample was female, changes in eating patterns should be further examined in both sexes before results can be generalized to the general population. Furthermore, provided that to our knowledge no prior research has examined the link between stress and method of food-preparation, further research should investigate this association as well. The self-report method used in this study also represents a limitation of this research. Future studies should attempt to validate these findings in a more controlled setting. The participant pool used for this study was somewhat limited. Given that all participants were university students, with 92% of the sample falling between the ages of 18-22 years these findings should be generalized with caution. Future research should attempt to examine these factors in a more diverse adult population as well as in adolescents, in order to determine if these findings can be generalized to the larger public as well as across the lifespan.

Lastly, given that women are at increased risk for disordered eating<sup>10</sup>, it would be sensible to continue to explore the unique susceptibility to unhealthy changes in certain stress-eating patterns, such as snacking and loss of control, in females, in order to further elucidate how and why gender impacts some stress-eating behaviours.



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## CHAPTER THREE

### The Effects of Stress and Attachment on Eating Behaviour and Food Preference in Stress Under-Eaters and Stress-Eaters

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## **Abstract**

It has been established within the literature that stress causes both hyperphagic and hypophagic responses. However, the majority of stress-eating research explores the stress response in experimental settings. The aim of this study is to explore the differences in eating behaviour in two self-identified stress-eating groups: stress under-eaters and stress-eaters, and to use a naturalistic approach to see if the eating patterns of these two groups are differentially affected by life stressors. Furthermore, gender, weight, and dietary restraint are the most prominently examined variables with regard to the stress-eating relationship. The purpose of this field study was therefore, to explore the influence of a more novel individual difference, adult attachment style. The results demonstrate that stress causes a hypophagic response in stress under-eaters and no change in the eating behaviour of stress-eaters. Furthermore, in stress under-eaters, decreases in secure attachment predicted increases in total caloric consumption and consumption of carbohydrates, sodium, protein and fiber. The opposite effect was found for increases in stress level. In stress-eaters, increases in avoidant attachment predicted increases in carbohydrate, sugar and fiber consumption. Stress had no effect on food preferences in stress-eaters. Therefore, the findings reveal that stress and

attachment style have differential effects on eating behaviour and food preference. The results also demonstrate that attachment style uniquely influences the eating behaviour and food preferences of stress under-eaters and stress-eaters. Overall, these results add to the paucity of research investigating 1) the effects of stress on eating from a naturalistic approach and 2) the role of attachment style in the eating behaviour and food preferences of nonclinical populations. They also identify some of the idiosyncratic differences between the novel groups of stress under-eaters and stress-eaters. Lastly, they provide valuable information that may help delineate novel aspects of some of the underlying psychological factors that contribute to eating behaviour and how they uniquely influence the complex relationship between stress and eating in different individuals.

#### Keywords

Stress-eating, stress under-eaters, eating and attachment style



## **Introduction**

Stress is a prevalent factor affecting daily living among Canadians. In 2013, 23.0% of individuals over the age of 15 reported that most days were “quite a bit or extremely stressful.” (Statistics Canada, 2014). Stress not only adversely affects health directly, through physiological changes that can increase the risk for physical illnesses such as cardiovascular disease, ulcers, and hypertension (Quick, Quick, Nelson & Hurrell, 1997) but also indirectly, through changes in health related behaviours such as food choice and intake.

Collectively, studies demonstrate a shift toward unhealthy food options when stressed. In particular, people tend to increase their intake of highly palatable, snack-type foods when stressed. (Oliver & Wardle, 1999; Wansink, Cheney & Chen, 2003; Zellner et al., 2006). For example, stress is associated with increased consumption of sweet, high fat snack foods whereas more meal-type foods are consumed less frequently under conditions of stress (Oliver & Wardle, 1999; Wansink et al., 2003; Zellner et al., 2006). Research has also linked stress to changes in food consumption. Many studies have demonstrated that stress has a bidirectional effect on food intake, whereby some individuals increase their food consumption when stressed and others decrease food intake

when stressed (Kandiah, Yake, Meyer & Jones, 2006; Kandiah, Yake and Willett, 2008; Wallis & Hetherington, 2009; Wellenbring, Levine & Morely, 1986; Oliver & Wardle 1999).

Although researchers have proposed various frameworks regarding the stress-eating relationship no theory has received definitive support. One model that has been widely examined in experimental settings is the “individual differences” model. This model has been tested on humans and postulates that psychological and environmental factors, such as learning history, are responsible for how one alters one’s eating behaviour when stressed (Green & Wing, 1994). Evidence is emerging from the literature indicating that various individual differences influence the stress-eating relationship. Currently, the three most prominent variables being studied in this field are: gender, dietary restraint and weight. A review of the literature indicates that, when stressed, women (Grunberg & Straub, 1992; Klien, Faraday & Grunberg, 1996), restrained eaters (Heatherton, Herman & Polivy, 1991; Schotte, Cools & McNally, 1990) and individuals who are overweight or obese (McKenna, 1972; Pine, 1985) increase their food intake and men (Grunberg & Straub, 1992; Klien et al., 1996), non-restrained eaters (Heatherton et al., 1991; Schotte et al., 1990) and individuals of average weight (McKenna, 1972; Pine, 1985)

decrease or exhibit no change in intake when stressed. Despite these findings, conclusive evidence regarding which individual difference variables affect the stress-eating relationship as well as how these variables impact stress-eating responses, remain largely unknown.

Two individual differences that have been less commonly explored are stress-eating style and adult-attachment style. Given that stress has been linked to both hyperphagic and hypophagic responses (e.g. Wallis & Hetherington, 2009), this study sought to identify and examine two distinct stress-eating styles: stress under-eaters, those who decrease their food intake when stressed and stress-eaters, and those who increase their food intake when stressed. As such, one of the goals of this study was to investigate how stress affects eating behaviour and food preference in individuals who self-identify as stress under-eaters and stress-eaters. Based on past findings that show stress has a two-way effect on eating behaviour, causing a hyperphagic response in some individuals and a hypophagic response in others (Herman et al., 1987; Kandiah et al., 2008; Kandiah et al., 2006; Oliver & Wardle 1999; Wallis & Hetherington, 2009; Wellenbring et al., 1986), it was predicted that individuals who self-identify as stress-eaters will increase their food intake when stressed,

whereas those who self-identify as stress under-eaters will decrease their food consumption when stressed.

Additionally, since attachment style influences one's perception of and interaction with their environment (Shorey & Snyder, 2006) it is potentially an important factor with regard to the stress-eating relationship. Attachment style refers to an internal schema of relating, which a child develops from repeated early interactions with their primary attachment figure (e.g. mother). This learned pattern of relating creates a template from which a child develops their understanding of relationship dynamics and is the framework from which a child learns how to engage in relationship with others throughout their lifespan (Maunder & Hunter, 2001; Shorey & Snyder, 2006). Although various attachment models have been developed (e.g. Ainsworth, Blehar, Waters & Wall, 1978; Bartholomew & Horowitz, 1991; Brennan, Clark & Shaver, 1998), the Hazan and Shaver (1987) conceptualization of attachment, which includes secure, anxious and avoidant attachment styles, was used for the purposes of this study. Based on this model, secure attachment style is characterized by feeling comfortable depending on others and having others depend on them as well as a lack of worry regarding being abandoned or having others become too intimate. In contrast, anxious attachment style is

marked by worry regarding how committed their loved ones are to the current relationship and anxiety of being ignored or abandoned.

Individuals who are anxiously attached often want to merge completely with their partners and become distressed when that desire is not reciprocated. Lastly, avoidant attachment is characterized by feeling uncomfortable with closeness and intimacy. Individuals who are attachment avoidant often find it difficult to trust others and prefer to rely on themselves rather than depend on other people (Hazan & Shaver, 1987).

Maunder and Hunter (2001) have proposed an attachment model developed from a biopsychosocial perspective to explain how the relationship between a child and their caregiver can have a long-lasting impact, affecting the child's stress-response into adulthood. (Maunder & Hunter, 2001). Their model describes how attachment insecurity can lead to increased risk for illness through increased vulnerability to stress, increased reliance on external affect regulation, and alternative methods of seeking help. In support of this view, animal and human studies alike have demonstrated that attachment style is a key factor involved in the physiological response to stress (Floeter & Greenough, 1979; Hofer, 1995; Kraemer, 1992; Levine, Haltmeyer, Kaas & Peneberg, 1967; Lui et al.,

1997; Poppius, Tenkanen, Kalimo & Heinsalmi, 1999; Spangler & Schieche, 1998; Sroufe & Waters, 1977; Struble & Riesen, 1978) and disease in certain individuals (Goldberg, Simmons & Newman, 1991; Marvin & Pianta, 1996; McCallum & McKim, 1999; Mrazek, Casey & Anderson, 1987; Scheidt et al., 2000; Simmons, Goldberg, Washington & Fischer-Fay, 1995; Ward & Kessler, 1993). Furthermore, there is evidence that insecure attachment is associated with increased health risk behaviours such as smoking, alcohol and drug use (Brook, Whiteman, Finch, & Cohen, 1998; DeFronzo & Pawlak, 1993).

The influence of adult-attachment style on psychopathology has also been extensively explored and is associated with numerable mental illnesses including depression, anxiety and eating disorders, (Dozier, 1999). Many studies have shown a link between insecure attachment style and eating disorders (Armstrong & Roth, 1989; Becker, Bell, & Billington, 1987). For instance, higher rates of insecure attachment were found in women with eating disorders compared to women from a community sample. Moreover, attachment insecurity was associated with severity of symptoms (Broberg, Hjalmlers, and Nevonen, 2001). These findings are congruent with the view that the underlying function of the eating disorder is to avoid and manage unwanted and painful emotions

(e.g. restricting numbs, bingeing soothes) (Cockell, Geller, & Linden, 2002; Dolhanty & Greenberg, 2008; Lafrance & Dolhanty, 2013; Treasure, Schmidt, & Troop, 2000).

However, the impact of attachment on food choice and intake in nonclinical populations has not been as widely explored. Koskina and Giovazolias (2010) evaluated the impact of attachment on eating behaviour in male and females university students in Greece. Their findings revealed that as avoidant attachment increased disordered eating behaviour increased as well (e.g. increased food restriction, preoccupation with losing weight and impulses to vomit). This finding was significant for both males and females. Yet, the anxiety dimension of the insecure attachment domain was not shown to significantly predict disordered eating behaviour.

