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ATTACHMENT INSECURITY AND EMOTIONAL EATING

by

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ABSTRACT OF THE DISSERTATION

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The concept of emotional eating is well known within the general public and has been given scientific consideration as well. However, there has been little work focusing on emotional eating from the perspective of attachment theory. Attachment theory posits that the social and emotional bonds an individual forms with his/her caregiver as an infant lead to the development of an attachment style, which influences how an individual perceives them self, others and social interactions. Distinct emotion regulation strategies also underlie attachment styles. Given the social and emotional nature of eating, it is probable that eating behavior can be influenced by attachment style. The following dissertation explored the relationships between attachment anxiety and avoidance and emotional eating. Study 1 established a connection between self reported attachment anxiety and emotional eating, but not attachment avoidance. This association was mediated by perceived hunger. Study 2 revealed that individuals who reported higher levels of attachment anxiety tended to eat more unhealthy food (potato chips) but not healthy food. Study 3 explored the processes underlying the relationship between attachment anxiety and eating after ostracism. Study 4 involved an intervention to suppress emotional eating.

Preface

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Table of Contents

	Page
LIST OF TABLES.....	vii
LIST OF FIGURES.....	viii
I. LITERATURE REVIEW	
Introduction.....	1
Development of a Secure Attachment.....	2
The Attachment System and Emotion Regulation.....	4
Attachment and Eating Behavior.....	7
Emotional Eating for Comfort.....	9
Emotional Eating as a Coping Strategy During Distress.....	11
II. ATTACHMENT AND SELF REPORTED EMOTIONAL EATING	
Introduction.....	15
Methods.....	18
Results.....	21
Discussion.....	24
III. ATTACHMENT ANXIETY, OSTRACISM, AND EMOTIONAL EATING	
Introduction.....	30
Methods.....	35
Results.....	36
Discussion.....	41

IV.	UNDERLYING MECHANISMS OF THE RELATIONSHIP BETWEEN ATTACHMENT AND EMOTIONAL EATING	
	Introduction.....	47
	Methods.....	49
	Results.....	53
	Discussion.....	62
V.	DEVELOPMENT OF AN INTERVENTION TO SUPPRESS EMOTIONAL EATING	
	Introduction.....	66
	Methods.....	72
	Results.....	76
	Discussion.....	82
VI.	GENERAL DISCUSSION.....	88
VII.	REFERENCES.....	104
VIII.	CURRICULUM VITAE.....	124

List of Tables

<u>Table</u>	<u>Page</u>
1. Study 1 correlations between attachment anxiety, avoidance and various eating measures.....	29
2. Study 2 correlations between attachment anxiety, avoidance, and dependent variables.....	46
3. Study 3 correlations between attachment anxiety, avoidance, and dependent variables.....	65
4. Study 4 correlations between attachment anxiety, avoidance, and dependent variables.....	86

List of Figures

<u>Figure</u>	<u>Page</u>
1. Mediation of the relationship between attachment anxiety and emotional eating by perceived hunger.....	24
2. Interaction of disinhibition and gender on amount of potato chips eaten.....	40
3. Difference scores in state attachment anxiety regressed onto global attachment anxiety and condition	59
4. Interaction of global attachment anxiety and condition on perceived hunger.....	81

Attachment Insecurity and Emotional Eating

Food provides much more than just nutrients and sustenance for our biological functioning. Food can also play a pivotal role in our psychological well-being. It can be rewarding, comforting, and distracting (Born, et al., 2011; Wansink, Cheney, & Chan, 2003). Eating too much or eating the wrong kind of food, e.g., “junk food,” can be experienced as embarrassing, and change the way we feel emotionally about ourselves and bodies (“I can’t believe I ate all that”). Eating does not only serve a survival purpose; it is strongly linked with emotion, self-image, and social overtones. The term “emotional eating” has become well known in popular culture. Emotional eating is typically defined as eating or overeating in response to distress (Van Strien & Ouwens, 2003), although there is evidence that some individuals may eat in response to positive emotions as well (Nolan, Halperin, & Geliebter, 2010). Scenes depicting emotional eating are common in movies and on TV. Obesity is a considerable problem in our culture (Ogden, Carroll, Kit, and Flegal, 2012) and research on emotional eating can identify ways to help people eat healthier.

In addition to being emotionally laden, eating also holds many social connotations. Eating is frequently a central part of social events, both happy and sad, such as weddings, parties, and funerals. It is common to share meals together with friends and family. Given the inherent social nature of eating, it is reasonable to think that social behaviors and traits would influence eating behavior. Certain behavioral traits and situations may make some more vulnerable to emotional eating than others. An especially important factor in social behavior is attachment. Attachment theory posits that the

quality of the social and emotional bonds we form with our caregivers in infancy lead to the development of an attachment style: a model of the self/other and expectations concerning our social world (Bartholomew & Horowitz, 1991; Bowlby, 1982). If the quality of the infant/caregiver relationship is poor, an insecure attachment can result. Insecure attachment styles are characterized by distinct, largely maladaptive emotion regulation strategies (Mikulincer & Shaver, 2007). Emotional eating is a coping strategy for dealing with distress (Evers, Stok & Ridder, 2010). Thus, insecurely attached individuals may be especially prone to emotional eating. Studying emotional eating through an attachment paradigm can provide valuable insight into emotional eating.

Development of a Secure Attachment

Attachment styles can be thought of as one building block of social behavior. Attachment styles develop during the first year of life, play an important role in how an individual perceives his/her social world (how others will respond to and interact with them), and for the majority of individuals, persist throughout the lifespan (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1982; Scharfe & Bartholomew, 1994). Attachment theory posits that our early experiences with caregivers lead to the development of an internal working model (IWM). The IWM is composed of the individuals' feelings about themselves, others, and expectations about how others will interact with them in social situations. Attachment is commonly measured through self-report questionnaires in which individuals are asked to report their conscious behaviors (Fraley, Waller, & Brennan, 2000), though attachment theory posits that these behaviors are driven by an underlying unconscious internalized model that develops in the first year of life (Bowlby, 1988).

Newborn babies are not only dependent on their caretakers for food and warmth, but emotion regulation as well. Since a newborn is unable to regulate his/her own emotions the caregiver must regulate for the baby (Bowlby, 1982). For example, when the infant cries, the caregiver responds by attending to the infant (picking him/her up, soothing). An infant whose caregiver responds sensitively and consistently will learn that he/she is capable of getting his/her needs met. Thus, the infant can develop a sense of competency (Grossman, Grossman, & Waters, 2005). Ainsworth found that babies whose caregivers responded to their crying consistently in the first six months of life cried less in the second half of the first year compared to infants whose caregivers were inconsistent and less responsive (Ainsworth, 1978). As the child grows the caregiver helps the child learn to regulate his/her own emotions. Consistent responsiveness and sensitivity on the part of caregivers is likely to result in a secure attachment to the caregiver (Grossman, Grossman, & Waters, 2005). Ainsworth observed that caregiver (maternal) behavior likely to contribute to secure attachment consists of tactile/physical contact between mother and baby, the ability of the mother to soothe the baby when distressed, frequent social interaction, the ability of the mother to appropriately time and respond to the baby during social interactions (attunement), and the ability of the mother to be responsive and sensitive to the baby's needs, thus contributing to the infant's sense of competence (Ainsworth & Bowlby, 1991; Bowlby, 1982).

Attachment styles continue into adulthood and can be transferred from caregivers to romantic partners and other important relationships (Hazan & Shaver, 1987; Brumbaugh & Fraley, 2006). A secure attachment is characterized by positive views of self and other, a belief that when in distress one can turn to others for support and those

others will be responsive, and an ability to successfully regulate emotion during periods of distress (Bartholomew & Horowitz, 1991; Mikulincer, Shaver, Sapir-Lavid, & Avihou-Kanza, 2009). If caregivers are inconsistent or neglectful in care, insecure attachments can develop (Bowlby, 1988). Bartholomew and Horowitz (1991) posit that there are two dimensions of attachment insecurity; anxiety and avoidance. Attachment anxiety is characterized by an increased need for emotional closeness, worries of rejection and abandonment, over-dependence on others, negative views of self and positive views of others, and increased emotional reactivity. Attachment avoidance is characterized by an increased need for emotional distance, resistance to trusting and depending on others, positive views of self and negative views of others, and a suppression of emotion (Bartholomew & Horowitz, 1991). Hazan and Shaver (1987) found that about 56% of their sample classified themselves as securely attached, 25% as avoidant, and 19% as anxiously attached.

An individual begins to develop attachments soon after birth. Attachment styles can change (Baldwin & Fehr, 1995; Waters, Merrick, Treboux, Crowell, Albersheim, 2000), but usually do not fluctuate much across the lifespan (Davila, Burge & Hammen, 1997; Lopez & Gormley, 2002). Attachment can also fluctuate daily depending on the meaning people assign to life events (Davila & Sargent, 2003). Attachment patterns are transferred from parents to romantic relationships, and from one romantic relationship to the next (Hazan & Shaver, 1987; Brumbaugh & Fraley, 2006). When considering how early attachment develops and how it is so ingrained, it is easy to see how one's attachment style would be fundamental to everyday functioning.

The Attachment System and Emotion Regulation

Another way to view the attachment system is as an emotion regulation system (Kobak and Sceery, 1988). Emotion regulation is defined as influencing emotions, both positive and negative (the strength, duration, and expression of emotions) either consciously or unconsciously (Gross, 1998; Gross & John, 2003). Shaver and Mikulincer (2002) outline a model explaining how the attachment system works to regulate emotion consisting of three components. The first component posits that the attachment system is activated by stress or a threat and this causes the individual to seek proximity to an attachment figure. Bowlby asserted that the functional purpose of the attachment system is to protect the infant from threats. Thus, the attachment system is activated by stress or threats and the direct consequence of the activation is that the infant behaves in order to maintain closer proximity to the attachment figure (Bowlby, 1982). Mikulincer, Gillath and Shaver (2002) provide empirical support for this in that subliminally priming participants with threat words increases cognitive accessibility of thoughts related to attachment figures. Additionally, Mikulincer, Birnbaum, Woddis and Nachmias (2000) found that after the priming of a threat word, participants had higher accessibility to proximity related words no matter what their attachment style. The studies found these results with threats and stress that were related and unrelated to attachment themes.

The second component consists of the “monitoring and appraisal” of how available and responsive the attachment figure will be when needed. If attachment figures are perceived as available and responsive, the individual can easily develop “security-based strategies.” These strategies give the individual resources to cope with distress. For adults, the attachment figures do not literally have to be physically present. Over time, the availability of the attachment figure is internalized and this is sufficient for reducing

distress (Mikulincer, Shaver, & Pereg, 2003). These security-based strategies are both conscious and unconscious and consist of the knowledge that the individual is capable of dealing with upsetting and distressing events and other people are usually good, available, and supportive. If the individual has a history of positive interactions with attachment figures, they develop a sense of control and ability to manage distressing events (Mikulincer, Shaver, & Pereg, 2003).

The third component has to do with how well the individual perceives that proximity maintaining will work as a means of coping. This component influences the development of hyperactivating and deactivating strategies. When the attachment system is activated the first response is to seek proximity to the attachment figure and this is the primary attachment strategy (Mikulincer, Shaver & Pereg, 2003). This has been discussed theoretically (Bowlby, 1982; Ainsworth & Bell, 1970) and there is empirical evidence as well (Mikulincer, et al., 2002; Mikulincer et al., 2000). However, if the attachment figure is unavailable or unresponsive, secondary strategies for emotion regulation develop. There are two distinct secondary strategies underlying insecure attachments: hyperactivating and deactivating (Cole-Detke & Kobak, 1996; Fuendeling, 1998). Those who are higher on the avoidance dimension tend to utilize deactivating strategies of emotion regulation characterized by suppression of emotion and distancing themselves from their emotions (as well as distancing themselves from others who might serve as support in times of distress). However, those who report higher levels of attachment anxiety tend to use hyperactivating strategies of emotion regulation characterized by becoming overemotional and over reactive to distress. If attachment figures are perceived as inconsistent in emotional availability, then hyperactivating strategies are likely to

develop. Hyperactivating strategies are characterized by vigilant attempts to gain proximity to attachment figures, clinginess, an increased focus on negative emotions, relationships, and anxiety. If attachment figures are perceived as not being emotionally available at all, then deactivating strategies are likely to develop (Mikulincer, et al., 2002). Deactivating strategies are characterized by a desire to maintain distance from attachment figures, suppress negative emotions and thoughts, deny needs for social support, and an increased desire to be independent and self-reliant (Shaver & Mikulincer, 2002).