Bryony and Halliwell (2009) drew similar conclusions from a study that explored the impact of attachment within a sociocultural model of disordered eating in female university students from the United Kingdom. In their study, attachment avoidance directly influenced disordered eating. Increased avoidance predicted increased eating disorder pathology. However, the relationship between attachment anxiety and disordered eating was mediated by social comparison.

Reasons for the relationship between attachment and disordered eating have been suggested in recent studies. For instance, Wilkinson et al. (2010) found increased attachment anxiety significantly predicted disinhibited eating in male and female university students in Bristol. Based on their findings, Wilkinson et al. (2010) postulated that anxiously attached individuals engage in disinhibited eating as a means to soothe their feelings of interpersonal anxiety. Most recently, Troisi and Gabriel (2014) investigated the relationship between attachment style and ability to reduce feelings of loneliness by having male and female university students write about comfort foods. Their findings revealed that writing about comfort foods significantly reduced feelings of loneliness in participants with secure attachments but not in those who were insecurely attached.

Given the paucity of research and mixed results regarding the influence of attachment on eating behaviour, further exploration is warranted. As such, the second objective of this investigation is to explore the possible impact of adult-attachment style on eating behaviour and food preference in stress under-eaters and stress-eaters. Based on the theory postulated by Wilkinson et al (2010) that eating comfort foods and highly palatable foods can act to reduce the negative affect brought on by



attachment anxiety, as well as previous findings from the literature (e.g. Koskina & Giovazolias, 2010) it was predicted that increased attachment anxiety would lead to increased intake of calories, carbohydrates, fat, sugar and sodium in both stress under-eaters and stress-eaters. Similarly, it was predicted that decreased attachment security would lead to increased consumption of calories, carbohydrates, fat, sugar and sodium in stress under-eaters and stress-eaters. In contrast, based on Mikulincer & Florian's (1998) theory that postulates that individuals who are attachment avoidant attempt to regulate their distressing emotions by detaching from the source of distress in their environment and shutting down their attachment system, thus rendering the need to turn to food to cope unnecessary, it was predicted that increased attachment avoidance would not significantly predict changes in caloric consumption and or intake of carbohydrates, fat, sugar and sodium in stress under-eaters or stress-eaters.

In sum, stress has been shown to have a detrimental impact on health indirectly, through changes in health related behaviours such as food choice and intake. Stress has been associated with increased preference for highly palatable snack-type food options that are rich in sugar and fat (Oliver & Wardle, 1999; Zellner et al., 2006). Stress has also been associated with both hyperphagic and hypophagic responses (Wallis &

Hetherington, 2009). Moreover, attachment anxiety and avoidance have been associated with disordered and disinhibited eating behaviour (Koskina & Giovazolias, 2010; Wilkinson et al., 2010). Given the bidirectional relationship between stress and eating behaviour, we are interested in exploring the idiosyncratic influences that affect eating behaviour and food choices in two self-reported stress-eating groups: stress under-eaters and stress-eaters. Therefore, the aim of this study was to investigate how general daily stress and adult-attachment style influence eating behaviour and food choice in stress under-eaters and stress-eaters.

Changes in eating behaviour and food preference have been predominately explored in experimental settings (Heatherton et al., 1991; Herman, Polivy, Lank, & Heatherton, 1987; Klein et al., 1996; Levine & Marcus, 1997; Schotte et al., 1990) where variables are controlled and manipulated by the researcher. This study employed a field methodology to explore the changes in eating patterns that occur when people experience stress due to natural, daily living stressors. Participants tracked their food intake using an application (My Fitness Pal) on their smartphone. This new method of data collection allowed participants to record a wide variety of nutrients in their daily food journal quickly and

easily. It was anticipated that the convenience of this method of food journaling would increase the accuracy of food tracking, addressing a primary concern with regard to this type of methodology.

## **Method**

### **Participants**

One hundred and twenty-eight female undergraduate students volunteered to participate in this study. Participants were recruited through sign-up sheets posted in the Psychology department of the University. The initial 128 participants completed demographic and anthropometric questionnaires as well as a questionnaire relating to their typical and stress eating behaviour. All questionnaires were completed in person on campus. After completing the initial questionnaire nineteen participants' data was excluded due to previous diagnosis of anxiety disorder and/or depression, given that this study was focused on nonclinical populations and fifteen participants' data was excluded due to incomplete questionnaires. The remaining 94 participants completed 10 days of tracking their food intake, spread over the course of 10 weeks. Participants then completed a follow-up questionnaire online that consisted of questionnaires pertaining to their stress-eating style and their adult-attachment styles. Given that the aim of

this study is to explore the differences between stress under-eaters and stress-eaters, nine participants were removed due to their self-report of not altering their eating behaviour when stressed and 22 participants' data were excluded because their initial and follow-up self-reports of their stress-eating styles were not consistent. Lastly, five participants requested that they be removed from the study. The remaining 58 participants data were included in the analyses of this study.

## **Measures**

**Demographic & Anthropometric Questionnaire (Eycke, 2010).** The demographic questionnaire was designed by Dr. Michael Emond and Kayla Ten Eycke for a previous Master's thesis (Eycke, 2010) and asked participants to report their current age and sex. Participants were also weighed and measured for their height. These measurements were used to calculate BMI. Participants were asked to report if they had received a diagnosis of depression, anxiety or eating disorder, as well as if they were currently pregnant or nursing. These factors were also used as exclusion criteria as they were considered unrepresentative of the general nonclinical population. Given that the primary focus of this study was to explore the influence of stress and attachment style, an accepted restraint measure was not included in the methods. However, participants were asked to report

on their current dieting status. This question was used to measure dietary restraint, which entails restricting and/or controlling eating. Restrained eaters were identified as those who were currently dieting, whereas unrestrained eaters were those who were not dieting.

**Typical Eating and Stress Eating Questionnaire (Eycke, 2010).** The Typical Eating and Stress Eating questionnaire was designed by Dr. Michael Emond and Kayla Ten Ecyke as part of a prior Master's thesis. In this study the questionnaire was used to gather information regarding participants' typical eating preferences and behaviours as well as the way in which their eating patterns change when stressed. The questionnaire asked subjects to report on the ways in which they alter their eating behaviours when under stress compared to in a relaxed state with the following choices: a) slightly under-eat, b) under-eat, c) eat the same, d) slightly overeat, e) overeat. This question was used to determine participants' stress eating style. Participants who reported, "under-eat" or "slightly under-eat" when stressed were categorized as "stress under-eaters". Participants who reported, "over-eating" or "slightly over-eating" when stressed were categorized as "stress-eaters". Individuals who reported, "eat the same" were considered "neutral stress-eaters." This questionnaire has been tested in the laboratory to determine if self-reported stress under-eaters and stress-eaters consume fewer and more

calories, respectively, when under stress compared to in a relaxed state. The expected conclusions were validated for both groups (Emond, Stillar, Kosmerly, Robinson, & Van Blyderveen, 2014; Eycke, 2010). Intra-test reliability was tested for stress-eating style. Items "stress-eating style in general," "stress-eating style under chronic stress," and "stress-eating style under episodic stress" were all significantly correlated,  $r=.68$ ,  $p=.01$ . Test-retest reliability of the "stress-eating style in general" item was verified. Participants completed the item on two occasions, 10 weeks apart. Reliability for this item was tested using 80 participants, which included the 58 used in the study as well as the 22 participants' who's data were excluded from additional analyses because their initial and follow-up self-reports of their stress-eating styles were not consistent. Reliability for the item was .62. It is understood that the reliability of this measure is low.

**My Fitness Pal Food Diary.** The My Fitness Pal is an online food diary program that was used by participants to track their daily food intake via their mobile device. The My Fitness Pal application contains a database of over three million foods and recognizes brand names and restaurants. This application allowed individuals to input nutrient information multiple ways. For instance, participants could use the search function to input the name brand name of the food they had eaten (e.g. Source yogurt, McIntosh red apple, medium) and the application automatically provides

various search options. Additionally, for packaged food participants could use the camera function on their phone to scan the barcode from the food package. Participants could also search foods without labels or packaging such as celery or grapes and the application provides various options to choose from. Participants underwent a one-hour tutorial regarding how to download, set up, and use this application on their phone and the tutorial leader verified they were able to use the application accurately. This program is compatible with Apple, Blackberry, Windows, and Android devices and was free to use. The nutrient information from each food diary was automatically stored online in a password secure account. Total caloric intake was measured in calories. Carbohydrate, saturated fat, total fat, and sugar were measured in grams. Sodium was measured in milligrams.

**Stress Survey.** The survey was designed by the researcher to gather information on the individuals' stress level on the day that they tracked their food intake. The survey was comprised of several open-ended questions regarding daily functioning (e.g. wake time, hours of sleep, hours of exercise completed that day). The survey also contained three questions pertaining to the participants' 1) highest 2) current and 3) overall level of stress for the day. The three stress level questions were each rated on a 7-point Likert scale ranging from "very relaxed" to "very

stressed”. Stress scores ranged from zero to six. Participants were notified in the afternoon of the day before they were required to track their food intake via text message and email from the researcher; so all participants knew what the data collection days would be one day prior to the data collections days. Participants completed the stress survey online in the afternoon or evening of the day they tracked their food intake.

**Relationship Styles Questionnaire (RSQ; Griffin & Bartholomew, 1994).** The RSQ is a 30-item scale derived from Hazan and Shaver's (1987) attachment measure, Bartholomew and Horowitz's (1991) Relationship Questionnaire, and Collins and Read's (1990) Adult Attachment Scale. Participants are asked to indicate how best each statement describes their characteristic style in a particular relationship. Items are rated on a 5-point Likert scale from “not at all like me” to “very much like me”. The scale was administered to each participant three times, each time referring to a different relationship: 1) close relationships, 2) relationship with mother and 3) relationship with father. Attachment scores for each relationship were derived based on Hazan & Shaver (1987) three attachment styles: secure, avoidant, anxious. The average score of three statements contributed to the secure attachment score (items 3, 10, 15). Secure attachment scores range from one to five. The average of five statements contributed to the anxious attachment score (4, 11, 18, 21, 25).



Anxious attachment scores range from one to five. Avoidant attachment scores were derived from the average of four statements (1, 12, 24, 29) and could range from one to five.