Attachment and Eating Behavior

Attachment insecurity is associated with a number of maladaptive behaviors; for instance, obsessive compulsive disorder, depression, and eating disorders (Doran, Moulding, Kyrios, Nedeljkovic, & Mikulincer, 2009; Cole-Detke & Kobak, 1996; Tasca, et al., 2009). Attachment insecurity is also associated with risky and problematic behavior (substance abuse, risky sexual behavior, interpersonal problems) and maladaptive affect regulation (Cooper, Shaver & Collins, 1998; Wei, Vogel, Ku, & Zakalik, 2005). Cooper, Shaver and Collins (1998) found that depression and hostility mediated the relationship between differences in secure and anxious/avoidant attachment styles and problem behaviors such as substance use and academic issues. Attachment insecurity is also related to increased negative affect (Wei, Vogel, Ku, and Zakalik, 2005; Caldwell & Shaver, 2012). Subliminal priming of secure themes leads to more positive affect in reaction to neutral stimuli (Mikulincer, Hirschberger, Nachmias, & Gillath, 2001). Additionally, Simpson, Collins, Tran, Haydon, 2007 conducted a longitudinal study observing individuals from infancy through mid-20's and found that secure infants

were more socially competent later in life and experienced more positive affect less negative affect in romantic relationships. The relationship between attachment insecurity, interpersonal problems, and negative mood are mediated by two different strategies for emotion regulation; attachment anxiety by emotional reactivity (over reactive to distress) and attachment avoidance by emotional cutoff (suppressing emotion during distress) (Wei, Vogel, Ku, and Zakalik, 2005). Additionally, subliminal priming of secure themes leads to more positive affect in reaction to neutral stimuli (Mikulincer, Hirschberger, Nachmias, & Gillath, 2001). Attachment insecurity is linked with a number of problematic behaviors; Unhealthy eating will likely be added to this list.

Bowlby contradicted Freud's belief that the reason an infant attaches to a caregiver is because the caregiver provides food (Bowlby, 1982; Ainsworth and Bowlby, 1991). Bowlby stated that the attachment system is separate from the feeding system and referred to the evidence of Harlow's infant monkeys, who when given the choice of a wire monkey which supplied food and a cloth covered monkey which did not, chose the cloth covered monkey, even when the cloth covered monkey elicited an aversive stimulus. In fact, when the monkey anticipated the stimulus, it actually clung to the cloth model even stronger (Bowlby, 1982). Alarming, threatening events stimulate attachment behavior. Bowlby referred to numerous other animal models as well as human children. For instance, attachment behavior (crying when leaving a room, smiling, approaching, clinging) is observed between children and other family members who do not supply food (like older siblings) (Bowlby, 1982). However, food is comforting and is often associated with social situations (Troisi & Gabriel, 2011; Wansink, Cheney, & Chan, 2003). Caregivers may use food as a way of comforting an infant when distressed (i.e.,

giving an infant a bottle when crying or a child candy when upset). Many children may learn that eating can be an emotion regulation technique. Therefore it is plausible that eating can become associated with attachment. This seems more likely to happen when an individual has an insecure attachment style. Since the attachment system is an emotion regulation system (Kobak & Sceery, 1988; Mikulincer & Shaver, 2007), insecure individuals who already have difficulty regulating emotion may be more likely to turn to other coping strategies, such as emotional eating. Perhaps the inconsistency in caregiving and maladaptive emotion regulation strategies make turning to food rather than social support much more likely in times of distress. Many of the underlying reasons individuals eat emotionally involve affect regulation and eating can be comforting in times of distress (Tice, et al., 2001; Spoor, et al, 2007).

Emotional Eating for Comfort

The importance of food in human psychological functioning and physical well-being is evident in the popularity of “comfort food,” a term first officially used in 1977 (*Comfort Food*, 2011). Many individuals tend to think of some foods as providing comfort in times of emotional distress. A variety of foods may serve as comfort foods. Wansink, Cheney and Chan (2003), found that most participants in their sample rated potato chips as their favorite comfort food (23%), with ice cream (14%), cookies (12%), and candy/chocolate (11%) following. Individuals report both meal related foods and snack or “junk” foods as their favorite comfort foods. While 60% of favorite comfort foods were high in calories and fat, 7% of individuals actually reported preferring vegetables and salads as comfort foods (Wansink, et al. 2003). While there are many similarities in the way that people eat emotionally, there are important differences as

well. Nguyen-Rodriguez, Unger, and Spruijt-Metz (2009) found that stress, worries, tension/anxiety was related to emotional eating among girls. For boys in this sample, only confused mood was related to emotional eating. There are also gender differences in what females and males consider comfort foods. For instance, females tend to prefer comfort foods which are more like snacks (candy, chocolate) and males tend to prefer comfort foods which are more like meals (pizza, pasta) (Wansink, et al. 2003).

Bruch (1964) proposed that obesity and emotional eating can develop when children do not learn to recognize the internal physiological signals from their own bodies. Children may learn to eat because of external pressures or as compensation for lack of fulfillment of their emotional needs, such as love or attachment. Troisi and Gabriel (2011) suggest that comfort foods are associated with close relationships, and since the need to belong is a fundamental human need, food may serve as a social surrogate when people feel lonely or as if they do not belong. The authors found that individuals who consumed chicken noodle soup and considered it a comfort food were more likely to activate relationship-associated cognitions than those who did not consider chicken noodle soup a comfort food. The activation of relationship-associated cognitions was measured as the number of word fragments that could be completed as relationship-associated words. These authors also found that securely attached participants who were asked to write about comfort food experienced less loneliness (after writing about a fight with a close other) compared to writing about a new food. However, writing about comfort food had no effects on loneliness in insecurely attached participants. The authors suggest that this is because securely attached individuals have positive relationship associations whereas insecure individuals do not. In this study participants wrote about

comfort food, rather than eating comfort food, so these results may have been different if participants were actually eating comfort food. Additionally, there is evidence that even if individuals eat emotionally because they think it will help them feel better, eating may not actually improve mood (Tice, et al., 2001; Herman & Polivy, 1975). It is possible that although insecure individuals may be more likely to use eating as a coping strategy, the outcomes of emotional eating may be different for secure and insecure individuals. In line with this study, Timmerman and Acton (2001) found a strong negative correlation between basic need satisfaction on Maslow's hierarchy of basic needs (Maslow, 1968) and emotional eating. Participants who felt as though their basic needs were not being fulfilled were more likely to self-report emotional eating. When the needs that are lower on Maslow's hierarchy (such as physiological needs) are fulfilled, an individual can begin to fulfill the needs that are higher on the hierarchy (e.g., the need to be loved and to belong). Timmerman and Acton (2001) found stronger negative correlations between self-reported emotional eating and the needs higher in the hierarchy than the needs lower in the hierarchy.

Emotional Eating as a Coping Strategy during Distress

Wansink and Payne (2007) hypothesized that individuals consume comfort food as a "mood self-verification technique." Self-verification theory posits that instead of being motivated to increase positive self-regard, people are often more motivated to maintain self-impressions (Wansink & Payne, 2007). For example, if someone is depressed, they may be more likely to agree with negative feedback on his/her performance than positive feedback. In line with this, Wansink and Payne (2007) found

that individuals tend to eat unhealthy comfort food when in a negative mood and eat more nutritious comfort food when in a positive mood.

There are other reasons why individuals may eat when in a negative mood. Tice et al., (2001) hypothesized that distress leads to impairments in self-regulation because during times of distress, people give priority to affect regulation. In other words, if an individual is upset, and is confronted with something that has the potential to make him or her feel better, priority will be given to feeling better rather than controlling impulses regardless of whether or not it is healthy. Tice et al. used a mood freezing procedure to test this hypothesis. The experimenters induced a sad mood in participants by having them read a sad vignette. Some participants were told that research has shown that eating will not make them feel better and whatever mood they were currently in would likely be their mood until the end of the experiment. The participants in the control group were not given any information on eating and mood. The authors found that sad participants who believed their mood was frozen ate significantly less than sad participants who did not believe their mood was frozen. Interestingly, the authors did not find any correlations between eating and mood increases. Although participants appeared to eat when they felt sad and thought their mood was changeable, the eating did not change their mood. Herman and Polivy (1975) found similar results; participants who were anxious and also restrained (with respect to eating) ate more than unrestrained participants, but this eating failed to reduce their anxiety. This suggests that even though individuals may eat emotionally as a means of emotion regulation, eating may not successfully alter emotion. Given the evidence that individuals eat because they believe it will make them feel better even if it does not, those with higher levels of attachment anxiety may be more likely to

eat emotionally regardless of the outcome (Tice, et al., 2001). Eating may help an individual feel good in the immediate/short term, but as soon as the food is gone, the initial negative feelings may return (Cooker Ross, 2009), especially considering that eating as a coping strategy does not actually address the underlying issue that caused distress.

Emotional eating can also be a coping strategy. Particular coping strategies are related to attachment insecurity and there is evidence that individual differences in coping styles may be at the root of emotional eating (Spoor et al., 2007). Emotion regulation is not synonymous with coping, but the two may overlap, such as using a coping strategy to regulate emotion (Gross, 1998). Coping refers to explicit and conscious behavioral actions taken by an individual to achieve a goal, decrease negative emotions, or deal with a situation that is diminishing one's resources. Coping strategies can be used in emotional and non-emotional situations, whereas emotion regulation focuses more on the individual person and conscious and unconscious processes that influence emotions both positive and negative (Gross, 1998). Lopez, Mauricio, Gormley, Simko, and Berger (2001) found that the relationship between attachment styles and college student distress is mediated by specific coping strategies. Attachment anxiety was positively related to reactive coping (focusing on emotions and intense distress) and attachment avoidance was positively related to suppressive coping (not acknowledging emotions, denying distress). Similarly, Wei, Heppner, and Mallinckrodt (2003) found that perceived coping (how well an individual thinks they can cope with a distressing situation) fully mediated the relationship between attachment anxiety and psychological distress and partially mediated the relationship between attachment avoidance and psychological distress.

Spoor explored three different coping styles and the associations with self-reported emotional eating. Task oriented coping, in which an individual focuses on the actual problem and tries to create ways to solve the problem was not found to be related to emotional eating. However, the use of emotion oriented coping, where individuals focus on themselves and negative emotions with the goal of relieving them was significantly associated with emotional eating. The use of avoidance distraction coping, where individuals try to engage in something to distract themselves from their distress was also associated with emotional eating. Interestingly, negative affect did not significantly contribute to emotional eating beyond that of the coping styles. In line with these findings, Evers, Stok, and de Ridder (2010), found that the emotion regulation strategy used after experiencing an emotional event is a far better predictor of the amount of food eaten than the actual emotion. Specifically, individuals who used suppression (not expressing emotion) consumed more food than participants who used reappraisal (thinking about something in a new way). Additionally, those who used suppression ate more than those who used no emotion regulation method, and this group did not differ from the reappraisal group in food consumption. Thus, it appears that suppression increases eating, not that reappraisal decreases eating. Yet, sadness and anger were not predictors of the amount of food consumed. These studies suggest that attachment insecurity is related to specific coping strategies and emotional eating is a method to cope with negative emotion, especially when other coping strategies are ineffective.

There is limited work on attachment and emotional eating. Studies to date have found that consuming comfort food activates relationship associated cognitions with close others, and securely attached individuals experience less loneliness when writing

about comfort food (Troisi & Gabriel, 2011). Additionally, Wilkinson, Rowe, Bishop, and Brunstrom (2010) found attachment anxiety to be significantly and positively correlated with disinhibited eating and body mass index (BMI), and furthermore, disinhibited eating mediated the relationship between attachment anxiety and BMI. Research focusing on helping and learning about emotional eaters from an attachment perspective is a new and unique approach to this issue.

There is good reason to propose that attachment insecurity, and attachment anxiety in particular, is linked to emotional eating. Individuals eat emotionally as a way to cope with distressing events and regulate emotion. Individuals with higher levels of attachment anxiety use hyperactivating strategies for emotion regulation, i.e., becoming emotionally reactive, vigilantly seeking extreme closeness to attachment figures, and external sources for comfort. Individuals who report higher levels of attachment anxiety developed this strategy as a result of a history of attachment figures being inconsistent in availability and responsiveness. Thus, individuals who report higher levels of attachment anxiety may approach distressing events with this maladaptive strategy for emotion regulation and turn to emotional eating as a way to cope with upsetting events, especially if attachment figures are unreliable. Individuals who report higher levels of attachment avoidance are probably less likely to turn to emotional eating because these individuals tend to use deactivating strategies of emotion regulation which involve suppressing the attachment system and emotion. The following studies will explore the connections between attachment insecurity and emotional eating and ways to prevent emotional eating within the framework of attachment theory.

Study 1

As rates of obesity rise, finding ways to keep eating under control is becoming increasingly important for our society (Hill, Catenacci, & Wyatt, 2005). Easy accessibility of food, desire for convenience, and decreasing physical activity all contribute to obesity, but the emotional nature of eating may also be a culprit (Hill, Wyatt, Reed, & Peters, 2003). Eating can be rewarding, comforting, and distracting during stressful times (Greeno & Wing, 1994; Wansink & Payne, 2007). Eating is also very social. We often eat meals together and food is the center point of celebrations and sad occasions. However, eating to regulate emotion can be maladaptive. For example, most individuals prefer unhealthy food as comfort food (Wansink & Payne, 2007). Considering its social/emotional nature, approaching the study of eating via a social/emotional framework will be informative.

There are numerous studies exploring the relationship between *disordered* eating and attachment (Latzer, Hochdorf, Bachar & Canetti, 2002; Chassler, 1997; Kenny & Hart, 1992; Hochdorf, Latzer, Canetti, & Bachar, 2005). These studies have found consistently larger percentages of insecurely attached individuals among eating disorder populations. However, most of this work has focused on bulimia nervosa and anorexia nervosa. There are fewer studies exploring the relationship between attachment and overeating. There is a correlation between attachment anxiety and disinhibition, which is the lack of ability to inhibit eating, and disinhibition mediates the link between attachment anxiety and body mass index (BMI; Wilkinson, et al., 2010). However, there is little research on attachment and emotional eating. The first goal of the current study is to broadly explore associations between attachment and various eating behaviors, such as tendencies of anorexia, bulimia, restricting eating, disinhibited eating, hunger, and

emotional eating. An individual who has experienced a history of inconsistent support from attachment figures during distressful times may find food a viable alternative for comfort. Attachment anxiety is predicted to be related to overeating and emotional eating because individuals who report higher levels of attachment anxiety tend to utilize hyperactivating strategies of emotion regulation. When distressed, these individuals become emotionally reactive and vigilantly seek extreme proximity to attachment figures. These individuals do not rely on an internalized feeling of worthiness, security, and sense of competence in their ability to regulate their emotion (Mikulincer & Florian, 1998). Thus, it is predicted that individuals who report higher levels of attachment anxiety will be more likely to engage in overeating related tendencies since they use external sources to find comfort. The information gained from this study will help to inform future experimental studies.

A second goal of this study is to explore mediating links between attachment anxiety and emotional eating. One possible mediating link could be perceived hunger because individuals who report higher levels of attachment anxiety may tend to misinterpret internal cues. Van Strien (2000) found a negative correlation between interoceptive awareness (measure of one's ability to recognize and label emotional arousal) and social insecurity (measure of social fears). These factors predicted emotional eating, including ice cream consumption. It is possible that individuals who report higher levels of attachment anxiety have less interoceptive awareness and incorrectly label internal states as hunger. Individuals may eat emotionally because they have trouble interpreting internal states such as hunger. Although these people may be aware that they tend to eat emotionally in general, (i.e., noticing over time that they eat more during

stressful transitions or gain weight during difficult times (interpersonal problems or major life transitions), in the moment they may be less aware of the exact emotional state that their behavior is linked to, but still able to report general patterns of emotional eating over time. For example, when an individual is actively engaged in eating, he/she might be suppressing negative emotions, or the act of eating in itself may help suppress negative emotions and distract the individual from negative emotions. However, over the course of a week, they may be able to see in retrospect that they have been experiencing stress and eating more than usual. Individuals who report higher levels of attachment avoidance may also have less interoceptive awareness but these individuals tend to suppress emotion and deactivate their attachment systems and so it is predicted that attachment avoidance will not be related to emotional eating.

Attachment insecurity may be associated with a variety of potentially maladaptive eating behaviors, especially emotional eating. The current study hypothesizes that higher levels of attachment anxiety are associated with emotional eating, and that this relationship is mediated by perceived hunger.

Method

Participants

97 Rutgers University undergraduates (37 male) participated for class credit. BMI's ranged from 16-35 ($M=23.6$, $S.D. = 4.24$). The sample was ethnically diverse; 35.1% of participants reported Asian, 24.7% Caucasian, 11.3% African American, 9.3% Hispanic, 9.3% other, and 6.2% Middle Eastern. Ages ranged from 18-50 with a mean of 20.69 ($S.D. = 4.94$).

Materials

The Experiences in Close Relationships Questionnaire-Revised.

The Experiences in Close Relationships Questionnaire-Revised (ECR-r; Fraley, Waller, & Brennan, 2000), is a 36-item measure of attachment anxiety and avoidance. The ECR-r shows test-retest reliability over a three week period of $r_s=.90$ (Sibley, Fischer, & Liu, 2005). ECR-r scores explained higher levels of variance (30%-40%) of attachment related emotions for social interactions between romantic partners than for those of friends (5%-15%), providing support for validity (Sibley et al., 2005).

The Three Factor Eating Questionnaire

The Three Factor Eating Questionnaire (Stunkard & Messick, 1985) contains three subscales: *restraint*: defined as the tendency to restrict food intake (20-item), *disinhibition*: defined as the lack of ability to inhibit eating (20-item), and *hunger*: individual's perception of typical hunger level (15-item). It should be noted that in the field at large, the term "restrict" is used rather than "restraint." However, to avoid confusion, if a work being discussed specifically used the term restraint (Born, et al., 2011; Herman & Polivy, 1975; Ouwens, van Strien, & van der Staak, 2003; Stunkard & Messick, 1985), the author will also use this term for the sake of clarity in order to be consistent with the wording in the original study. Disinhibition refers to the lack of ability to control eating. The original intent of the measure was to determine the lack of ability an individual has to control his/her eating after restricting. In other words, if someone is restraining for a period of time, disinhibition refers to when they lose control and eat again, hence the term DIS-inhibit. However, as Westenheofer, Brockmann, Munch, and

Pudel (1994) found, the disinhibition measure is probably much more comprehensive. These authors found that the behavioral disinhibition effect occurs among subjects regardless of their level of restriction. Thus, the authors recommend that the scale be thought of as a measure of “susceptibility to eating problems.” The reliabilities for restraint, disinhibition, and hunger are reported as .93, .91, and .85, respectively (Stunkard & Messick, 1985). Validity is evidenced in findings that the disinhibition scale predicts weight change during depression and there are differences in responses between dieters and free eaters (Stunkard & Messick, 1985). Marcus and Wing found that scores on the disinhibition and hunger subscales correlated with binge eating severity (as cited in Stunkard & Messick, 1985).

The Binge Eating Scale

The Binge Eating Scale (BES; Gormally, Black, Daston, & Rardin, 1982) is a 16-item measure of binge eating tendencies. The BES has demonstrated two week test-retest reliability at levels of $r = .87$ (Timmerman, 1999). Scores on the BES correlate with subjective and objective binge eating measures at levels of .3 to .4, demonstrating moderate validity (Timmerman, 1999). BES scores are able to discriminate between different severity levels of binge eating (Gormally et.al., 1982). The authors characterized binge eating by behavioral (eating a large amount of food in a short period of time, eating fast, eating in secret), cognitive (unrealistic expectations for a diet, low efficacy expectations), and emotional (feeling a loss of control, feeling guilty) components. One example item was “I have the habit of bolting down my food, without really chewing it. When this happens I usually feel uncomfortably stuffed because I’ve eaten too much.”

The Emotional Eating Scale

The Emotional Eating Scale (EES; Arnow, Kenardy & Agras, 1995) is a checklist where participants check off how strong a desire they have to eat when experiencing various emotions. The EES is comprised of three subscales measuring the desire to eat when experiencing anxiety (EES-Anx), the desire to eat when experiencing depression (EES-Dep), and the desire to eat when experiencing anger/frustration (EES-Ang) with a two week test-retest reliability of $r=.79$. EES scores are significantly correlated with BES scores and not related to other measures of psychological adjustment (i.e., self-esteem), providing evidence for construct validity (Arnow et al., 1995). These authors found significant correlations between changes in EES scores and BES scores after completion of binge eating treatment, demonstrating criterion validity.

Scales measuring anorexic tendencies and bulimic tendencies

The Eating Attitudes Test (EAT; Garner & Garfinkel, 1979) and The Bulimic Investigatory Test, Edinburgh (BITE; Henderson & Freeman, 1987) measure anorexic and bulimic tendencies, respectively. Scores on the EAT significantly predict anorexic or control group membership, supporting validity (Garner & Garfinkel, 1979). The BITE scale consists of two subscales; symptom and severity. One week test-retest reliabilities of $r=.68$ and $r=.86$ were found for women with and without bulimia, respectively. Scores were able to distinguish between binge eaters and controls (Henderson & Freeman, 1987).

Results

Correlations

Attachment anxiety was significantly correlated with: binge eating ($r = .462$, $p < .001$), disinhibition ($r = .400$, $p < .001$), hunger ($r = .299$, $p < .01$), BMI ($r = .298$, $p < .01$), bulimic symptoms ($r = .392$, $p = .01$), EES-Dep ($r = .289$, $p < .01$), and EES-Anx ($r = .257$, $p < .05$), and marginally significantly correlated with EES-Ang ($r = .194$, $p = .068$). Attachment avoidance was only significantly correlated with hunger ($r = .213$, $p < .05$). A complete report of correlations can be found in Table 1.

Gender effects

When split by gender, the emotional eating measures remained significant for females but not males. Gender differences were further explored using a MANOVA. The main model demonstrated a significant Wilk's lambda ($F(3, 83) = 3.61$, $p = .02$) and significant main effect for gender and EES-Dep ($F(1, 85) = 6.61$, $p = .01$), demonstrating that females reported higher EES-Dep, but not EES-Ang or EES-Anx.

Mediation analysis

A mediation analysis was conducted to explore the relationship between attachment anxiety, hunger, and emotional eating in accordance with steps outlined by Baron and Kenny (1986). In steps 1 and 2, the predictor (attachment anxiety) is correlated with the outcome variable (emotional eating) and then the mediator (hunger). In steps 3 and 4, the predictor and the mediator are entered into the model. If there is mediation, the relationship between the predictor (attachment anxiety) and the outcome variable (emotional eating) will be diminished when the mediator is correlated with the outcome variable.

The criterion for each step of the mediation analysis was successfully met (see Figure 1). Attachment anxiety was significantly correlated with EES-Anx (step 1) and hunger (step 2). Hunger was correlated with EES-Anx (step 3). When hunger was entered into the model, the relationship between attachment anxiety and EES-Anx was diminished, demonstrating that the relationship between attachment anxiety and EES-Anx is mediated by perceived hunger (see Figure 1).

A mediation analysis was conducted for EES-Dep. Attachment anxiety was significantly correlated with EES-Dep (step 1) and hunger (step 2). Hunger was correlated with EES-Dep (step 3). Last, when hunger was entered into the model, the relationship between attachment anxiety and EES-Dep was diminished, demonstrating that the relationship between attachment anxiety and EES-Dep is mediated by perceived hunger (see Figure 1 below).

The Sobel test confirmed the mediation for EES-Dep ($t = 2.85, p = .004$) and EES-Anx ($t = 2.72, p = .007$).

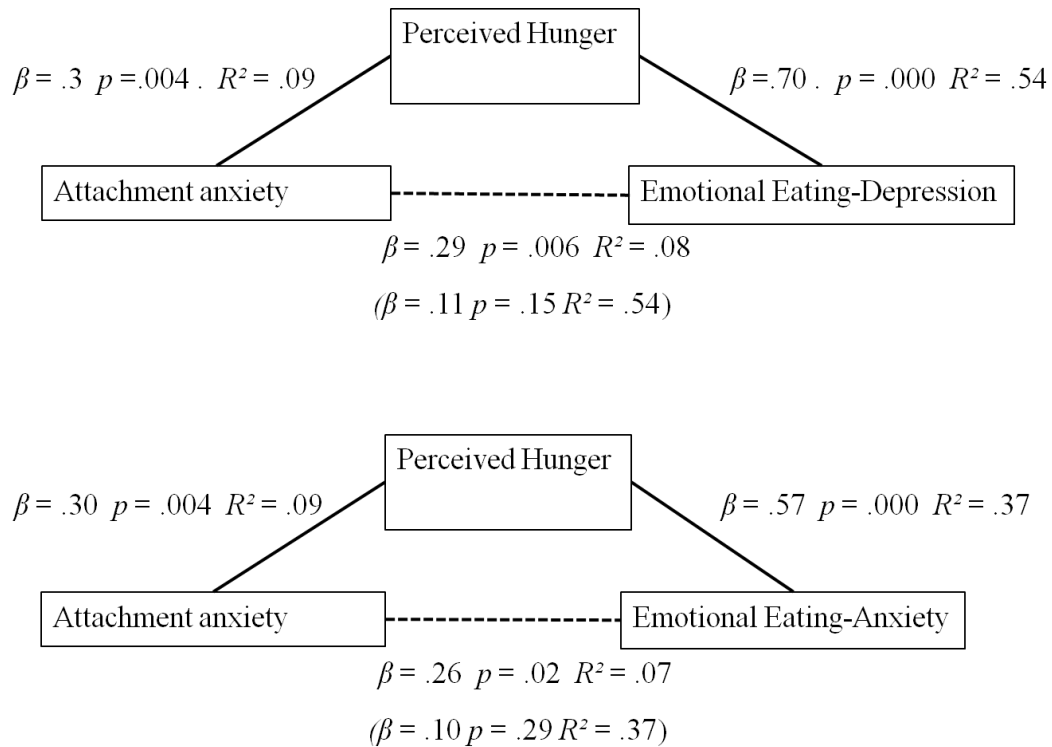


Figure 1. Mediation of the relationship between attachment anxiety and emotional eating by perceived hunger.

Discussion

The current study implicates attachment anxiety in overeating/emotional eating but not eating behaviors characterized by the restriction of food intake (anorexic tendencies). This relationship is mediated by perceived hunger, which may be better understood in terms of the psychosomatic theory of obesity. The theory posits that obese individuals eat more because they are less able to distinguish between their internal physiological signals and confuse stress with hunger (Van Strien & Ouwens, 2003; Kaplan & Kaplan, 1957). Additionally, these individuals may be eating in response to psychological perceptions of hunger. For example, these individuals may be more likely

to eat in response to external cues in the environment (eating because food is available or others around them are eating), rather than their own internal physiological sensations (Craighead, 2006). Thus, not being in tune with internal cues may predispose these individuals to be more susceptible to external environmental cues, and lead to urges to eat even when there is no biological necessity to eat. Bruch (1964) stated that the way in which parents respond to their children's needs could influence the development of their awareness of internal signals, especially if parents are insensitive or unresponsive. The article is dated, so Bruch did not explicitly write about attachment theory, but the situations and examples are similar to what lead to attachment insecurity.