## **Results**

### **Participant Characteristics**

The mean age of all participants was 20 years, ranging from 18-33 years.<sup>1</sup> Body Mass Index was calculated based on the Centers for Disease Control and Prevention BMI formula, using weight and height measurements that were taken by the researcher for each participant. Mean BMI was 25.14 (SD=4.32), ranging from 17.11-35.36. BMI categories established by the Centers for Disease Control and Prevention were followed for this study. Of all participants, 5.10% fell within the “under weight” range, 54.20% within the “normal weight” range, 27.10% within the “overweight” range, and 13.60% within the “obese” range. Twenty-two percent reported currently being on a diet while 78% were not currently restricting their food intake. Twenty-five participants (43%) self-identified as stress under-eaters and 33 participants (57%) self-identified as stress-eaters.

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<sup>1</sup> Analyses only included data points with a minimum of 700 calories. This estimate was used as to eliminate outliers due to possible inaccurate food tracking. Therefore, one data point was excluded for nine stress under-eaters and twenty-two stress-eaters. Their remaining nine data points were used in the analyses.

### **Stress under-eaters Compared to Stress-eaters.**

Independent samples t-tests were used to explore possible differences between stress under-eaters and stress-eaters with regard to stress level, BMI, and parental attachment scores. None of these variables were significantly different between the two groups. The mean stress level was 3.25 (SD=1.77) for stress under-eaters and was 3.39 (SD=1.66) for stress-eaters. Stress levels were not significantly different between stress under-eaters and stress-eaters,  $t(2,516)=-.89, p=.38$ .

The mean BMI for stress under-eaters was 24.08 (SD=3.98) and the mean BMI for stress-eaters was 25.68 (SD=4.37). According to the Centre for Control and Prevention BMI categories, 8.0% of stress under-eaters and 3.00% of stress-eaters were “under weight”; 68.0% of stress under-eaters and 45.50% of stress-eaters were “average weight”; 16% of stress under-eaters and 36.40% of stress-eaters and were “over weight”; 8% of stress under-eaters and 15.20% of stress-eaters were “obese”. There was no significant difference between BMI for stress under-eaters and stress-eaters  $t(2,56)=-1.44, p=.15$ .

The mean parental attachment scores were as follows: secure parent attachment was  $M=2.77$  (SD=.45) for stress under-eaters and  $M=2.96$  (SD=.40) for stress-eaters; anxious parent attachment for stress

under-eaters was  $M=1.48$  ( $SD=.35$ ) and was  $M=1.46$  ( $SD=.38$ ) for stress-eaters; avoidant parent attachment  $M=1.65$  ( $SD=.62$ ) for stress under-eaters and  $M=1.83$  ( $SD=.85$ ) for stress-eaters. There were no significant differences in secure parent attachment,  $t(2,55)=-.11$ ,  $p=.65$ , avoidant parent attachment,  $t(2,53)=-.82$   $p=.10$ , or anxious parent attachment,  $t(2,52)=.15$ ,  $p=.74$  between stress under-eaters and stress-eaters.

A chi-square analysis was used to explore possible differences between frequency of dieting in stress under-eaters and stress-eaters. Of participants who self-identified as stress under-eaters, 92.0% were not on a diet and 8.0% were currently dieting. Seventy-three percent of participants who self-identified as stress-eaters, were not on a diet, while 27.0% were currently dieting. The results indicated that there was no significant difference in frequency of dieting between stress under-eaters and stress-eaters,  $\chi^2(1, N=58) = 3.44$ ,  $p=.06$  N.S> but trending towards significance.

The mean daily caloric intake for stress under-eaters was 1379.31 calories ( $SD=391.93$ ) and 1471.59 calories ( $SD=499.11$ ) for stress-eaters. The daily nutrient intake for stress under-eaters was as follows: carbohydrate  $M=166.60g$  ( $SD=57.01$ ); fiber  $M=12.50g$  ( $SD=6.04$ ); total fat  $M=48.02g$  ( $SD=21.71$ ); sugar  $M=63.00g$  ( $SD=33.74$ ); sodium  $M=2008.10mg$  ( $942.64$ ). The daily nutrient intake for stress under-eaters

was as follows: carbohydrate M=188.56g (SD=77.71); fiber M=13.81g (SD=7.54); total fat M=49.50g (SD=24.58); sugar M=70.54g (SD=39.43); sodium M=2083.99mg (11.51.19).

### **Analysis of Stress Questions**

The three stress level questions relating to highest, current, and overall stress level for the day were submitted for a factor analysis of the principle component type with varimax rotation. One factor explained 80% of common variance. According to rotated codings the factor represented high ratings of overall stress (.92), highest level of stress (.91) and current stress level (.84). Since all stress variables loaded on one factor, the variable with the highest loading, overall stress, was used to represent “general stress level” for all subsequent analyses.

### **Influence of Stress and Attachment Style on Caloric Intake**

A linear mixed model was used to account for the nested data structure of several time points for each individual to obtain consistent and unbiased results. The final model predicting caloric intake for the stress under-eaters included stress level (continuous repeated measures variable rated on a 7-point Likert scale from very relaxed to very stressed) and parent attachment styles: secure, anxious and avoidant (continuous total scores

derived from the combined average scores of 3-5 items relating to relationship with mother and father for each attachment dimension). This model structure included fixed effects only<sup>2</sup> and omitted the time variable because the repeated time measurements were included in the study design to control for the potential of a participant tracking data on a day that was out of the ordinary (i.e. a particularly good or bad day).<sup>3</sup> This model structure was used for both stress under-eaters and stress-eaters across all dependent variables (caloric, total fat, saturated fat, sugar, carbohydrate and sodium intake). However, given that the objectives of this study were to examine the differential effects of stress and attachment style on food intake in stress under-eaters and over-eaters, analyses using the same model were conducted separately for each stress-eating style.

**Stress Under-Eaters.** There was a significant effect of stress level on total caloric intake, which indicated that as stress increased caloric consumption decreased,  $t(1, 179) = -2.14, p = .03$ . There was also a significant effect of secure attachment on total caloric intake,  $t(1, 179) = -2.74, p = .007$ .

Specifically, as secure attachment decreased caloric consumption increased. No effects of anxious or avoidant attachment styles were found

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<sup>2</sup> Random effects were not included into the model structure due to the limited sample size. See limitations for further discussion.

<sup>3</sup> Preliminary analyses were conducted with the time to ensure there was no significant effect of time on eating behaviour. Time was no a significant predictor for any of the dependent variables in this study.

for caloric intake. Therefore, general stress level and secure attachment were significant predictors of caloric intake in stress under-eaters. Stress under-eaters consumed fewer calories as they became more stressed. In contrast, the less securely attached stress under-eaters were the more calories they consumed (see Table 2 for predictor estimates).

**Stress-Eaters.** There was no significant effect of stress or secure, anxious or avoidant attachment style on total caloric intake in stress-eaters.

Therefore, neither stress nor attachment style could predict caloric consumption in stress-eaters (see Table 2 for predictor estimates). Overall, the eating behaviour of stress under-eaters was significantly predicted by stress level and secure attachment style, whereby increases in stress level led to decreases in food intake and decreases in secure attachment led to increases in food intake. In contrast, stress level and attachment style did not significantly predict food consumption for stress-eaters.

### **Influence of Stress and Attachment Style on Food Preferences**

**Stress Under-Eaters.** There was a significant effect of stress level on sodium and protein intake, which indicated that as stress increased consumption of sodium decreased,  $t(1, 179) = -2.50, p = .01$  and consumption of protein decreased  $t(1, 179) = -2.16, p < .05$  (see Table 2 for

predictor estimates). There was no significant effect of stress on total fat, sugar, carbohydrate or fiber intake. Secure attachment was a significant predictor of sodium, carbohydrate, protein and fiber intake in stress under-eaters. As secure attachment decreased sodium,  $t(1, 282) = -3.15, p < .05$ , carbohydrate,  $t(1, 179) = -3.16, p < .05$ , protein,  $t(1, 179) = -4.48, p < .001$ , and fiber intake all increased  $t(1, 179) = -3.96, p < .001$  (see Table 2 for predictor estimates). There was no significant effect of secure attachment on fat or sugar intake. There was a significant effect of avoidant attachment style on fiber intake, indicating that as avoidant attachment increased consumption of fiber increased as well,  $t(1, 179) = -2.21, p < .05$  (see Table 2 for predictor estimates). There was no significant effect of avoidant attachment on carbohydrate, fat, sugar, sodium or protein intake. There was no significant effect of anxious attachment style on any nutrient consumption in stress under-eaters.

Therefore, in stress under-eaters, stress level and secure attachment style were significant predictors of sodium and protein intake. As stress level increased, consumption of sodium decreased. Increases in stress also predicted decreased in protein intake. In contrast, as secure attachment decreased, consumption of sodium increased. Secure attachment style was also a significant predictor of carbohydrate, protein and fiber intake. Analogous to the relationship with sodium, as secure attachment decreased

consumption of carbohydrates, protein and fiber increased as well. Increases in avoidant attachment predicted increases in fiber intake (see Table 2 for predictor estimates). Anxious attachment style did not significantly predict any nutrient consumption in stress under-eaters.

**Stress-Eaters.** There was no effect of stress level on any nutrient consumption in stress-eaters. There was a significant effect of avoidant attachment style on carbohydrates,  $t(1,282) = 2.38, p < .05$ , sugar,  $t(1,282) = 2.45, p < .05$ , and fiber intake,  $t(1,282) = 5.64, p < .001$  (see Table 2 for predictor estimates). As avoidant attachment style increased consumption of carbohydrates, sugar and fiber increased. Anxious attachment was also a significant predictor of fiber intake in stress-eaters,  $t(1, 282) = -4.00, p < .001$  (see Table 2 for predictor estimates). As anxious attachment to parents increased, consumption of fiber decreased. Secure attachment style was a significant predictor of sodium intake, whereby as secure attachment increased intake of sodium increased as well,  $t(1282) = 1.90, p < .05$  (see Table 2 for predictor estimates).

Therefore, stress level did not significantly impact eating preference in stress-eaters. However, avoidant attachment style was a significant predictor of carbohydrate, sugar and fiber intake in stress-eaters. The more attachment avoidant stress-eaters were the more



carbohydrates, sugar, and fiber they consumed. In contrast, the more anxiously attachment stress-eaters were the more fiber they consumed. Lastly, the more securely attachment participants were the more sodium they consumed (see Table 2 for predictor estimates).