No significant correlations were found between any of the overeating/emotional eating measures and attachment avoidance. Avoidant individuals tend to suppress emotion and are less likely to report emotional distress, although they show physiological signs (Diamond & Fagundes, 2010; Wei, Vogel, Ku, & Zakalik, 2005). Whether they are intentionally underreporting these emotions or unaware of them is not known. Frequent practice of suppressing emotion may lead to less emotional awareness. Like those with higher levels of attachment anxiety, they may misinterpret internal cues as hunger, hence the correlation between avoidance and hunger. However, attachment avoidance was not associated with overeating/emotional eating. Individuals higher on attachment avoidance may be less likely to overeat/emotionally eat, but there is also the possibility that they are less likely to report these behaviors. Individuals who report higher levels of attachment avoidance feel a need to extremely independent and hide vulnerabilities (Feeney, & Noller, 1996). Emotional eating may be perceived as a weakness and these individuals may be reluctant to admit any weakness to others and perhaps even themselves.

Although higher levels of emotional eating were found among females than males, males may have under-reported emotional eating because there is a cultural stereotype that emotional eating is something women do. A direct observation of eating could be employed in future studies as this study utilized self reports of emotional eating.

It could be argued that if individuals are eating emotionally because they misinterpret internal cues and incorrectly perceive that they are hungry, they should not be able to report emotional eating. However, it may be that in the moment of eating, these individuals perceive that they are hungry and are less aware they are emotionally eating, but in retrospect, they realize that they have a general tendency to eat emotionally.

This study has the major strength of demonstrating a relationship between eating behavior and attachment anxiety, an area in which there is little work. However, a limitation of this study is the use of self-report measures of eating behaviors. The task of measuring emotional eating has spurred some debate as to whether self-reported emotional eating reflects actual eating behavior. Evers, de Ridder, and Adriaanse (2009) used 4 different negative mood inductions and gave their participants a variety of foods to consume. These authors found no differences in actual eating behavior between self-reported emotional eaters and non-emotional eaters (as assessed by the Dutch Eating Behavior Questionnaire: DEBQ). However, Van Strien (2010) criticized the authors for their method of using median splits and reported that they found that emotional eaters did in fact eat more after a negative mood induction when using cut off points on the DEBQ of the highest and lowest 20% of participants. Van Strien also claimed that a central feature of emotional eaters is that during distress they continue to eat the same amount while non-emotional eaters actually eat *less* (Van Strien, 2010). Evers, de Ridder and

Adriaanse (2010) countered this claim by stating that emotional eating has typically been defined (by Van Strien) as *overeating* in response to negative events. Evers, et al.(2010) also criticize Van Strien for using extreme cut off points because these points will not generalize to other samples and this eliminates 60% of the sample. Adriaanse, de Ridder, and Evers (2011) consequently conducted a study asking participants to keep diaries of their overall snack food intake and mood. Self-reported emotional eating did not predict calorie intake during snacking episodes in general and snacking episodes accompanying negative emotions. However, restriction in eating and having a habit of eating snack foods did predict calorie intake. Although the predictions concerning emotional eating were not significant, the researchers found that emotional eating was significantly related to participants' perceived link between emotions and eating and concerns about eating. In other words, participants who worried more about eating, tried to control their eating more, ate healthy foods more often, and paid attention to what they ate, scored higher on the emotional eating scales. This debate was centered around the Dutch Eating Behavior Questionnaire, but implies that this self-report emotional eating measure may actually reflect more of a concern about eating, than objective emotional eating. The current study used the Emotional Eating Score, so it is not known for certain whether these findings would apply to the EES. None the less researchers should use caution when utilizing self-reports of emotional eating. Individuals may inaccurately perceive themselves as emotional eaters. Additionally, Allison and Heshka (1993) found that participants who tend to respond to surveys in more socially desirable ways report lower levels of emotional eating. Therefore, caution should be used when considering work utilizing

self-reports of emotional eating. Thus, future studies will directly observe eating behavior.

The nature of the study may have increased the chances of demand characteristics or response sets. However, precautions were taken to prevent these issues such as the experimenter not being in the room, the inclusion of reverse scored questions, and emphasizing that the questionnaires were anonymous. Still, an experimental approach to this topic will be valuable.

In summary, higher levels of attachment anxiety are associated with emotional eating, and this is mediated by perceived hunger. Perhaps attachment anxiety leads to a tendency to misinterpret internal cues, and individuals perceive hunger when they actually desire something else. Using this social/emotional framework may provide a unique perspective and solution.

Table 1

	Attachment Anxiety	Attachment Avoidance
Binge Eating Scale (BES)	$r = .462^{***}$	$r = -.013$
Three Factor Eating Questionnaire (TFEQ)—Restraint	$r = -.091$	$r = -.121$
Three Factor Eating Questionnaire (TFEQ)—Hunger	$r = .299^{**}$	$r = .213^*$
Three Factor Eating Questionnaire (TFEQ)—Disinhibition	$r = .400^{***}$	$r = .061$
Eating Attitudes Test (EAT)	$r = .129$	$r = .027$
Bulimic Investigatory Test-Edinburgh (BITE)—Symptoms	$r = .392^*$	$r = -.090$
Bulimic Investigatory Test-Edinburgh (BITE)—Severity	$r = .011$	$r = .025$
Emotional Eating Scale (EES)—Anxiety	$r = .257^*$	$r = .080$
Emotional Eating Scale (EES)—Depression	$r = .289^{**}$	$r = .156$
Emotional Eating Scale (EES)—Anger/Frustration	$r = .194$	$r = .059$

Correlations between attachment anxiety and avoidance and various eating measures

* $p < .05$, ** $p < .01$, *** $p < .001$

Study 2

In Study 1, a positive relationship was found between attachment anxiety and self-reported emotional eating. Individuals who reported higher levels of attachment anxiety tended to report higher levels of overeating and emotional eating. However, the previous study used self-report measures of emotional eating; it would be valuable to induce an actual emotional eating episode and measure amount of food eaten among individuals who report higher levels of attachment anxiety. In the current study, a negative event was chosen that would be especially impactful for individuals who report higher levels of attachment anxiety. Ostracism is a useful paradigm for studying emotional eating because it is a stressful and threatening event that relates to social needs and is likely to activate the attachment system (Zadro, et al., 2004). Baumeister, DeWall, Ciarocco, and Twenge (2005) conducted six experiments demonstrating that social exclusion (specifically, being told that no one wants to work with them or they will have a lonely future) led to various impairments in self-regulation including eating more unhealthy food, and drinking less of a healthy but bad tasting beverage. Oaten, Williams, Jones and Zadro (2008) found that participants who were made to feel ostracized during a game of “cyberball” ate more cookies than included (not-ostracized) participants. Furthermore, participants high on social anxiety continued to eat at the same level at time 2 (45 minutes after the ostracism) while the eating of participants low on social anxiety decreased from time 1 to time 2. The effect of negative events on self-regulation is furthered demonstrated in a second experiment by the same authors. Participants were given a poor tasting vinegar beverage and told that it was good for them. The experimenters measured how much each participant drank. Ostracized participants drank

significantly less of the drink than included participants, suggesting that the ostracized participants engaged in less self-regulation. Additionally, from time 1 to time 2, the ostracized participants drank more of the beverage, indicating that their self-regulation improved as the time from the ostracism increased. As in the first study, participants high on social anxiety did not demonstrate this improvement in self-regulation from time 1 to time 2.

There has been some attempt to distinguish between the terms ostracism, exclusion, and rejection. Ostracism has been explored in terms of the consequences that occur after being ignored over time (minutes to days). Exclusion is defined as being alone and not included, but may or may not involve explicit rejection (Williams, 2007). The key distinction is the relational value, or how important the individual perceives they are in the eyes of another. If the perceived relational value is lower than the level the individual desires, the person would perceive that they were rejected (Williams, Ogas, & Von Hippel, 2005). For example, if an individual cannot fit into a crowded elevator, they would not be included, but whether or not they felt rejected would depend upon whether his/her perceived relational value was above or below their desired criteria. If the individual could not fit into the crowded elevator but did not feel as though his/her relational value was lowered below what they desire, they would not experience rejection. In this same vein, an individual might feel rejected, even when objective exclusion has not occurred (Williams, et al., 2005). Despite these attempts to define and segregate the constructs, Williams (2007) suggests that since there is no empirical evidence to support that differences in these definitions lead to different outcomes, the terms can be used interchangeably (Williams, 2007).

Ostracism is extremely aversive and lowers the four basic needs (belonging, control, self-esteem, and meaningful existence; Williams, Forgas, & von Hippel, 2005). Ostracism is also very powerful. People still experience the negative effects of ostracism (lowering of the basic needs) even if they know that those ostracizing them are just computer generated individuals (Zadro, Williams, & Richardson, 2004). Additionally, people still feel negatively even if they are ostracized by out-groups they dislike, for example, the KKK (Gonsalkorale & Williams, 2007). It can be easily created in the laboratory with a computerized game of catch called “cyberball.” In this game, participants are made to feel ostracized by not being thrown the ball (Williams & Jarvis, 2006). Given that ostracism is such an aversive experience, impairs self regulation, and has a higher impact on the socially anxious, it would make sense that individuals who report higher levels of attachment anxiety would be more likely to eat comfort food after ostracism, particularly food high in fat and calories. Most people prefer comfort foods that are high in fat and calories over healthier foods (Wansink & Cheney, 2003). Attachment anxiety is positively associated with social anxiety and sensitivity to social rejection (Aderka, Weisman, Shahar & Gilboa-Schechtman, 2009; Ronan & Baldwin, 2010) Ostracism should therefore be particularly effective for individuals who report higher levels of attachment anxiety.

Study 1 also provided evidence to justify exploring dimensions of attachment anxiety and avoidance rather than categories of attachment style. There are multiple advantages to using dimensions of attachment rather than placing participants in categories. Attachment insecurity is a dimensional construct and thus partitioning the construct into categories can be problematic (Scharfe & Bartholomew, 1994; Fraley

& Waller, 1998; Feeney & Noller, 1996). For example, individuals who score high on a dimension would be included in the same category as individuals who score moderately on a dimension or there is a chance that an individual who scores on the boundary of two classifications could be given either category label based on measurement error. Fraley and Waller (1998) assert that categorical measures are also less stable, not because the underlying construct of attachment is unstable but because partitions are being forced onto a dimensional construct. Using categories also decreases statistical power because some categories are less common and fewer participants qualify for that category. Analyzing attachment as a dimensional construct creates more stability, reliability, validity, and statistical power (Scharfe & Bartholomew, 1994; Fraley & Waller, 1998).

There is also a theoretical reason to believe that the dimension of attachment anxiety would be related to emotional eating rather than the dimension of attachment avoidance. Individuals who report higher levels of attachment anxiety tend to rely on hyperactivating strategies of emotion regulation, characterized by emotional reactivity. Individuals who report higher levels of attachment avoidance rely on deactivating strategies of emotion regulation, characterized by suppression of emotions (Mikulincer, Shaver, & Pereg, 2003). Because individuals who report higher levels of attachment anxiety are characterized by more approach type behavior (more expression of their attachment needs and actively seek extreme proximity to attachment figures when in distress) and individuals who report more attachment avoidance tend to suppress their attachment needs and distance themselves from attachment figures when in distress, there is reason to believe that individuals who report more attachment anxiety would turn to an external source for comfort (Mikulincer & Shaver, 2003). Importantly, these predictions

were supported in Study 1, where effects of eating were found within the dimension of attachment anxiety and not attachment avoidance. Since significant effects were found only within the attachment anxiety dimension and not the attachment avoidance dimension, it would be most appropriate to continue to analyze results using dimensions of attachment.

Condition (ostracized, included) and attachment anxiety are expected to predict the amount of food eaten, particularly unhealthy food (potato chips). Another variable may also play an important role, namely the behavioral trait of disinhibition. Disinhibition was developed as part of the Three Factor Eating Questionnaire (Stunkard & Messick, 1985). The original intent of the measure was to determine the lack of ability an individual has to control his/her eating after restricting. In other words, if someone is restricting for a period of time, disinhibition refers to when they lose control and eat again, hence the term DIS-inhibit. However, as Westenheofer, Brockmann, Munch, and Pudel (1994) found, the disinhibition measure is probably much more comprehensive. These authors found that the behavioral disinhibition effect occurs among subjects regardless of their level of restriction. Thus, the authors recommend that the scale be thought of as a measure of “susceptibility to eating problems.”

Disinhibition is also closely linked to emotion regulation as both are forms of self-control. Negative emotion can lead to failures in self-control when one does not have the resources to exercise self-control (for example: feeling bad, eating a cookie) (Herman & Polivy, 1975; Baumeister, Bratslavsky & Tice, 1998; Baumeister, DeWall, Ciarrocco, & Twenge, 2005). Additionally, the methods an individual chooses to regulate emotion may involve a failure of self-control (an individual on a diet eats a cookie to feel better

when in a bad mood) (Tice & Bratslavsky, 2000; Tice, Bratslavsky, & Baumeister, 2001). Therefore, disinhibition may also predict emotional eating and interact with attachment anxiety. Individuals who report higher levels of disinhibition are predisposed to an inability to control their eating. Individuals who report higher levels of attachment anxiety are prone to maladaptive strategies for emotion regulation. Therefore, a highly negative situation will likely induce emotional eating for an individual who has trouble regulating both emotion and eating. In the current study, individuals who report higher levels of attachment anxiety are hypothesized to eat more after experiencing ostracism and to eat more high caloric foods.