Overall, the results indicated that changes in preferences for sodium and protein consumption were significantly predicted by stress level in stress under-eaters. However stress level did not significantly affect any food preferences in stress-eaters. In stress under-eaters increases in secure attachment style predicted decreased preference for carbohydrates, sodium, protein and fiber. However, secure attachment had the opposite effect in stress-eaters, and only affected preference for sodium. Increases in avoidant attachment style predicted increased preference for carbohydrates, sugar and fiber in stress-eaters. In stress under-eaters increases avoidant attachment only increased preference for fiber. Lastly, as stress-eaters became more anxiously attached their preference for fiber decreased. Anxious attachment style did not significantly affect food preferences in stress under-eaters.

## Discussion

The findings suggest that different psychological factors influence eating behaviour and food preference in stress under-eaters and stress-eaters and that these factors alter food intake and choice differently for each group. Specifically, stress level and secure attachment style predicted the eating behaviour of stress under-eaters. However, these two factors showed opposite effects on eating behaviour. Increased stress caused a hypophagic response whereas decreased attachment security caused a hyperphagic response. In contrast, the eating behaviour of stress-eaters could not be predicted by stress level or attachment style.

The food preferences of stress under-eaters were also predicted by stress and secure attachment style. Again, these factors led to opposite reactions. Increased stress level led to decreased consumption of sodium and protein, whereas decreased attachment security led to increased sodium and protein intake. Decreased attachment security also led to increased consumption of carbohydrates and fiber. This result is particularly interesting as it highlights the differential effects of perceived daily stress and attachment stress on eating behaviour and food preference measured in the same individual, something that, to our knowledge has not be done before.

The food preferences of stress-eaters were not predicted by stress level but were predicted by the avoidant attachment domain. As stress-eaters became more attachment avoidant they consumed more carbohydrates, sugar, and fiber. Therefore, from the results of this study it appears that unique psychological factors affect the eating behaviour and food preference of these two groups. The eating behaviour and food preferences of stress under-eaters are affected by both stress level and attachment style, whereas the food preferences of stress-eaters appear to be predominately affected by attachment.

These findings suggest that stress under-eaters and stress-eaters are in fact two distinct groups of individuals whose eating behaviour and food preferences are affected differently, by different factors. Specifically, stress level influences the eating behaviour of stress under-eaters but not stress-eaters. It appears that although individuals perceive that they increase their food consumption when stressed (as they self-identify as stress-eaters), their eating behaviour is in fact not significantly influenced by stress level. However, when individuals report that they decrease their food intake when stressed (self-identify as stress under-eaters), stress does appear to be a significant factor in said eating response. This is an important distinction that further characterizes the unique differences of

these two groups. This finding also suggests that the eating patterns of stress-eaters are more vulnerable to changes in attachment style rather than daily life stressors.

An additional outcome that further characterizes these two groups is the finding that each groups' eating patterns were influenced by different attachment domains. More specifically, the secure attachment domain predicted changes in the eating patterns of stress under-eaters whereas the changes in eating patterns of stress-eaters were predominately influenced by the avoidant attachment domain. Given that the mean scores for secure and avoidant attachment styles were not significantly different between groups, the differential impact of attachment styles on eating behaviour for each of these groups may suggest that stress under-eaters are more susceptible to changes in attachment security whereas stress-eaters may be more vulnerable to changes in attachment avoidance. This suggests that different psychological processes underlie eating behaviour in these two groups. These findings not only help to elucidate the idiosyncratic differences between these two groups but also provide novel possibilities to explain the variance in their eating responses when stressed. In particular, these results underscore the unique influences of different attachment styles on eating behaviour and food preference for

different groups of individuals. Teasing apart the influences of attachment style on eating patterns helps to further understand the complex relationship between stress and eating and may provide valuable information regarding targets for obesity and disordered eating interventions. Therefore, this result highlights another valuable distinction between the stress-related food preferences of these two groups and provides information that may help us to further understand the differential underlying factors that lead to variant changes in eating patterns in different individuals.

For instance, the interaction between attachment and disinhibited behaviours can be explained in terms of affect regulation (see Maunder & Hunter, 2001 for a review). It is generally understood that Attachment theory provides a framework for explaining how individuals use various coping strategies to manage stress (Fleming, & Gamble, 1993; Kobak, Holland, Ferenz-Gillies; Mikulincer, Florian, & Tolmacz, 1990). An individual's coping strategy depends on their attachment style (see Mikulincer, 1998 for a review). It is commonly understood that individuals with insecure attachment styles possess poorer internal capacity to regulate affect and therefore turn to external resources to cope with stress. For example, when stressed, individuals with secure

attachment seek comfort through proximity to a secure base in order to help regulate their feelings of distress. Therefore they typically do not rely on external strategies such as food or alcohol to cope (Mikulincer & Florian, 1998).

Alternatively, individuals who are insecurely attached do not have a secure base from which to help regulate affect. The absence of this resource leads to hyperactivation of their attachment system and causes environmental cues of stress to become overwhelming. This pattern creates the need to turn to external methods such as food and alcohol consumption to dampen and cope with the distressful experience (Maunder & Hunter, 2001). The results from this study are congruent with these explanations of attachment theory, in that, individuals who were less securely attached were more likely to regulate their stress by using positive external stimuli such as increased total food consumption and heightened preference for highly palatable, carbohydrate and sodium rich foods.

In this study, attachment style was the most predominate predictor of eating behaviour and food preference in both stress-eating groups. As previously stated, different attachment domains affected the two groups. The results also demonstrated that these attachment styles also affected

unique nutrients for each group. Changes in attachment security led to changes in preferences for carbohydrates, sodium, protein and fiber in stress under-eaters but only led to changes in sodium preference for stress-eaters. Highlighting again that the food preferences of stress under-eaters appear to be more susceptible to changes in attachment security than stress-eaters. In addition, changes in attachment security caused the opposite effect in stress under-eaters and stress-eaters. Decreased attachment security led to increased preference for foods rich in carbohydrates, sodium, protein and fiber for stress under-eaters and decreased preference for sodium in stress-eaters. As explained by Mikulincer & Florian, 1998, individuals with low attachment security tend to rely on external factors to regulate affect. Perhaps then, stress under-eaters alter food preferences as a means to cope with attachment insecurity, increasing their intake of overall consumption as well as highly palatable food options as a means to sooth distresses experienced from decreased attachment security. Wilkinson et al. (2010) demonstrated similar findings with regard to attachment anxiety.

Alternatively, the food preferences of stress-eaters were particularly sensitive to changes in attachment avoidance. Parenting that is intolerant to a child's affective experiences or unresponsive to a child's

needs predisposes a child to avoidant attachment style. Through this process of interacting the child learns that their needs will not be met and therefore disengages in attachment seeking behaviours (e.g. crying, seeking closeness) (Maunder & Hunter, 2001). Adult individuals with avoidant attachment style may therefore attempt to satiate their attachment needs through different behaviours, such as increased consumption of palatable food. In this study, increased attachment avoidance led to increased consumption of carbohydrates, sugar and fiber rich foods for stress-eaters, whereas only a change in fiber preferences occurred for stress under-eaters. This finding is congruent with the results from Bryony (2009) who demonstrated that avoidant attachment was associated eating disorder pathology. Furthermore, a primary function of the eating disorder can be understood as a means to manage and avoid painful or wanted emotions (Cockell et al., 2002; Treasure et al., 2000). Therefore it may be possible that disordered eating in non-clinical populations may also serve to manage unmet attachment and emotional needs.

Overall, these findings underscore the idiosyncratic differences in the stress-related food preferences of stress under-eaters and stress-eaters, which may be helpful in developing a clearer picture of distinct eating profiles for these two groups. These results also highlight the impacts of



unique attachment-styles for each group. This information may be helpful in further understanding some of the underlying psychological factors that drive changes in food preferences when stressed, information which may be valuable for improving future interventions.

Long-term effects of disinhibited eating can lead to serious health problems such as obesity, hypertension, ulcers (Quick et al., 1997). Therefore, understanding that attachment style plays at least some role in eating changes for stress under-eaters and eaters alike, may provide useful information to researchers and professionals alike who may find is valuable to increase efforts toward addressing the unmet needs that are represented by the anxious attachment style in this group of individuals rather than encouraging the development of more pro-health but equally as maladaptive coping strategies such as increased exercise. Interventions targeted toward improving self-efficacy with emotion may help these individuals develop internal self-regulation skills, thereby eliminating the need to rely on increased consumption and preference for highly palatable food options to cope. In the long term, these changes may lead to decreases in future health problems that are of concern in this field.

Overall, this research adds to the paucity of research regarding the role of attachment style in the eating behaviour and food preferences of

nonclinical populations. This research also identifies some of the idiosyncratic differences between the novel groups of stress under-eaters and stress-eaters. Findings from this study highlight the role of attachment in disordered eating behaviour and provide valuable information that may help delineate novel aspects of some of the underlying psychological factors that contribute to eating behaviour and how they uniquely influence eating in different individuals. From a theoretical standpoint, this information can be helpful in developing a more comprehensive understanding of disordered eating. These findings also have useful practical application, as this information on attachment can be integrated into models of disordered eating to identify individual vulnerability to disordered eating and potentially important targets for interventions.

### **Limitations and Future Research**

The number of participants limited this study. For example, as a result of the limited sample size, only fixed effects were investigated (time variable was omitted from set of predictors). Therefore, only changes between groups were examined. However, future research should explore the possibility of both fixed and random effects to develop a more comprehensive understanding of changes between groups and within individuals.

This research also only involved female participants. Although research does indicate that women are at an increased risk for disordered eating than men (Golden et al., 2003), the rate of eating disorders in males is on the rise (Hill, 2004; Hudson et al., 2007). Additionally, obesity is more prevalent in adult males than females, 62.0% versus 45.1% in 2013 (Statistics Canada, 2013) and has been such for the past five years (Statistics Canada, 2013). Therefore disordered eating in men is also concerning and should be explored in future research as well.

Table 1.