Method

Participants

Rutgers undergraduates participated (N=72, 28 male). The sample was ethnically diverse, with, 22.2 % of participants identifying as other/mixed 19.4 % Black/African American, 19.4 % Asian, 19.4 % Hispanic/Latino, 16.7 % White, and 2.8 % Arab American. BMI's ranged from 17-48 with a mean of 25.38 (S.D. =5.65). Ages ranged from 18-66 with a mean of 21.7 (S.D.=7.95).

Procedure

In prescreening, participants completed the Experiences in Close Relationships Questionnaire-Revised (ECR-R) and the disinhibition subscale from the Three Factor Eating Questionnaire (See Study 1). Upon arrival to the lab, participants were asked to read and sign an informed consent which described the cover story; that the aim of the study was to explore the effects of hunger on video game performance. Thus, participants

were asked not to eat for 2 hours prior to arrival at the lab. Participants were told that they would be playing a video game against students in other labs and asked if they would mind having their picture uploaded in the game. In the game, “Cyberball,” (Williams & Jarvis, 2006) ball tosses occur between the participant and other players (the other players are computer generated). The game begins with all the players tossing the ball to each other and after each player receives the ball twice, the other two players stop throwing the ball to the participant. The effect is that the participant is made to feel temporarily ostracized. In the control (included) group the ball is tossed to the participant an equal number of times as to the other players. Immediately after finishing cyberball, participants were asked to complete a measure of state attachment security (Luke, Carnelley, & Sedikides, 2006, *unpublished*) and state anxiety (Egloff & Schmukle, 2002; Schmukle & Egloff, 2004). Then, the experimenter brought the participant bowls of carrots, saltines, potato chips, and a bottle of water. Participants were told that they could eat since they did not eat before the experiment while the experimenter left to tally the scores of the video game. The experimenter returned in 8 minutes and gave the participants a questionnaire regarding their feelings about cyberball (Zadro, et al., 2004). After the participant completed the questionnaires (8-10 minutes), the experimenter asked if they could weigh the participants and measure their height for demographic purposes. Finally, participants were given a debriefing statement (which included the information to the counseling center should they need it), told that the other players were not real, and the true hypothesis of the study.

Results

Manipulation Check

The ostracism manipulation was effective; ostracized participants perceived themselves to receive the ball significantly less (on average 3.7 times) than included participants (on average 10 times) ($t(32.7)=8.11, p=.000$). Ostracized participants felt significantly less accepted and more rejected than included participants: $t(70)=7.58, p=.000, t(70)=4.97, p=.000$). Additionally ostracized participants felt a significantly lower level of belonging ($t(59)=7.60, p=.000$), self-esteem ($t(60)=4.30, p=.000$), meaningful existence ($t(58)=6.13, p=.000$), and control ($t(70)=5.50, p=.000$). The average reported believability of the game was 4.88 on a scale of 1 (not at all) to 9 (very much so). There were no significant differences in believability between the ostracized ($M=4.16$) and control ($M=5.71$) groups ($t(28)=1.70, p=.10$). No significant differences were found between the ostracized group and control group for state anxiety ($t(60)=-.463, p=.65$) or state attachment ($t(69)=-.892, p=.38$).

Main Results

The overall design of this study was 2 x 2 in which the predictors were condition (ostracized, included) and attachment anxiety (high/low). Attachment anxiety was analyzed as a continuous variable. Condition was a categorical variable and was dummy coded. The dependent variable of interest was amount of food eaten (a continuous variable measured in grams). Moderated multiple regressions were expected to discover main effects for condition and attachment anxiety (model 1) and a significant interaction of condition and attachment anxiety (model 2) in which individuals with higher levels of attachment anxiety in the ostracized condition would eat more. The interaction term was

created by multiplying condition and attachment anxiety. Standardized scores were used for each food item because the distributions were skewed. Other variables of interest were disinhibition (continuous), attachment avoidance (continuous), the four fundamental needs (continuous), and gender (categorical, dummy coded: male/female).

Attachment anxiety and avoidance were significantly correlated with disinhibition ($r=.30, p=.01$; $r=.33, p=.005$). Since attachment anxiety and avoidance were also significantly correlated ($r=.64, p=.000$) and a correlation between attachment avoidance and disinhibition was unexpected a moderated multiple regression was conducted to determine if attachment anxiety and avoidance predict disinhibition or interact. Model one was significant ($F(3,102)=5.35, p=.002$) and there was a main effect for attachment anxiety ($t=3.03, p=.003, \beta=1.09$), but not attachment avoidance ($t=1.32, p=.19, \beta=.47$). There was not a significant interaction effect ($t=-.11, p=.91, \beta=-.03$). Thus, the relationship between attachment avoidance and disinhibition is probably driven by attachment anxiety, since attachment avoidance did not predict disinhibition when controlling for attachment anxiety. Attachment anxiety was also correlated with control among ostracized participants ($r=.37, p=.03$). Attachment avoidance was correlated with state attachment among ostracized participants ($r=.36, p=.04$). For a complete list of correlations for attachment anxiety and avoidance see Table 2.

Amount of potato chips eaten was regressed onto condition and attachment anxiety. Model one was not significant ($F(2,69)= 1.14, p=.33, R^2=.004$) and model two was not significant ($F(1,66)= .37, p=.55, R^2\text{change}= .005$). Amount of carrots eaten was regressed onto condition and attachment anxiety. Model one was not significant ($F(2,68)= 1.30, p=.28, R^2= .008$) and model two was not significant ($F(1,65)= .07, p=.80$).

, R^2 change=.001). These analyses were repeated by standardizing the amount of food eaten by BMI (body mass index) and this did not yield any significant results. These analyses were also repeated using attachment avoidance as a predictor and did not yield any results.

Another set of moderated multiple regressions were conducted including disinhibition as a predictor. Amount of potato chips eaten was regressed onto condition, attachment anxiety, and disinhibition. Model one was significant ($F(3,69)= 3.21, p=.03, R^2= .09$) and demonstrated significant main effects of attachment anxiety ($t= 2.36, p=.02, \beta= .23$) and disinhibition ($t= -2.67, p=.01, \beta= -.11$). Model two and Model three were not significant. Attachment anxiety was a significant predictor of potato chips eaten, when controlling for disinhibition. Disinhibition negatively predicted amount of potato chips eaten. Condition, attachment anxiety, and disinhibition did not significantly interact.

Gender was included in the above model. There was main effect of gender in that males tended to eat more than females ($t=-3.70, p=.000$) and there was also a significant interaction of disinhibition and gender ($t= 2.40, p=.02, \beta=.47$), in that males who reported higher levels of disinhibition tended to eat significantly less than males who reported lower levels of disinhibition ($t= -2.75, p=.008$) (See Figure 2 below).

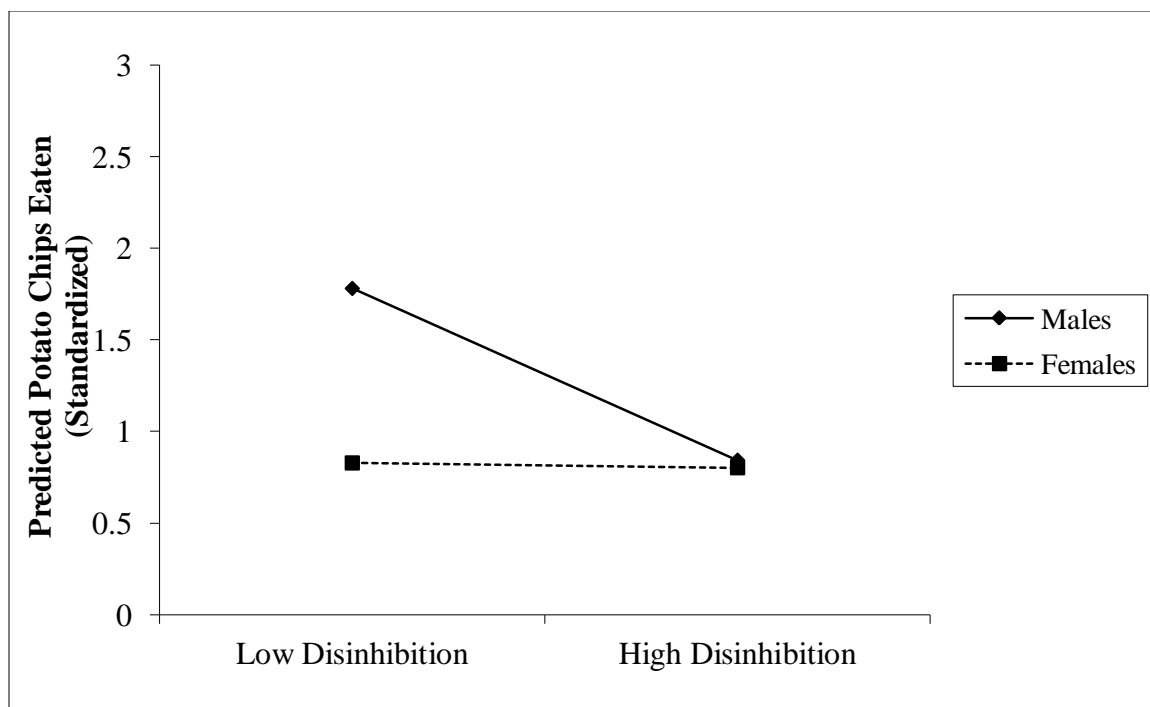


Figure 2. Interaction of disinhibition and gender on amount of potato chips eaten. Males who report higher levels of disinhibition tend to eat less potato chips than males who report lower levels of disinhibition.

It is possible that the reason why condition and attachment anxiety did not significantly interact is because of a floor effect in that the four fundamental needs of individuals who reported higher levels of attachment anxiety are already so low they cannot be lowered. To address this, a moderated multiple regression was performed to determine the effects of attachment anxiety and condition on the four fundamental needs. There was no main effect of attachment anxiety or a significant interaction between condition and attachment anxiety.

Amount of carrots eaten was regressed onto condition, attachment anxiety, and disinhibition. Model one was not significant ($F(3,68) = 2.10$, $p = .10$, $R^2 = .09$) and there

were no significant effects of attachment anxiety ($t = -.70$, $p = .50$, $\beta = -.07$) or disinhibition ($t = -1.90$, $p = .06$, $\beta = -.08$). Model two and Model three were not significant and there were no significant two or three way interactions.

Amount of crackers eaten was regressed onto condition, attachment anxiety, and disinhibition. Model one was significant ($F(3,69) = 3.01$, $p = .04$, $R^2 = .12$) and demonstrated a significant main effect of disinhibition ($t = -2.86$, $p = .01$, $\beta = -.11$). Model two and three were not significant and there were no significant two or three way interactions. Disinhibition negatively predicted amount of crackers eaten.

All of the above analyses were repeated using attachment avoidance as a predictor and did not yield any significant results.

Discussion

As predicted, there is a relationship between attachment anxiety and eating. Attachment anxiety is a significant predictor of potato chip consumption when controlling for disinhibition. Additionally, attachment anxiety only predicted unhealthy food consumption (potato chips) and not healthy food consumption (carrots). As in Study 1, food consumption was not related to attachment avoidance. However, there was no main effect of condition, i.e. ostracism did not predict emotional eating or interact with attachment anxiety. This is interesting because other studies have found a general effect of ostracism leading to increased eating. Although the ostracism manipulation did lower the four fundamental needs in comparison to included individuals, ostracism did not have any effect on eating behavior. Perhaps a stronger experience of ostracism is needed to affect eating behavior. In the current study, participants reported only moderate levels of

believability. Even though participants do not have to believe the cyberball game in order to be affected in terms of the four fundamental needs (Zadro, et al., 2004), perhaps increasing the believability will make the ostracism strong enough to affect eating behavior. Future studies will increase the believability of the cyberball manipulation by making a pretend phone call at the beginning of the game to the “other lab” as a way to increase the believability and perhaps the strength.

This study also revealed some perplexing results: namely, the negative relationship between disinhibition and food eaten. This relationship appears to be driven by gender in that males who reported higher disinhibition scores consumed fewer potato chips than males who reported lower disinhibition scores. This was not the case for females. It is interesting that this effect was found for males and not females. There is no obvious explanation, but one influencing factor may be that both experimenters in this study were female. This may have had some influence on males with higher disinhibition scores. Perhaps individuals who score high on the disinhibition measure are very aware that they have this trait (the measure was self-report, so they would need to be aware in order to report it), and therefore, in general, they may put more effort into controlling what they eat when not in the privacy of their homes because eating is a private behavior and there is stigma surrounding overeating. However, a number of measures were taken to eat as they normally would at home. Participants were not aware that the food was a part of the experiment, so it is unlikely that their behavior was motivated by knowledge that what they ate would be monitored and measured. Additionally, the experimenter was not in the room when the participants were eating. Disinhibition was measured in pre-screening and participants did not know that the scale would have anything to do with

this particular study, so it is unlikely that the act of filling out the questionnaire would have influenced their behavior. Interestingly, even though disinhibition was negatively correlated with the amount of food eaten, it was positively correlated with BMI ($r=.31$, $p=.01$). Still, males with higher disinhibition scores may not have felt completely comfortable simply because they were not at home or because they were participating in an experiment conducted by a female experimenter and it is possible that this may have increased how much they monitor their behavior.