*Means and standard deviations of participant characteristics, predictor variables: stress level and attachment style, and dependent variables: total caloric, carbohydrate, fat, saturated fat, sugar and sodium intake for stress under-eaters and stress-eaters*

		Stress		Stress-Eaters	
		Under-Eaters			
		M	SD	M	SD
Participant	BMI	24.08	3.98	25.68	4.37
Characteristics	Age	20.28	3.11	19.87	1.61

	Stress Level	3.25	1.77	3.39	1.66
Predictor	Secure	5.42	.90	5.38	.80
	Attachment				
Variables	Anxious	2.86	.72	2.81	.87
	Attachment				
	Avoidant	3.24	1.20	3.65	1.69
	Attachment				
	Caloric Intake	1379.31	391.93	1471.59	499.11
Dependent	Carbohydrate	166.60	57.01	188.56	77.71
Variables	Fiber	12.50	6.04	13.81	7.54
	Total Fat	48.02	21.71	49.50	24.58
	Sugar	63.00	33.74	70.54	39.43
	Sodium	2008.10	942.63	2083.99	1151.19

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**Note:** Stress level ranges from 0-6. Secure attachment scores range from 2-10; anxious attachment scores range from 2-10; avoidant attachment scores range from 2-8. Nutrient intake measured in grams, except sodium, which was measured in milligrams.

Table 2.

*Regression coefficients, standard errors and t-values for fixed effects of stress level and attachment style on total caloric, carbohydrate, fiber, fat, sugar and sodium and protein intake for stress under-eaters and stress-eaters*

	Variable	Stress Under-Eaters			Stress-Eaters		
		Estimate	Std. Error	<i>t</i>	Estimate	Std. Error	<i>t</i>
Caloric Intake	Stress Level	-37.32	16.25	-2.30*	-10.12	18.02	-.56
	Secure Attachment	-170.28	62.23	-2.74*	29.57	77.82	.38
	Anxious Attachment	40.77	82.87	.49	-3.01	91.87	-0.03
	Avoidant Attachment	6.93	50.17	.14	39.95	42.60	.94
Carbohydrate Intake	Stress Level	-4.05	2.29	-1.77	-.25	2.75	-.09
	Secure Attachment	-27.73	8.78	-3.16*	7.23	11.88	.61
	Anxious Attachment	10.96	11.70	.94	-13.23	14.03	-.94
	Avoidant Attachment	2.37	7.08	.33	15.51	6.51	2.38*
Fiber Intake	Stress Level	-.16	.25	-.65	-.22	.26	-.87
	Secure Attachment	-3.76	.95	-3.96**	-.71	1.11	-.65
	Anxious Attachment	-.18	1.27	-.14	-5.23	1.31	-4.00**
	Avoidant Attachment	1.69	.77	2.21*	3.42	.60	5.64**
Fat Intake	Stress Level	-1.29	.90	-1.43	-.13	.91	-.15
	Secure Attachment	1.90	3.45	.55	-1.45	3.91	-.37
	Anxious Attachment	6.24	4.60	1.36	3.78	4.62	.82
	Avoidant Attachment						

	Avoidant Attachment	.55	2.78	.20	-2.58	2.14	-1.20
Sugar Intake	Stress Level Secure Attachment	-1.34	1.26	-1.07	1.84	1.42	1.30
	Anxious Attachment	-7.88	4.82	-1.64	5.20	6.13	.85
	Avoidant Attachment	7.90	6.41	1.23	-1.12	7.24	-1.56
	Stress Level Secure Attachment	5.63	3.88	1.45	8.22	3.36	2.45*
Sodium Intake	Stress Level Secure Attachment	-95.52	38.15	-2.50*	-47.53	40.95	-1.16
	Anxious Attachment	-459.53	146.07	-3.15*	336.26	176.80	1.90*
	Avoidant Attachment	252.12	194.59	-1.30	-159.08	208.69	-.76
	Stress Level Secure Attachment	-165.14	117.76	-1.40	-29.17	96.78	-.30
Protein Intake	Stress Level Secure Attachment	-2.14	.99	-2.16*	-.44	.96	-1.49
	Anxious Attachment	-16.99	3.79	-4.48*	-4.14	4.16	-.99
	Avoidant Attachment	-1.46	5.04	-.29	-7.01	4.91	-1.43
	Stress Level Secure Attachment	-2.96	3.06	-.97	2.88	2.28	1.26

Note: \* $p \leq .05$ , \*\* $p \leq .001$

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## CHAPTER FOUR

### Discussion

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## **Discussion**

The overall purpose of this research was to examine the relationship between stress and eating. This was done through two research studies which investigated stress-eating patterns in general, as well as in two novel stress-eating groups: stress under-eaters and stress-eaters. The survey study examined the typical and stress-related eating habits of 155 undergraduate students. The aim of this study was to explore the stress-related eating patterns in non-clinical populations through investigation of novel aspects of eating habits such as flavour preferences, food-type preferences and food preparation preferences. The goal of the second study was to examine the influences of stress level and adult-attachment style on eating behaviour and food preferences in self-reported stress under-eaters and stress-eaters. The second study was a field study that employed a quasi-experimental design. Participants included 58 female university students. Participants tracked their food intake one day per week for ten weeks using a food journal application on their smartphone. This methodology adds a unique contribution to the literature, as it has yet, to our knowledge, been used before to track food intake for research purposes.

Overall the findings from this research revealed that specific

factors influence eating patterns in general as well as uniquely impact eating habits in stress under-eaters and stress-eaters. This research demonstrated that the vast majority of individuals alter their eating behaviour and food preferences in response to daily life stressors. This finding was consistent when explored in general as well as when examined specifically in stress under-eaters and stress-eaters.

In terms of stress-eating behaviour in general, the survey study supports past research (e.g. Kandiah, Yake, Meyer, & Jones, 2006; Kandiah, Yake, & Willet, 2008; Zellner et al., 2006), which demonstrates that stress is associated with unhealthy changes in eating behaviour and food preferences. Analogous with findings from Wardle, Steptoe, Oliver, and Lipsey (2000) and Zellner et al. (2006) it was shown that preferences for highly palatable (e.g. salty) foods were heightened when stressed and that preferences for less palatable (e.g. bitter) foods were diminished. Additionally, stress was associated with unhealthier eating habits. For example, increased frequency of snacking occurred when stress was experienced as well as increased selection of take-out food options.

Findings from this study also provided preliminary evidence that gender may play a significant role in terms of stress-eating responses. When exposed to stress, women appeared more prone to alter certain

eating patterns than men. In this study, 90% of women altered their eating behaviour when experiencing stress. In contrast, only 51.9% of men changed their amount of food consumption when stressed. Moreover, women were more likely than men to lose control over eating when stressed. When exposed to stress women also showed a greater preference for snacking. These results are similar to findings by Wansink, Cheney and Chan (2003), which established a gender trend for food preference under stress through a survey study. Their findings indicated that females showed a preference for highly palatable, snack-type foods, such as ice cream, chocolate and candy, whereas males showed a preference for nutrient dense, meal-type foods, such as pasta, steak and casserole. These findings are noteworthy given the high prevalence of stress (Statistics Canada, 2013a) and eating related conditions (e.g. Eating Disorders, Obesity) experienced by women (Golden et al., 2013). However, the male sample used in this study was limited, therefore these findings should be corroborated by additional studies.

Results from the experimental study demonstrated that different factors predicted the eating behaviour and food preferences of stress under-eaters and stress-eaters. For instance, stress was a significant predictor of eating behaviour for stress under-eaters, causing decreased

consumption, but was not a significant predictor of eating behaviour in stress-eaters. Furthermore, stress level predicted preference of sodium and protein in stress under-eaters but did not predict any food preference in stress-eaters. These results also highlight both interesting and novel differences between what appear to be two distinct stress-eating groups and suggest that the eating patterns of stress under-eaters are more susceptible to stress than stress-eaters. These findings also suggest the possibility that additional underlying factors may be impacting eating behaviour, particularly in stress-eaters.

It was found that attachment style was a significant predictor of eating behaviour and food preference in both stress under-eaters and stress-eaters. Unique attachment styles impacted the two stress-eating groups. Stress under-eaters were more susceptible to changes in secure attachment style, whereas stress-eaters were more vulnerable to changes in avoidant attachment style. However, despite these differences, as each attachment style approach the more extreme end of the spectrum, both groups increased their consumption of specific nutrients. For instance, as secure attachment decreased, the overall consumption of calories as well as intake of carbohydrates, sodium, protein and fiber of stress under-eaters increased. As attachment avoidance increased, stress-eaters consumed more carbohydrates, sugar and fiber. It is posited that individuals with low

attachment security regulate emotions through reliance on external factors (Mikulincer & Florian, 1998). Stress under-eaters may therefore increase their overall food intake and preference for highly palatable food options as a means to cope with the distress their experience due to low attachment security. Similarly, stress-eaters, who appear more susceptible to changes in attachment avoidance, may also increase their preference for highly palatable foods as a means to cope with their experiences of increased attachment avoidance. These findings not only help depict the unique nutrient profile of each group, but also highlight the potential that different underlying psychological processes occur in each group. This information adds knowledge to our understanding of the relationship between attachment and eating, which can be helpful for improving interventions.

Furthermore in stress under-eaters, attachment style had the opposite effect on eating than stress level. When stress under-eaters experienced stressed, consumption of calories as well as sodium and protein intake decreased. However, as secure attachment style became less secure, stress under-eaters increased their total caloric consumption and intake of carbohydrates, sodium, protein, and fiber. These findings suggest that daily life stressors and attachment style cause opposing reactions in terms of both eating behaviour and food preferences in stress under-eaters.

Collectively, these findings support past research that stress is associated with unhealthier eating patterns (e.g. Kandiah et al., 2008; Wansink et al., 2003; Kandiah et al., 2001; Zellner et al., 2006). These results also provide novel information regarding stress-related preferences for take-out food options and suggest that gender may uniquely impact certain stress-eating habits in general. Moreover, this research highlights the potential that stress under-eaters and stress-eaters are in fact two distinct groups, each with unique psychological factors involved in their relationship with food.

Recently researchers and practitioners have identified that individuals with eating disorders have significant deficits in emotion regulation skills (Brockmeyer, et al., 2013) and have begun to understand the eating disorder is relied upon as a means to cope with emotions (Cockell, Geller, & Linden, 2002; Treasure, Schmidt, & Troop, 2000). Identifying that attachment also plays a role in eating behaviour in non-clinical populations is important for understanding and helping individuals who struggle with food in the general public. Therefore, this research adds to the limited pool of research regarding the impact of attachment on eating (Bryony and Halliwell, 2009; Koskina and Giovazolias, 2010; Troisi and Gabriel, 2014; Wilkinson et al., 2010).



In the literature, BMI gender and dietary restraint are the individual differences that have received the most attention in this field. However, the findings from this research further support the notion that additional psychological factors impact eating behaviours. As such, this study helps to open the door to exploring additional psychological factors that may be involved in disordered eating. Future research should continue to explore the possible implications that attachment and emotion regulation may have on eating behaviour in non-clinical populations. In a society where stress (Statistics Canada, 2014) and eating difficulties (Statistics Canada, 2013a; Statistics Canada 2013b) are highly prevalent in the general population, this avenue of research is worthy of attention.

In sum, this research highlights the role of attachment in increasing an individuals' susceptibility to disordered eating. In particular, this study provides information on attachment that may be valuably integrated into models of disordered eating and may also be helpful in developing a more comprehensive understanding of disordered eating. By integrating the influence of attachment into models of disordered eating it may be possible to identify individual vulnerability to disordered eating as well as to highlight potentially useful targets for interventions.

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87, 789-793.

## APPENDIX A. Participation Consent Form



**Laurentian University**  
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### CONSENT FORM

**Study Title:** The Effects of Stress on Eating Behaviour and Food Choice in Self-Reported Stress-eaters and Non-eaters.

**Investigators:** Amanda Stillar, Dr. Michael Emond

I am a Graduate Psychology student at Laurentian University investigating the effects of stress on the eating behaviour and food choice. With your consent, you are agreeing to participate in an experimental study on stress and eating. Over the course of 10 weeks you will be asked once a week to track your food intake for the entire day using My Fitness Pal Application. You will also be asked to fill out a self-report questionnaire regarding your stress that day. Prior to commencing the study you will be asked to meet with myself, where you will undergo a tutorial regarding the proper use of the email account and My Fitness Pal account that are required for this study. These accounts will be set up for you by the researcher and will be used for the duration of the study as the method of receiving and sending the questionnaires from/to the researcher. Both of these accounts are free and will be safe guarded by a username and password that will remain confidential knowledge of myself and yourself. In order to participate in this study you must have a portable electronic device capable of sending and receiving email (iphone, android, blackberry, ipad, ipod touch with 3G).

The goal of this study is to gather information on the relationship between stress and eating. This information could be applied to policy and treatment on eating disorders and stress, and could be used to further research in this area. This could be achieved through academic publication. If you are willing to participate in this study please sign this consent form.



There is also a second copy for you to keep for your records. This form contains valuable information on how to contact the researcher (myself), the research ethics officer, stress management resources, and eating disorder resources if at any time you have questions or concerns or if at any time you begin to feel uncomfortable or distressed. You have the right to withdrawal your participation from this study at any time without consequence or repercussions. Please inform the researcher if at any time you wish to withdraw from the study.

To ensure anonymity your name will not be kept on any of the data; a participant number will be the only identifier. Your identity will not be associated with your data or revealed at any time. Your data will be kept online in a secured email account, the username and password will be kept in a locked filing cabinet in Dr. Emond's office for eight years where no one other than the researchers will have access to it.

You should know that identifying your behavioural eating responses might cause some anxiety. Risks in this part of the study include (but are not limited to) sensitivity surrounding eating behaviour, stress or negative emotions due to thoughts and memories of eating behaviours, body conditions and stress.

A copy of the final results can be obtained directly from me. If you have any questions or concerns about the study or about being a subject, you can call Dr. Michael Emond (705) 675-1151, ext. 4246 for more information. You may also contact Jean Dragon in the Research Office at (705) 675-1151, ext. 3213 for information on Laurentian University research policy and procedures or if you would like to speak with an official unaffiliated with the research team regarding possible ethical issues or complaints about the research itself. For information on stress or eating disorders, you may contact Laurentian University Counseling Services (705-673-6506), the Sudbury Regional Hospital Eating Disorders Clinic (705-523-4988) or Sudbury Health Unit (705-522-9200).

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I agree to participate in this study, and I have read and received a copy of this consent form.

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Subject's Signature

-----

Date

APPENDIX B. Laurentian University Research Ethics Board Approval

Certificate



**Laurentian University**  
**Université Laurentienne**

**APPROVAL FOR CONDUCTING RESEARCH INVOLVING HUMAN  
SUBJECTS**

Research Ethics Board – Laurentian University

This letter confirms that the research project identified below has successfully passed the ethics review by the Laurentian University Research Ethics Board (REB). Your ethics approval date, other milestone dates, and any special conditions for your project are indicated below.

TYPE OF APPROVAL / New X / Modifications to project / Time extension	
<b>Name of Principal Investigator and school/department</b>	Amanda Stillar
<b>Title of Project</b>	<i>The Effects of Stress on Eating Behaviour and Food Choice in Self-Reported Stress-eaters and Non-eaters.</i>
<b>REB file number</b>	2012-06-07
<b>Date of original approval of project</b>	August 7, 2012
<b>Date of approval of project modifications or extension (if applicable)</b>	

<b>Final/Interim report due on</b>	August 7, 2013
<b>Conditions placed on project</b>	Final report due on August 7, 2013

During the course of your research, no deviations from, or changes to, the protocol, recruitment or consent forms may be initiated without prior written approval from the REB. If you wish to modify your research project, please refer to the Research Ethics website to complete the appropriate [REB form](#).

All projects must submit a report to REB at least once per year. If involvement with human participants continues for longer than one year (e.g. you have not completed the objectives of the study and have not yet terminated contact with the participants, except for feedback of final results to participants), you must request an extension using the appropriate [REB form](#).

In all cases, please ensure that your research complies with [Tri-Council Policy Statement \(TCPS\)](#). Also please quote your REB file number on all future correspondence with the REB office.

Congratulations and best of luck in conducting your research.



Susan James, Acting chair

Laurentian University Research Ethics Board

APPENDIX C. Demographic and Anthropometric Questionnaire

**Demographic Questionnaire**

1. Participant Number \_\_\_\_\_
2. Gender:  Male  Female
3. Age \_\_\_\_\_
4. Height (ft, in) \_\_\_\_\_
5. Weight (lbs) \_\_\_\_\_
6. Hip (cm) \_\_\_\_\_
7. Waist (cm) \_\_\_\_\_
8. What time do you typically wake up today? \_\_\_\_\_
9. Approximately how many hours of sleep did you typically get a night? \_\_\_\_\_
10. Are you pregnant or nursing?  Yes  No
11. Have you ever been diagnosed with anxiety disorder?  Yes  No
12. Have you ever been diagnosed with depression?  
 Yes  No
13. Have you ever been diagnosed with or received treatment for an eating problem (such as anorexia or bulimia)? (Check one)  
 Yes  No
14. Are you someone who experiences a lot of daily stress?  Yes  No

## APPENDIX D. The Typical and Stress Eating Questionnaire

1. Typically, do you:

- Eat until you are full
- Eat until you are finished (after you are full)
- Remain hungry after eating

2. Typically, which do you do most often?

- Prepare your own food
- Have someone else prepare food for you
- Order in
- Eat out

3. How many hours, on average, do you exercise per week?

\_\_\_\_\_

4. Are you currently dieting?  Yes  No

If “yes”, please provide a brief description of the diet:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

5. How long have you been on this diet? \_\_\_\_\_ (days)

6. In the past five years, how many times have you gone on a diet that has lasted longer than two weeks?

\_\_\_\_\_

7. In the past five years, how many times have you gone on a diet that has lasted less than two weeks?

\_\_\_\_\_

8. a) When on a diet, do you ever find yourself “cheating” or eating liberally?

- Yes  No

b) If “yes”, please indicate why?

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9. Are you vegetarian?  Yes  No

10. Are you vegan?  Yes  No

11. a) Do you follow any other sort of restricted diet? (e.g., for religious reasons, lactose intolerance, etc.)  Yes  No

b) If yes, please describe:

---

---

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---

12. 17. List your five **favourite snacks** in order of preference (starting with your favourite).

13. Please be specific (i.e. flavour or toppings).

1st \_\_\_\_\_  
2nd \_\_\_\_\_  
3rd \_\_\_\_\_  
4th \_\_\_\_\_  
5th \_\_\_\_\_

14. List the five **most common snacks** that you eat (starting with the most common).

Please be specific (i.e. flavour or toppings).

1st \_\_\_\_\_  
2nd \_\_\_\_\_  
3rd \_\_\_\_\_  
4th \_\_\_\_\_  
5th \_\_\_\_\_

15. List your five **favourite meals** in order of preference (starting with your favourite). Please be specific (i.e. flavour or toppings).

1st \_\_\_\_\_

2nd \_\_\_\_\_  
3rd \_\_\_\_\_  
4th \_\_\_\_\_  
5th \_\_\_\_\_

16. List the five **most common meals** that you eat (starting with the most common).

Please be specific (i.e. flavour or toppings).

1st \_\_\_\_\_  
2nd \_\_\_\_\_  
3rd \_\_\_\_\_  
4th \_\_\_\_\_  
5th \_\_\_\_\_

17. List your five **favourite drinks** in order of preference (starting with your favourite).

Please be specific (i.e. flavour or toppings)

1st \_\_\_\_\_  
2nd \_\_\_\_\_  
3rd \_\_\_\_\_  
4th \_\_\_\_\_  
5th \_\_\_\_\_

18. List the five **most common drinks** that you drink (starting with the most common).

Please be specific (i.e. flavour or toppings).

1st \_\_\_\_\_  
2nd \_\_\_\_\_  
3rd \_\_\_\_\_  
4th \_\_\_\_\_  
5th \_\_\_\_\_

19. Please list all the foods and drinks that you typically avoid.

_____	_____
_____	_____
_____	_____
_____	_____



20. Why do you avoid these foods and drinks?

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---

---

21. What are the characteristics of the foods you typically eat? (Check all that apply)

a) Taste:

Sweet  Sour  Bitter  Bland  Salty  Savory

b) Size:

Small or bite-size  Large or requiring biting

c) Type:

Snack-type  Meal-type

22. When you eat, do you feel full afterwards?

Yes  No

23. Would you consider yourself someone who overeats at times?  
(Check one)

Never  
 Rarely  
 Sometimes  
 Often  
 Very Often

24. When you eat, do you lose control over your eating?

Yes  No

25. If yes, please indicate on average how many times you lose control over your eating in a 30 day span

26. \_\_\_\_\_ times in 30 days

27. If “Yes”, please list any foods that you lose control over.

---

---

28. Describe what causes you to lose control over your eating

---

---

29. Describe what causes you to stop eating

---

*DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then check the appropriate box to the right of the statement to indicate how you **generally feel**. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you **generally feel**.*

	1 NOT AT ALL		2 SOMEWHAT		3 MODERATELY SO		4 VERY MUCH SO
I feel pleasant.....	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
I feel nervous and restless.....	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
I feel satisfied with myself.....	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
I wish I could be as happy as others seem to be.....	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
I feel like a failure.....	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
I feel rested.....	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
I am "calm, cool, and collected".....	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
I feel that difficulties are piling up so that I cannot overcome them .....	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
I worry too much over something that doesn't really matter .....	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
0. I am happy.....	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
1. I have disturbing thoughts.....	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
2. I lack self-confidence.....	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
3. I feel secure.....	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>

- 4. I make decisions easily.....
- 5. I feel inadequate.....
- 6. I am content.....
- 7. Some unimportant thought runs through my mind and bothers me  
.....
- 8. I take disappointments so keenly that I can't put them out of my mind  
.....
- 9. I am a steady person.....
- 10. I get in a state of tension or turmoil as I think over my recent concerns  
and interests .....