Of much interest is the fact that attachment anxiety predicted unhealthy food consumption (potato chips) and not healthy food consumption (healthier defined as being lower in fat and calories). Perhaps, even though there was no interaction with ostracism, individuals with higher levels of attachment anxiety were still eating for comfort. Individuals who report higher levels of attachment anxiety are more sensitive to rejection and more socially anxious (Aderka, et al., 2009; Ronan & Baldwin, 2010). The ostracism manipulation may not have been salient because these individuals may expect and perceive rejection wherever they go. Thus, being ostracized to a low degree was expected and being included may not have been effective enough. Individuals who reported higher levels of attachment anxiety who were included may have downplayed the inclusion or not noticed it. Therefore, individuals who reported higher levels of attachment anxiety may have been eating for comfort, because any social situation is somewhat distressing and threatening. The higher fat and calorie potato chips may have been perceived as more of a comfort food than the carrots or saltines. Wansink, Cheney, and Chan (2003) found that 60% of their total sample preferred unhealthy snack foods as comfort foods and 23% of their total sample reported potato chips as their favored comfort food. Thus, unhealthy

foods are more likely to be considered comfort foods and potato chips are a popular comfort food. Individuals who report higher levels of attachment anxiety use hyperactivating strategies of emotion regulation (over reacting to distress, vigilantly seeking extreme proximity to attachment figures) (Mikulincer, 2007). Given that these individuals use external sources for comfort and over react to distress, they are expected to be more likely to turn to emotional eating as a coping strategy. Individuals eat emotionally as a coping strategy, to feel better, and for comfort (Wansink, et al., 2003; Tice, et al., 2001; Spoor, et al., 2007). It is probable that individuals who report higher levels of attachment anxiety are eating more potato chips because they experience a greater desire for comfort food after a perceived stressful social situation.

One reason that condition and attachment anxiety did not interact to predict potato chips eaten could be that the four fundamental needs of individuals who report higher levels of attachment anxiety were already too low to be lowered any further. However, this is unlikely because there were no correlations between attachment anxiety and any of the four fundamental needs (with or without controlling for condition). Additionally, attachment anxiety did not interact with condition to predict decreases in the four fundamental needs.

The ostracism manipulation did not affect state attachment. This may be a result of the wording of the questions. The questions were targeted at how the participant felt about the other players in the game. Considering that the participants were fairly removed from the other players, it would make sense that they did not feel loved or comforted by them whether or not they were ostracized. Future studies will use a different measure, the State Adult Attachment Measure (SAAM; Gillath, Hart, Nofle, & Stockdale, 2009).

This scale questions participants on how they feel in general, not towards a specific person, which may be more appropriate. The SAAM also has subscales for attachment security, anxiety and avoidance.

In sum, this study provided empirical evidence that individuals with higher levels of attachment anxiety eat more unhealthy food, but not healthy food, when controlling for disinhibition. This effect was not moderated by condition or disinhibition.

Table 2

PRESCREENING	Attachment Anxiety	Attachment Avoidance
Disinhibition	$r = .30^{**}$	$r = .33^{***}$
BMI	$r = .12$	$r = .000$
Attachment Anxiety	--	$r = .64^{***}$

OSTRACIZED	Attachment Anxiety	Attachment Avoidance
Potato Chips	$r = .24$	$r = .004$
Carrots	$r = -.13$	$r = -.17$
Saltines	$r = -.04$	$r = -.06$
Belonging	$r = .13$	$r = .13$
Meaningful Existence	$r = .12$	$r = .07$
Self Esteem	$r = .11$	$r = .03$
Control	$r = .37^*$	$r = .10$
State Anxiety	$r = .15$	$r = .36^*$
State Attachment Security	$r = -.05$	$r = -.15$
INCLUDED	Attachment Anxiety	Attachment Avoidance
Potato Chips	$r = .11$	$r = .004$
Carrots	$r = -.21$	$r = -.17$
Saltines	$r = .12$	$r = -.06$
Belonging	$r = -.03$	$r = -.08$
Meaningful Existence	$r = .04$	$r = -.15$
Self Esteem	$r = .07$	$r = -.17$
Control	$r = -.08$	$r = -.13$
State Anxiety	$r = .04$	$r = .23$
State Attachment Security	$r = .19$	$r = .01$

Correlations between attachment anxiety, avoidance, and dependent variables.

$*p < .05$, $**p < .01$, $***p < .001$

Study 3

Studies 1 and 2 suggest that individuals who report higher levels of attachment anxiety are particularly susceptible to emotional eating and eating unhealthy food. In general, individuals eat emotionally for a variety of reasons: affect regulation (Tice, et al., 2001), fulfillment of higher needs, i.e., social needs or the need to belong (Troisi & Gabriel, 2011; Timmerman & Acton, 2001), comfort (Wansink & Cheney, 2003), or as a result of maladaptive coping styles (Spoor et al., 2007).

The current study used ostracism to create a negative experience to induce emotional eating and explore underlying mechanisms of this relationship. Ostracism did not affect eating behavior in Study 2 but did have other effects, such as lowering the four fundamental needs. Even though in Study 2 the ostracism manipulation successfully created the experience of ostracism, perhaps a stronger experience was needed to impact eating behavior. In an effort to increase the strength of the ostracism manipulation in the current study, the believability was increased. At the beginning of the game, the experimenter called the “other lab” where the “other students” were playing to make sure they were ready to start. Thus, the ostracism manipulation was still included in the current study.

Ostracism may have a severe impact upon those with higher levels of attachment anxiety. For example, the anxiously attached may experience more affect to regulate, may have depleted needs or increased desire to fulfill needs, increased need for comfort or be more likely to use maladaptive coping skills leading to emotional eating. Mood and the ability to regulate mood may be particularly relevant for individuals who report

higher levels of attachment anxiety due to their hyper-activating strategies of emotion regulation (Mikulincer & Florian, 1998). Hyper-activating strategies are characterized by distress and over reacting to distressing events (Mikulincer, Shaver, & Pereg, 2003). The four fundamental needs (belonging, control, self-esteem, and meaningful existence) are lowered among ostracized individuals (Zadro, et al., 2004; Smith & Williams, 2004; Gonsalkorale & Williams, 2007), but since anxiously attached individuals are more sensitive to rejection and more socially anxious, their four needs may be more sensitive to fluctuations (Ronan & Baldwin, 2010; Aderka, et al., 2009). Thus ostracism may impact individuals who report higher levels of attachment anxiety in a number of ways. Although global models of attachment security and insecurity are fairly stable over the lifespan of an individual, state attachment can fluctuate over short periods of time, even on a daily basis or in conjunction with certain events (Zhang, 2009; Davila & Sargent, 2003). Thus, it is possible that ostracism can also affect state attachment anxiety levels.

The current study hypothesizes that reports of positive and negative affect, rejection sensitivity, state attachment anxiety, and emotion regulation skills will be important underlying mechanisms of the relationship between attachment anxiety and eating after ostracism. The specific predictions of this study are that the relationship between global attachment anxiety and changes in negative and positive affect from before to after cyberball, higher levels of rejection sensitivity, changes in state attachment anxiety from before to after cyberball, and higher levels of emotional reactivity should be moderated by condition (ostracized or included) in that participants who are both ostracized and report higher levels of attachment anxiety are expected to report higher levels on these measures than included participants who report lower levels of attachment

anxiety. Additionally, a significant positive relationship between attachment anxiety and the consumption of potato chips is expected, but not for carrots. This relationship is expected to be moderated by condition. Last, positive and negative affect, state attachment anxiety, rejection sensitivity, and emotional reactivity may mediate the relationship between attachment anxiety and consumption of potato chips among ostracized participants.

Method

Participants

Rutgers undergraduates participated in this study ($N=103$, 38 male). Ages ranged from 17 to 52 ($M=21$, $SD=4.79$). BMI ranged from 18-40 ($M=26$, $SD=4.60$). The sample was ethnically diverse, with, 24.3 % participants identifying as Asian/Asian-American, 22.4 % Hispanic/Latino/a, 19.6 % Black/African-American, 15% White (not Hispanic), 11.2 % Middle Eastern/Arabic/Persian, and 6.5 % Other/Mixed.

Procedure

Levels of global attachment avoidance and attachment anxiety using the Revised Experiences in Close Relationships (Fraley, Waller & Brennan, 2000) and disinhibition in eating (Stunkard & Messick, 1985) were assessed in prescreening. Upon arrival to the lab, participants were asked to read and sign an informed consent. Participants were told that the aim of the study was to explore the effects of hunger on video game performance, and asked not to eat for two hours prior to arrival at their appointment. Participants were first asked to complete three questionnaires measuring positive and negative affect using the PANAS (Watson D., Clark, L.A., & Tellegen, A., 1988), state attachment using the

State Adult Attachment Measure (SAAM; Gillath, Hart, Nofle, & Stockdale, 2009), and self esteem using the Rosenberg's Self-Esteem Scale (Rosenberg, 1965). Participants played cyberball in accordance with the same procedures as in previous studies (Williams & Jarvis, 2006). After finishing cyberball, participants were asked to complete the PANAS, SAAM, and two additional surveys; emotion regulation skills were measured using the Differentiation of Self Inventory (DSI; Skowron, and Friedlander, 1998) and rejection sensitivity was measured using the Rejection Sensitivity Questionnaire (RSQ; Downey & Feldman, 1996). These surveys were administered after cyberball so that the ostracism would be most salient and differences between the ostracized and included groups in emotional reactivity, affect, state attachment anxiety, and rejection sensitivity could be optimally captured. Participants received food under the guise of a snack since they could not eat for two hours. The food consisted of potato chips, saltines and carrots. Participants were told that they could eat since they did not eat beforehand. After 8 minutes, the experimenter returned with three final questionnaires measuring feelings about the cyberball experience (Zadro, et al., 2004), the PANAS, and preferences and liking of the food, after which the experimenter debriefed the participant.

Measures

The Positive and Negative Affect Scale.

The Positive and Negative Affect Scale is a 20 item measure of two primary dimensions of mood, i.e. positive and negative affect (Watson, et al., 1988). The PANAS addresses broad dimensions of affect rather than specific moods or emotions. This scale was chosen because there were no predictions concerning specific emotions and mood

and the goal was to measure the effects of ostracism on the broad dimensions of positive and negative affect. Additionally, scales addressing specific mood and emotion states do not address the entire domain of negative and positive mood (Ekkekakis, 2012). The positive and negative affect scales are not necessarily correlated or opposites. They are two separate dimensions. Watson, et al., (1988) reported internal reliability coefficients for the positive and negative affect scales of .89 and .85 respectively. The test-retest reliability coefficients over 8 weeks for the positive and negative affect scales were .54 and .45, respectively. The positive and negative affect scales also correlate with other mood measures, lending support for validity (Watson, et al., 1988).

The State Adult Attachment Measure.

The SAAM is a 21 item measure of security, anxiety, and avoidance dimensions of attachment (Gillath, et al., 2009). Attachment security is negatively and moderately correlated with attachment anxiety and avoidance whereas attachment anxiety and avoidance are mostly independent. Three dimensions are used because there is evidence that state attachment security may be an independent dimension (Gillath, et al., 2009). Additionally, Gillath, et al. (2009) found that their data best represent a three factor structure. These authors reported test-retest reliability coefficients over a period of three months of .51 for anxiety, .53 for avoidance, and .59 for security. These reliability measures are similar to other state variable measures and lower than other trait variable measures, thus demonstrating the appropriateness of using the SAAM to test fluctuations in attachment. These authors also report internal reliability coefficients ranging from .83 to .87. The SAAM scores are correlated with related measures, for example ECR-R scores, and not correlated with less related measures, for example relationship

satisfaction, providing support for convergent and discriminant validity. The SAAM also captures fluctuations in state attachment after security primes when controlling for self esteem and positive mood (Gillath, et al., 2009).

The Differentiation of Self Inventory.

Two subscales of the Differentiation of Self Inventory were used to assess emotion regulation ability: the emotional reactivity scale (11 items) and the emotional cutoff scale (12 items) (Skowron & Friedlander, 1998). These two subscales have been used as indexes of hyperactivating and deactivating strategies of emotion regulation and found to mediate the relationship between attachment insecurity and negative affect (Wei, Vogel, Ku, and Zakalik, 2005). Skowron & Friedlander (1998) define differentiation of self as “the degree to which one is able to balance (a) emotional and intellectual functioning and (b) intimacy and autonomy in relationships.” These authors report reliability coefficients for the emotional reactivity scale and emotional cutoff scale of .87 and .79 respectively. Emotional reactivity and emotional cutoff were shown to be related to greater symptomatic distress and emotional cutoff was related to less marital satisfaction, supporting the validity of the measure.

The Rejection Sensitivity Questionnaire.

The RSQ is an 18 item measure of sensitivity to rejection (Downey & Feldman, 1996). Participants are given a list of 18 brief scenarios (You ask someone in one of your classes to coffee) and for each one are asked “How concerned or anxious would you be about the outcome of this situation” and “How likely do you think it is that the other person would respond in an accepting fashion?” Downey and Feldman (1996) report an

internal reliability coefficient of .83 and test-retest reliabilities (2-3 weeks) ranging from .78 and .83 for two different samples. RSQ scores predicted the amount of rejection an individual would feel in an ambiguous rejection situation. RSQ scores also predicted how insecure an individual would feel in a romantic relationship and was negatively associated with relationship satisfaction, providing support for validity of the scale (Downey & Feldman, 1996).

Self-Esteem.