*When people are in a state of stress, changes in their eating habits and food preferences may occur. The following questions concern your eating behaviour under stress. Please take a moment to reflect on the types and quantities of foods you eat in various stressful situations.*

34. In general, which describes your eating behaviour under stress compared to a relaxed state? (Check one)

- Undereat
- Slightly undereat
- Eat the same
- Slightly overeat
- Overeat

35. Why do you think you do so?

---

---

36. Does eating alleviate your stress?  Yes  No

37. Which describes your eating behaviour under chronic, long-term stress?  
(Check one)

- |                          |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Undereat                 | Slightly undereat        | Eat the same             | Slightly overeat         | Overeat                  |

38. Which describes your eating behaviour under stress caused by a specific episode or event? (Check one)

- |                          |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Undereat                 | Slightly undereat        | Eat the same             | Slightly overeat         | Overeat                  |

39. If you overeat when stressed, why do you think you do so (Check one)?

- As a distraction
- To ease your stomach
- You feel you deserve a treat
- You are too busy to focus on eating healthy
- Impulses

Other:

---

40. If you under eat when stressed, why do you think you do so (Check one)?

As a distraction       To ease your stomach       You feel you deserve a treat

You are too busy to focus on eating healthy       Impulses

Other:

---

41. Of the following types of stress, please indicate:

A. If it causes you stress

B. Your eating behaviour under that stress

Stress Type	Stress	Eating Behaviour
Test, exam and schoolwork stress	<input type="checkbox"/> Yes, this causes stress <input type="checkbox"/> No, this does not cause stress	<input type="checkbox"/> Under eat <input type="checkbox"/> Slightly under eat <input type="checkbox"/> Eat the same <input type="checkbox"/> Slightly over eat <input type="checkbox"/> Over eat
Family and relationship stress (problems with friends, romantic partners and family)	<input type="checkbox"/> Yes, this causes stress <input type="checkbox"/> No, this does not cause stress	<input type="checkbox"/> Under eat <input type="checkbox"/> Slightly under eat <input type="checkbox"/> Eat the same <input type="checkbox"/> Slightly over eat <input type="checkbox"/> Over eat
Work stress (job dissatisfaction, conflicts with co-workers or supervisors, exhausting workload)	<input type="checkbox"/> Yes, this causes stress <input type="checkbox"/> No, this does not cause stress	<input type="checkbox"/> Under eat <input type="checkbox"/> Slightly under eat <input type="checkbox"/> Eat the same <input type="checkbox"/> Slightly over eat <input type="checkbox"/> Over eat

Social stress (poverty, financial pressures)	<input type="checkbox"/> Yes, this causes stress <input type="checkbox"/> No, this does not cause stress	<input type="checkbox"/> Under eat <input type="checkbox"/> Slightly under eat <input type="checkbox"/> Eat the same <input type="checkbox"/> Slightly over eat <input type="checkbox"/> Over eat
You are frightened, scared or endangered	<input type="checkbox"/> Yes, this causes stress <input type="checkbox"/> No, this does not cause stress	<input type="checkbox"/> Under eat <input type="checkbox"/> Slightly under eat <input type="checkbox"/> Eat the same <input type="checkbox"/> Slightly over eat <input type="checkbox"/> Over eat
You are in physical pain (injury, physical ailment, illness, sickness)	<input type="checkbox"/> Yes, this causes stress <input type="checkbox"/> No, this does not cause stress	<input type="checkbox"/> Under eat <input type="checkbox"/> Slightly under eat <input type="checkbox"/> Eat the same <input type="checkbox"/> Slightly over eat <input type="checkbox"/> Over eat
Internal stress (uncertainty, low self-esteem, perfectionism, pessimistic attitudes, self-criticism, etc.)	<input type="checkbox"/> Yes, this causes stress <input type="checkbox"/> No, this does not cause stress	<input type="checkbox"/> Under eat <input type="checkbox"/> Slightly under eat <input type="checkbox"/> Eat the same <input type="checkbox"/> Slightly over eat <input type="checkbox"/> Over eat
Positive life changes or large events (marriage, holidays, birth etc.)	<input type="checkbox"/> Yes, this causes stress <input type="checkbox"/> No, this does not cause stress	<input type="checkbox"/> Under eat <input type="checkbox"/> Slightly under eat <input type="checkbox"/> Eat the same <input type="checkbox"/> Slightly over eat <input type="checkbox"/> Over eat
Negative life changes or large events (death of a loved one, loss of a job, etc.)	<input type="checkbox"/> Yes, this causes stress <input type="checkbox"/> No, this does not cause stress	<input type="checkbox"/> Under eat <input type="checkbox"/> Slightly under eat <input type="checkbox"/> Eat the same <input type="checkbox"/> Slightly over eat <input type="checkbox"/> Over eat
Other: _____	<input type="checkbox"/> Yes, this causes	<input type="checkbox"/> Under eat <input type="checkbox"/> Slightly under eat

	stress  <input type="checkbox"/> No, this does not cause stress	<input type="checkbox"/> Eat the same <input type="checkbox"/> Slightly over eat <input type="checkbox"/> Over eat
--	---	--

42. What are the top five foods you eat when you are under stress?

Please be specific (i.e. flavour or toppings).

1st \_\_\_\_\_

2nd \_\_\_\_\_

3rd \_\_\_\_\_

4th \_\_\_\_\_

5th \_\_\_\_\_

43. Why do you eat these foods over other foods? (Check all that apply)

- Convenience
- Taste
- Texture (for example, crunchy or smooth)
- Reminders of these foods (for example, advertisements or seeing others)
- They are part of your regular diet
- Other: \_\_\_\_\_

44. What are the top five foods you **avoid** when you are under stress?

Please be specific (i.e. flavour or toppings).

1st \_\_\_\_\_

2nd \_\_\_\_\_



3rd \_\_\_\_\_

4th \_\_\_\_\_

5th \_\_\_\_\_

45. Why do you avoid these foods under stress?

---

---

46. What are the characteristics of the foods you eat under stress? (Check all that apply)

Taste:

- Sweet     Salty     Savory     Sour     Bitter     Bland

Size:

- Small or bite-size     Large or requiring biting

Type:

- Snack-type     Meal-type

47. What are the characteristics of the foods you avoid under stress? (Check all that apply)

Taste:

- Sweet     Salty     Savory     Sour     Bitter     Bland

Size:

- Small or bite-size     Large or requiring biting

Type:

- Snack-type     Meal-type

48. Under stress, which do you do most often?

- Prepare your own food     Have someone else prepare food for you

Order in                       Eat out

49. When do you eat under stress?

During regular meal times       As snacks

50. When you eat under stress, do you feel full afterwards?

Yes     No

51. a) When you eat under stress, do you lose control over your eating?

Yes     No

b) If “Yes”, please list any foods that you lose control over.

---

---

52. Describe what causes you to stop eating when under stress.

---

---

53. Of the foods that you typically avoid (Question 23), which do you eat when you are under stress?

_____	_____
_____	_____
_____	_____
_____	_____

54. Does eating or drinking foods alleviate your stress?

Yes     No

## APPENDIX E. Stress Survey

**Participant ID:**

**Date:**

### Stress Survey

#### STAI

*DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then check the appropriate box to the right of the statement to indicate how you **feel right now**, that is, at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your **present feelings** best.*

	1	2	3	4
	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1. I feel calm.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I feel secure.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I am tense.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I feel strained.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I feel at ease.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- |   |                          |                          |                          |                          |
|---|--------------------------|--------------------------|--------------------------|--------------------------|
| 6. I feel upset.....                                    | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. I am presently worrying over possible misfortunes... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. I feel satisfied.....                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. I feel frightened.....                               | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. I feel comfortable.....                             | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. I feel self-confident.....                          | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. I feel nervous.....                                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. I feel jittery.....                                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. I feel indecisive.....                              | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 15. I am relaxed.....                                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. I feel content.....                                 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17. I am worried.....                                   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. I feel confused.....                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19. I feel steady.....                                  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 20. I feel pleasant.....                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

**PANAS**

**Directions:** This scale consists of a number of words that describe different feelings and emotions. Read each item and then circle the number on the scale that **indicates to what extent you have felt this way today.**

	Very Slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely
1. Interested	1	2	3	4	5
2. Distressed	1	2	3	4	5
3. Excited	1	2	3	4	5
4. Upset	1	2	3	4	5
5. Strong	1	2	3	4	5
6. Guilty	1	2	3	4	5
7. Scared	1	2	3	4	5
8. Hostile	1	2	3	4	5
9. Enthusiastic	1	2	3	4	5
10. Proud	1	2	3	4	5
11. Irritable	1	2	3	4	5
12. Alert	1	2	3	4	5
13. Ashamed	1	2	3	4	5
14. Inspired	1	2	3	4	5
15. Nervous	1	2	3	4	5
16. Determined	1	2	3	4	5
17. Attentive	1	2	3	4	5
18. Jittery	1	2	3	4	5
19. Active	1	2	3	4	5
20. Afraid	1	2	3	4	5
21. Sad	1	2	3	4	5
22. Depressed	1	2	3	4	5
23. Worried	1	2	3	4	5
24. Anxious	1	2	3	4	5
25. Motivated	1	2	3	4	5

1. What time did you wake up today? \_\_\_\_\_
2. Approximately how many hours of sleep did you get last night? \_\_\_\_\_
3. How many hours of exercise do you do **each week**? \_\_\_\_\_
4. How many hours of exercise have you done **today**? \_\_\_\_\_
5. Indicate your **overall** level of stress for today. (Check one)

- Very relaxed
- Moderately relaxed
- Slightly relaxed
- Neutral
- Slightly stressed
- Moderately stressed
- Very stressed

6. Indicate your **current** level of stress. (Check one)

- Very relaxed
- Moderately relaxed
- Slightly relaxed
- Neutral
- Slightly stressed
- Moderately stressed
- Very stressed

7. Indicate the **highest** level of stress you felt today. (Check one)

- Very relaxed
- Moderately relaxed
- Slightly relaxed
- Neutral
- Slightly stressed
- Moderately stressed
- Very stressed

8. For each of the following types of stress, please indicate the level of stress you felt today.

Stress Type	Level of Stress
Test, exam and schoolwork stress	<input type="checkbox"/> Very relaxed <input type="checkbox"/> Moderately relaxed <input type="checkbox"/> Slightly relaxed <input type="checkbox"/> Neutral <input type="checkbox"/> Slightly stressed <input type="checkbox"/> Moderately stressed <input type="checkbox"/> Very stressed
Family and relationship stress (problems with friends, romantic partners and family)	<input type="checkbox"/> Very relaxed <input type="checkbox"/> Moderately relaxed <input type="checkbox"/> Slightly relaxed <input type="checkbox"/> Neutral <input type="checkbox"/> Slightly stressed <input type="checkbox"/> Moderately stressed <input type="checkbox"/> Very stressed
Work stress (job dissatisfaction, conflicts with co-workers or supervisors, exhausting	<input type="checkbox"/> Very relaxed <input type="checkbox"/> Moderately relaxed

workload)	<input type="checkbox"/> Slightly relaxed <input type="checkbox"/> Neutral <input type="checkbox"/> Slightly stressed <input type="checkbox"/> Moderately stressed <input type="checkbox"/> Very stressed
Social stress (poverty, financial pressures)	<input type="checkbox"/> Very relaxed <input type="checkbox"/> Moderately relaxed <input type="checkbox"/> Slightly relaxed <input type="checkbox"/> Neutral <input type="checkbox"/> Slightly stressed <input type="checkbox"/> Moderately stressed <input type="checkbox"/> Very stressed
Frightened, scared or endangered	<input type="checkbox"/> Very relaxed <input type="checkbox"/> Moderately relaxed <input type="checkbox"/> Slightly relaxed <input type="checkbox"/> Neutral <input type="checkbox"/> Slightly stressed <input type="checkbox"/> Moderately stressed <input type="checkbox"/> Very stressed
Physical pain (injury, physical ailment, illness, sickness)	<input type="checkbox"/> Very relaxed <input type="checkbox"/> Moderately relaxed <input type="checkbox"/> Slightly relaxed <input type="checkbox"/> Neutral <input type="checkbox"/> Slightly stressed <input type="checkbox"/> Moderately stressed <input type="checkbox"/> Very stressed
Internal stress (uncertainty, low self-esteem, perfectionism, pessimistic attitudes, self-criticism, etc.)	<input type="checkbox"/> Very relaxed <input type="checkbox"/> Moderately relaxed <input type="checkbox"/> Slightly relaxed <input type="checkbox"/> Neutral <input type="checkbox"/> Slightly stressed <input type="checkbox"/> Moderately stressed <input type="checkbox"/> Very stressed
Positive life changes or large events (marriage, holidays, birth etc.)	<input type="checkbox"/> Very relaxed <input type="checkbox"/> Moderately relaxed <input type="checkbox"/> Slightly relaxed <input type="checkbox"/> Neutral <input type="checkbox"/> Slightly stressed <input type="checkbox"/> Moderately stressed



	<input type="checkbox"/> Very stressed
Negative life changes or large events (death of a loved one, loss of a job, etc.)	<input type="checkbox"/> Very relaxed <input type="checkbox"/> Moderately relaxed <input type="checkbox"/> Slightly relaxed <input type="checkbox"/> Neutral <input type="checkbox"/> Slightly stressed <input type="checkbox"/> Moderately stressed <input type="checkbox"/> Very stressed
Other: (leave blank if not applicable) <hr/> <hr/> <hr/>	<input type="checkbox"/> Very relaxed <input type="checkbox"/> Moderately relaxed <input type="checkbox"/> Slightly relaxed <input type="checkbox"/> Neutral <input type="checkbox"/> Slightly stressed <input type="checkbox"/> Moderately stressed <input type="checkbox"/> Very stressed

## Appendix F. Relationship Scales Questionnaire

Please read each of the following statements and rate the extent to which you believe each statement best describes your feelings about **CLOSE RELATIONSHIPS** (friends and people you date).

	<b>Not at all like me</b>		<b>Somewhat like me</b>		<b>Very much li me</b>
. I find it difficult to depend on other people	1	2	3	4	5
. It is very important to me to feel independent	1	2	3	4	5
. I find it easy to get emotionally close to others	1	2	3	4	5
. I want to merge completely with another person	1	2	3	4	5
. I worry that I will be hurt if I allow myself to become too close to others.	1	2	3	4	5
. I am comfortable without close emotional relationships	1	2	3	4	5
. I am not sure that I can always depend on others to be there when I need them	1	2	3	4	5
. I want to be completely emotionally intimate with others	1	2	3	4	5
. I worry about being alone	1	2	3	4	5
0. I am comfortable depending on other people	1	2	3	4	5
1. I often worry that friends and romantic partners don't care about me	1	2	3	4	5

2. I find it difficult to trust others completely	1	2	3	4	5
3. I worry about others getting too close to me	1	2	3	4	5
4. I want emotionally close relationships	1	2	3	4	5
5. I am comfortable having other people depend on me	1	2	3	4	5
6. I worry that others don't value me as much as I value them	1	2	3	4	5
7. People are never there when you need them	1	2	3	4	5
8. My desire to merge completely sometimes scares people away	1	2	3	4	5
9. It is very important to me to feel self sufficient	1	2	3	4	5
0. I am nervous when anyone gets too close to me	1	2	3	4	5
1. I often worry that friends and romantic partners won't want to stay with me	1	2	3	4	5
2. I prefer not to have other people depend on me	1	2	3	4	5
3. I worry about being abandoned	1	2	3	4	5
4. I am somewhat uncomfortable being close to others	1	2	3	4	5
5. I find that others are reluctant to get as close as I would like	1	2	3	4	5
6. I prefer not to depend on others	1	2	3	4	5
7. I know that others will be there when I need them	1	2	3	4	5
8. I worry about having others not accept me	1	2	3	4	5

9. Friends and romantic partners often want me to be closer than I feel comfortable being	1	2	3	4	5
10. I find it relatively easy to get close to others	1	2	3	4	5

Please read each of the following statements and rate the extent to which you believe each statement best describes your feelings about **YOUR RELATIONSHIP WITH YOUR MOTHER.**

	<b>Not at all like me</b>		<b>Somewhat like me</b>		<b>Very much li me</b>
1. I find it difficult to depend on my mom	1	2	3	4	5
2. It is very important to me to feel independent from my mom	1	2	3	4	5
3. I find it easy to get emotionally close to my mom	1	2	3	4	5
4. I want to merge completely with my mom	1	2	3	4	5
5. I worry that I will be hurt if I allow myself to become too close to my mom.	1	2	3	4	5
6. I am comfortable without a close emotional Relationship with my mom.	1	2	3	4	5
7. I am not sure that I can always depend on my mom to be there when I need her	1	2	3	4	5
8. I want to be completely emotionally intimate with my mom	1	2	3	4	5
9. I worry about being alone (away from my mom)	1	2	3	4	5
10. I am comfortable depending on my mom	1	2	3	4	5

1. I often worry that my mom doesn't really love me	1	2	3	4	5
2. I find it difficult to trust my mom completely	1	2	3	4	5
3. I worry about my mom getting too close to me	1	2	3	4	5
4. I want an emotionally close relationship with my mom	1	2	3	4	5
5. I am comfortable having my mom depend on me	1	2	3	4	5
6. I worry that my mom doesn't value me as much as I value her	1	2	3	4	5
7. My mom is never there when I need her	1	2	3	4	5
8. My desire to merge completely sometimes scares my mom away	1	2	3	4	5
9. It is very important to me to feel self sufficient	1	2	3	4	5
0. I am nervous when my mom gets too close to me	1	2	3	4	5
1. I often worry that my mom won't want to stay with me	1	2	3	4	5
2. I prefer not to have my mom depend on me	1	2	3	4	5
3. I worry about being abandoned by my mom	1	2	3	4	5
4. I am somewhat uncomfortable being close to my mom	1	2	3	4	5
5. I find that my mom is reluctant to get as close as I would like	1	2	3	4	5
6. I prefer not to depend on my mom	1	2	3	4	5
7. I know that my mom will be there when I need her	1	2	3	4	5
8. I worry about my mom not accepting me	1	2	3	4	5
9. My mom often wants me to be closer than	1	2	3	4	5



2. I find it difficult to trust my dad completely	1	2	3	4	5
3. I worry about my dad getting too close to me	1	2	3	4	5
4. I want an emotionally close relationship with my dad	1	2	3	4	5
5. I am comfortable having my dad depend on me	1	2	3	4	5
6. I worry that my dad doesn't value me as much as I value him.	1	2	3	4	5
7. My dad is never there when I need him.	1	2	3	4	5
8. My desire to merge completely sometimes scares my dad away.	1	2	3	4	5
9. It is very important to me to feel self sufficient	1	2	3	4	5
0. I am nervous when my dad gets too close to me	1	2	3	4	5
1. I often worry that my dad won't want to stay with me	1	2	3	4	5
2. I prefer not to have my dad depend on me	1	2	3	4	5
3. I worry about being abandoned by my dad	1	2	3	4	5
4. I am somewhat uncomfortable being close to my dad	1	2	3	4	5
5. I find that my dad is reluctant to get as close as I would like	1	2	3	4	5
6. I prefer not to depend on my dad	1	2	3	4	5
7. I know that my dad will be there when I need him	1	2	3	4	5
8. I worry about my dad not accepting me	1	2	3	4	5
9. My dad often wants me to be closer than I feel comfortable being with him	1	2	3	4	5
0. I find it relatively easy to get close to my dad	1	2	3	4	5