The Rosenberg Self Esteem Questionnaire (Rosenberg, 1965) is a ten item measure of self esteem. The scale has been found to have high test-retest reliability (two weeks) of .85 (Silber & Tippet, 1965). Silber and Tippet (1965) also provide evidence to support convergent and discriminant validity.

Support for reliability and validity of the ECR-R and disinhibition scales are reported in Study 1.

Results

Manipulation check

T-tests were performed to confirm the effectiveness of the cyberball manipulation. Individuals in the ostracized condition perceived that the ball was tossed to them significantly less ($t(57) = -7.13, p < .000$), and felt significantly more rejected ($t(101) = 9.20, p < .000$), and less accepted ($t(90) = -9.02, p < .000$). Thus, the manipulation was successful. Ostracized participants reported significantly lower levels of belonging ($t(101) = -9.25, p < .000$), control ($t(101) = -7.85, p < .000$), self esteem

($t(82) = -6.56, p < .000$), and meaningful existence ($t(101) = -7.96, p < .000$). On average, individuals in the ostracized condition found cyberball to be significantly less believable ($M=4.44$) than those in the included condition ($M= 5.63; t(99) = -2.23, p = .03$).

Main Results

This study consisted of a 2 x 2 design in which the predictor variables were global attachment anxiety (high/low) and condition (ostracized and included). Global attachment anxiety was analyzed as a continuous variable and condition as a categorical variable which was dummy coded. Moderated multiple regressions were predicted to discover main effects of global attachment anxiety, condition (model 1) and the interaction of global attachment anxiety and condition (model 2) on the dependent measures. The dependent variables of interest were amount of food eaten, emotion regulation skills (subscales: emotional cutoff and emotional reactivity), rejection sensitivity, state attachment (subscales: security, anxiety, and avoidance), and affect (subscales: positive and negative). All the dependent variables of interest were analyzed as continuous variables. Other independent variables were attachment avoidance (continuous), disinhibition (continuous), the four fundamental needs (continuous), and self esteem (continuous).

As in Studies 1 and 2, attachment anxiety was correlated with disinhibition ($r = .35, p = .000$). Attachment avoidance was also correlated with disinhibition ($r = .25, p = .01$), but as in Study 2, this correlation was no longer significant when controlling for attachment anxiety ($r = .10, p = .28$). Attachment avoidance was also correlated with BMI

($r = .21, p = .04$). Attachment anxiety and avoidance were both negatively correlated with self esteem ($r = -.34, p = .001$; $r = -.27, p = .01$). In the ostracized condition attachment anxiety and avoidance were negatively correlated with self esteem (measured as part of the four fundamental needs after cyberball) ($r = -.33, p = .02$; $r = -.31, p = .03$). In the included condition, attachment avoidance was negatively correlated with belonging ($r = -.28, p = .04$). A complete list of correlations for attachment anxiety and avoidance can be found in Table 3.

Eating Behavior

A moderated multiple regression was conducted to explore eating behavior after ostracism. Amount of potato chips eaten was regressed onto condition and attachment anxiety. Model one was not significant ($F(2,102) = .20, p = .83, R^2 = .004$) and model two was not significant. Disinhibition was included into the model and these results still were not significant ($F(3,102) = .18, p = .91, R^2 = .005$). These analyses were repeated using food measures standardized by BMI and this did not yield significant results.

Further moderated multiple regressions were conducted exploring whether attachment anxiety and condition interact to predict the degree to which participants liked the food and how hungry participants were. These analyses did not yield significant results. The results of these tests remained not significant when controlling for disinhibition. These analyses were repeated using standardized measures of food eaten by BMI and this did not yield significant results.

No significant effects were found when these analyses were repeated replacing global attachment anxiety with attachment avoidance.

Rejection Sensitivity

A moderated multiple regression was conducted predicting rejection sensitivity with attachment *anxiety* and condition (model 1) and the interaction of attachment anxiety and condition (model 2). Model 1 was significant ($F(2,100)=3.45, p=.04, R^2=.07$) and model 2 was not significant ($F(1,99)=.21, p=.65, R^2\text{change}=.002$). There was a significant effect of attachment anxiety ($t=2.98, p=.011, \beta=.77$) and no significant effect of condition ($t=-.713, p=.477, \beta=-.53$). There were no significant effects in model 2. Attachment anxiety significantly predicted rejection sensitivity when controlling for condition and this effect was not moderated by ostracism.

A moderated multiple regression was conducted predicting rejection sensitivity with attachment *avoidance* and condition (model 1) and the interaction of attachment avoidance and condition (model 2). Model 1 was significant ($F(2,100)=5.46, p=.006, R^2=.10$) and model 2 was not significant ($F(1,99)=.06, p=.81, R^2\text{change}=.001$). There was a significant effect of attachment avoidance ($t=3.28, p=.001, \beta=1.12$) and not for condition ($t=-.94, p=.35, \beta=-.68$). These results demonstrate that attachment anxiety and avoidance significantly predict rejection sensitivity. There was not a significant interaction between ostracism and attachment insecurity.

Emotion Regulation Skills

A moderated multiple regression was conducted predicting emotional reactivity with attachment anxiety and condition (model 1) and the interaction of attachment anxiety and condition (model 2). Model 1 was significant ($F(2,100)=8.80, p=.000, R^2=.15$) and model 2 was not significant ($F(1,99)=.26, p=.61, R^2\text{change}=.002$). There was

a significant effect of attachment anxiety ($t=3.98, p=.000, \beta=3.70$) and a marginally significant effect for condition ($t= -1.83, p=.07, \beta=-4.25$). Attachment anxiety was a significant predictor of emotional reactivity. Ostracized individuals reported marginally significantly higher levels of emotional reactivity and this was not moderated by attachment anxiety.

A moderated multiple regression was conducted predicting emotional cutoff with attachment avoidance and condition (model 1) and the interaction of attachment avoidance and condition (model 2). Model 1 was significant ($F(2,100) =4.87, p=.01, R^2=.09$) and model 2 was not significant ($F(1,99) =.009, p=.92, R^2_{change}=.000$). There was a significant effect of attachment avoidance ($t=3.12, p=.002, \beta=3.03$) but not condition ($t= -.55, p=.58, \beta=-1.21$). Attachment avoidance was a significant predictor of emotional cutoff. Ostracism does not appear to play an immediate role in emotional cutoff.

Attachment anxiety was not significantly correlated with emotional cutoff when controlling for attachment avoidance. Attachment avoidance was not significantly correlated with emotional reactivity when controlling for attachment anxiety.

State Attachment

Difference scores of state attachment were calculated by subtracting the state attachment score post-cyberball from the state attachment score pre-cyberball. Thus, a negative number would indicate that the individual's state attachment increased from pre-cyberball to post-cyberball and a positive score would indicate a decrease. Larger numbers indicate bigger increases/decreases.

A moderated multiple regression was conducted to explore changes in state attachment anxiety from before to after cyberball. State attachment anxiety was regressed onto condition and global attachment anxiety. Model one was significant ($F(2,102) = 5.44, p = .01, R^2 = .10$) and demonstrated main effects of condition ($t = 2.36, p = .02, \beta = .310$) and global attachment anxiety ($t = -2.58, p = .01, \beta = -.14$). Model two was significant ($F(1,99) = 5.37, p = .02, R^2 \text{ change} = .05$) and demonstrated a significant interaction effect of condition and global attachment anxiety ($t = -2.32, p = .02, \beta = -.24$). Simple slopes were tested at each level of the moderator. The slope of included individuals was significant ($t = -3.51, p = .001$). Individuals with lower levels of global attachment anxiety are significantly more likely to report larger, more positive difference scores, but only for included individuals. Thus, within the included group, lower levels of global attachment anxiety significantly predict decreases in state attachment anxiety from before to after cyberball (see Figure 3 below).

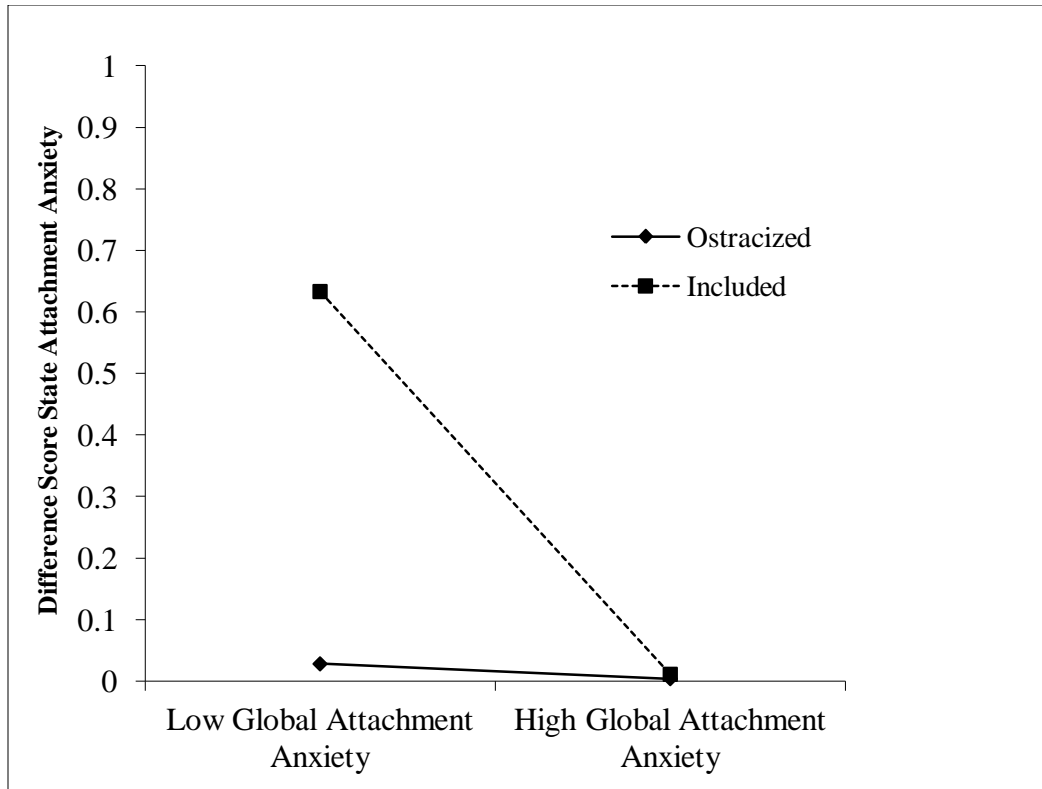


Figure 3. Difference scores in state attachment anxiety were regressed onto global attachment anxiety and condition. Lower levels of global attachment anxiety significantly predict decreases in state attachment anxiety from before to after cyberball but only among included individuals.

No significant findings were found when difference scores of state attachment *security* were regressed onto condition and global attachment anxiety or condition and global attachment avoidance. No significant findings were found when difference scores of state attachment *avoidance* were regressed onto condition and global attachment avoidance.

Affect

Attachment anxiety positively predicted baseline reports of negative affect ($F(1,101) = 9.41, p = .003, R^2 = .09, \beta = .14$) and negatively predicted baseline reports of

positive affect ($F(1,101) = 10.72, p = .001, R^2 = .10, \beta = -.214$). Attachment avoidance did not predict baseline reports of negative affect ($F(1,101) = 2.00, p = .16, R^2 = .02, \beta = .07$) and negatively predicted baseline reports positive affect ($F(1,101) = 8.69, p = .004, R^2 = .08, \beta = -.216$).

Difference scores of positive and negative affect were calculated by subtracting the affect score at one time from the affect score at the previous time. Thus, a negative number would indicate that the individual's affect increased from time one to time two and a positive score would indicate a decrease. Larger numbers indicate bigger increases/decreases.

From Before to After Cyberball

Positive Affect. Condition and global attachment anxiety were not significant predictors of positive affect differences scores of before and after cyberball, nor was global attachment avoidance.

Negative Affect. The difference scores of negative affect before and after cyberball were regressed onto condition and global attachment *anxiety*. Model one was significant ($F(2,99) = 4.24, p = .02, R^2 = .08$) and there was a significant main effect of condition ($t = 2.07, p = .04, \beta = .17$). Model two was not significant ($F(1,96) = .32, p = .47, R^2 \text{ change} = .003$). Condition significantly predicts larger, more positive difference scores of negative affect. Thus, included individuals were more likely than ostracized individuals to experience a decrease in negative affect after cyberball. Condition and global attachment anxiety did not significantly interact.

The difference scores of negative affect before and after cyberball were regressed onto condition and global attachment *avoidance*. Model one was significant ($F(2,99) = 3.17, p = .05, R^2 = .04$) and there was a significant main effect of condition ($t = 2.08, p = .04, \beta = .17$). Model two was not significant and there was not a significant interaction effect.

From Before to After Eating

Positive Affect. Global attachment anxiety was not a significant predictor of the difference scores of positive affect between baseline and after eating, controlling for negative affect after cyberball. Global attachment avoidance was also not a significant predictor of positive or negative affect difference scores between baseline and after eating. When condition was included in the model, these findings remained insignificant, demonstrating that ostracism did not have a significant effect on reports of positive affect after eating.

Negative Affect. Global attachment anxiety significantly predicted larger, more positive differences scores in negative affect between baseline and after eating, controlling for negative affect after cyberball ($F(2,99) = 9.87, p = .000, R^2 = .17$). In other words, global attachment anxiety significantly predicted decreases in negative affect from baseline to after eating. The difference scores of negative affect before and after eating were regressed onto global attachment avoidance, controlling for negative affect after cyberball and there was not a significant main effect for global attachment avoidance. Condition was included in the model, and there was not a significant main effect of

condition demonstrating that ostracism did not have a significant effect on reports of negative affect after eating.

Discussion

Positive and negative affect, emotional reactivity, state attachment anxiety, and rejection sensitivity were hypothesized to be important underlying mechanisms of the relationship between attachment anxiety, ostracism, and eating. These variables were measured after cyberball so the effects of ostracism would be strongest. Global attachment was predicted to be related to eating potato chips, and was not. This may have been because participants completed the PANAS in which they were asked to think about what they were feeling after cyberball and before eating. There is evidence that individuals eat in response to diffuse emotions and the specific label participants placed on their emotions may have affected their eating behavior (Van Strien & Ouwens, 2003; Kaplan, & Kaplan, 1957; Bruch, 1964). Inserting the PANAS between cyberball and eating was a concession that was made in this study because the advantage was that the effects of ostracism upon state attachment, affect, and emotion regulation could be explored. One interesting finding was that attachment anxiety predicted decreases in negative affect after eating. Individuals eat emotionally to feel better (Tice, et al., 2001; Wansink & Cheney, 2003; Spoor et al., 2007), so even though individuals who reported higher levels of attachment anxiety did not eat more in this study, the eating may have still affected them.

Ostracism was not found to affect eating behavior and again believability levels were only moderate. However, this study revealed some interesting effects of ostracism

in that included individuals who reported lower levels of attachment anxiety experienced decreases in state attachment anxiety after cyberball. Additionally, included individuals were more likely than ostracized individuals to report a decrease in negative affect after cyberball. Rather than saying that ostracism was not strong enough to induce emotional eating, it may be the case that inclusion was not strong enough to prevent it. Even if the effects of ostracism are driven by inclusion rather than ostracism, correlations between attachment anxiety and amount of food consumed would still be expected within the ostracized group and not the included group.

In the current study, attachment anxiety and attachment avoidance were both found to predict rejection sensitivity as expected. However, there was no interaction of attachment insecurity and ostracism. The cyberball manipulation does not appear to have had an effect on reports of rejection sensitivity.

Attachment anxiety significantly predicted emotional reactivity and attachment avoidance significantly predicted emotional cutoff. Attachment insecurity did not significantly interact with ostracism. However, ostracized individuals reported marginally significantly higher levels of emotional reactivity than included individuals. The cyberball manipulation does not appear to have had an effect on reports of emotional cutoff. Ostracism may have affected reports of emotional reactivity but these findings should be interpreted with caution because they were marginally significant.

It was found that in the included (control) condition attachment anxiety levels tended to decrease after cyberball but more so for individuals whose level of global attachment anxiety was low. After ostracism, state attachment anxiety levels remained

stable. Again, it may be that the experience of playing a game and being included lowered state attachment anxiety levels, but only for those people whose global attachment anxiety was low to begin with. It is likely much more difficult for individuals with higher levels of attachment anxiety to become less anxious. Differences between the ostracized and included groups may be due to the positive experience of being included in a game with strangers.

It was predicted that individuals who reported higher levels of global attachment anxiety would report more negative affect and less positive affect after ostracism, but attachment insecurity and ostracism did not interact. Global attachment insecurity and ostracism do not appear to affect differences in reports of positive affect either before and after cyberball or before and after eating.

In summary, no relationship was found between attachment anxiety and eating unhealthy food, and ostracism did not affect the dependent variables of interest: eating, state attachment anxiety, rejection sensitivity, emotional reactivity, positive affect, and negative affect. Attachment anxiety predicted significant decreases in negative affect after eating. A significant positive relationship was found for attachment anxiety and rejection sensitivity, emotional reactivity, and negative affect. A significant negative relationship was found between attachment anxiety and positive affect. Interesting findings were discovered with regard to cyberball: Individuals who reported lower levels of global attachment anxiety experienced a decrease in state attachment anxiety from before to after cyberball but only within the included group. Included individuals also reported decreases in negative affect from before to after cyberball.

Table 3

PRESCREENING	Attachment Anxiety	Attachment Avoidance
Disinhibition	$r = .35^{**}$	$r = .25^*$
BMI	$r = -.10$	$r = .21^*$
Self Esteem	$r = -.34^{***}$	$r = -.27^{**}$
Attachment Anxiety	--	$r = .33^*$
OSTRACIZED	Attachment Anxiety	Attachment Avoidance
Potato Chips	$r = .05$	$r = .12$
Carrots	$r = .01$	$r = -.16$
Saltines	$r = .04$	$r = .03$
Belonging	$r = -.25$	$r = -.16$
Meaningful Existence	$r = -.02$	$r = -.19$
Self Esteem	$r = -.33^*$	$r = -.31^*$
Control	$r = -.13$	$r = -.19$
INCLUDED	Attachment Anxiety	Attachment Avoidance
Potato Chips	$r = .04$	$r = .09$
Carrots	$r = .07$	$r = .15$
Saltines	$r = .002$	$r = -.05$
Belonging	$r = -.21$	$r = -.28^*$
Meaningful Existence	$r = -.02$	$r = -.09$
Self Esteem	$r = -.26$	$r = -.18$
Control	$r = -.06$	$r = -.08$

Correlations between attachment anxiety, avoidance, and dependent variables

$*p < .05$, $**p < .01$, $***p < .001$

Study 4

Numerous interventions have been conducted to increase attachment security (Mikulincer, et al., 2001; Carnelley & Rowe, 2007; Rowe & Carnelley, 2003). The short and long term effects of subliminal and supraliminal techniques for priming security, defined as making thoughts related to attachment security more active and accessible, have been explored (Mikulincer, et al., 2001). Carnelley and Rowe (2007) primed attachment security with writing exercises three times over the course of three days (ten minutes each day). Participants who engaged in the priming (as opposed to writing about neutral experiences) reported having more positive relationship expectations, more positive views of themselves, decreased attachment anxiety and increased attachment security. Importantly, these effects lasted two days after the last priming session.

Rowe and Carnelley (2003) primed participants with a relationship-specific attachment style, either avoidant, anxious or secure, regardless of their global attachment style. The authors observed that individuals primed with a secure attachment style were able to recall more positive attachment words than primed avoidant participants, had more positive interpersonal expectations than primed avoidant and anxious participants, and more post-priming positive affect than primed avoidant participants. Furthermore, the relationship-specific attachment style was the primary influence (not the global attachment style) and these results remained significant when controlling for affect. These results demonstrate that regardless of global attachment styles, primed security and insecurity can influence interpersonal expectations, affect, and thoughts.

Mikulincer, et al., (2001) primed participants subliminally (outside of conscious awareness) and supraliminally. These authors discovered that participants rated neutral symbols higher (liked them more) when they were paired with a subliminally presented attachment related prime. They did not find effects for primes (pictures and words) presented supraliminally. Additionally, in this study, attachment related primes produced similar effects to positive primes. The authors first concluded that the attachment related primes induced positive affect. However, in subsequent replications of the studies conducted under stressful conditions, the secure attachment related primes were found to be more effective (on ratings of neutral symbols) than the positive primes. The authors concluded that the secure base content of these primes created a buffer against the stress that the positive primes do not. In line with these findings, Carnelley and Rowe (2010) analyzed written scripts of individuals primed with security and positive affect and found that those primed with security produced more words related to merging and positive care. Additionally, those primed with security used more positive emotion words and less negative emotion words than those primed with positive affect. In sum, priming of attachment security leads to numerous desirable outcomes above and beyond effects of just positive priming.

If attachment related thoughts are repeatedly made accessible, they (and other security related thoughts) will become easier to access over time (Carnelley & Rowe, 2007; Rowe & Carnelley, 2003). The more often secure thoughts are activated, the more accessible they should become because priming individuals with security related words or concepts activates other related concepts, a phenomenon called “spreading activation” (Collins & Loftus, 1975).

The main goal of the current study was to create an intervention that would suppress emotional eating after ostracism. There are a number of interventions available to treat eating disorders, obesity, and emotional eating. Eating disorders are most commonly treated with a form of psychotherapy. Bulimia nervosa and anorexia nervosa are often treated with cognitive behavioral therapy (CBT). A core cognitive disturbance of both anorexia nervosa and bulimia nervosa is thought to be the notion that an individual's self worth is determined largely by eating, weight, body shape, and control over these constructs and cognitive behavioral therapy works to change cognitive disturbances and emotions and behaviors that accompany them (Fairburn, 2002). There is evidence that CBT is effective in reducing binge episodes by 80% on average among individuals diagnosed with bulimia nervosa and these effects can be maintained over 6-12 months (Fairburn, 2002). There is less evidence supporting the effectiveness of CBT in the treatment of anorexia nervosa and many individuals do not recover fully (Vitousek, 2002). Family therapy, in which families are involved in the treatment of the individual, is deemed effective for anorexia nervosa (more so for adolescents) but evidence on its effectiveness of bulimia nervosa is not clear (Dare & Eisler, 2002). In Interpersonal Psychotherapy the focus is on the individual's interpersonal issues. There is some preliminary evidence that this form of psychotherapy may be effective in the treatment of binge eating disorder (Fairburn, 2002).

There are numerous weight loss interventions available ranging from popular crash diets to empirically based weight loss interventions. The majority of weight loss interventions focus on diet and exercise. There are a number of commercial programs (Weight watchers, Jenny Craig) available but there is little data to support their

effectiveness (Womble & Wadden, 2002). Behavioral weight loss (BWL) treatment is one treatment for obesity that involves self-monitoring of food intake, learning environmental and personality factors that trigger eating, avoiding cues that trigger overeating, increasing physical activity, and improving nutrition. The treatment lasts 16-24 weeks and in general patients lose 7-10% of initial body weight, however, this weight loss is usually not maintained long term (Terrence & Brownell, 2002).

Another tactic and treatment of obesity involves increasing physical activity. In the lifestyle approach, patients are encouraged to accumulate 30 minutes of exercise over the course of the day (Blair & Holder, 2002). Meal replacements, or replacing certain meals with functional foods or drinks, are another commonly used method for weight loss. A number of studies provide evidence that meal replacements are effective at least in the short term (Heber, 2002). Meal replacements may be effective because the meal replacements restrict choices, simplify eating, and participants are not eating foods that may trigger a binge. Thus, in an indirect way meal replacements may help to treat emotional eating. Last, very low calorie diets may be used to treat obesity, but there is evidence that restricting calories to an extreme is not effective in the short or long term (Wadden & Berkowitz, 2002). In this same vein, total fasting, or not taking in any food is also ineffective and leads to a number of health issues (Dwyer & Melanson, 2002).

There are fewer interventions focused specifically on improving emotional eating. One intervention conducted on middle age women found that Cognitive Behavioral therapy over a period of 2 hours per week for 8 weeks significantly reduced emotional eating compared to a control group (McLean, et al., 2011). There are many psychotherapy approaches which have been effective in treating emotional eating which

use mindfulness as a core component, for example, dialectical behavior therapy, acceptance and commitment therapy, and mindfulness-based cognitive therapy (Cook-Cottone, Tribole, & Tylka, 2013; Taitz, 2012). Mindfulness is characterized by awareness of one's current emotions and state but without judgment of those feelings. In mindfulness, individuals learn to live in the present, aware of their emotions and physical sensations without being distracted by thoughts about the future or past. Additionally, there is no attachment to or judgment of current feelings (Cook-Cottone, Trybal, & Tylka, 2013; Taitz, 2012; Walsh, Balint, Smolira, Fredericksen, & Madsen, 2009). In one study, participants engaged in a nine week intervention designed to increase mindfulness. The intervention consisted of participating in mindfulness classes, mindful yoga stretches, meditations, and exercises teaching mindful eating practices. This study found that participants who demonstrated greater improvements in mindfulness had the largest reductions in abdominal fat. The intervention also reduced tendencies to eat in response to emotions (Daubenmier, et al., 2011).

Appetite awareness training is an 8 session intervention which focuses on helping the individual become more aware of his/her internal hunger cues and more mindful of his/her eating experience (Craighead & Allen, 1995; Craighead, 2006). Individuals learn to eat when hungry rather than because of emotions or external triggers. There is evidence in case studies that appetite awareness training is effective in decreasing binge eating (of which emotional eating is a key component) (Craighead & Allen, 1995).

Many of the above interventions focus on a cognitive-emotional component. For example, mindfulness interventions target the individual's emotional experience and how they think about it. The intervention in this study approaches emotional eating via a

social-emotional component. Although there are a number of interventions available to treat emotional eating, incorporating attachment theory may help enhance current interventions. For example, mindfulness is a core component of a number of psychotherapy approaches (Cook-Cottone, Trybal, & Tylka, 2013; Taitz, 2012). The approach posits that increasing mindfulness changes cognitive, behavioral and interpersonal skills which leads to more mindful eating habits. However, there is evidence that attachment anxiety is negatively related to mindfulness (Walsh, et al., 2009). Thus, if therapists attempt to decrease attachment anxiety, it may facilitate an increase in mindfulness and make it easier for clients to acquire mindfulness skills. Attachment theory is also viewed as valuable in psychotherapy because the therapist becomes a secure base from which the client can explore painful emotional experiences (Mikulincer & Shaver, 2007; Bowlby, 1988). Thus, individuals with disordered eating who viewed their therapist as a secure base, might be more willing to explore the underlying reasons of their disordered eating.

Some individuals also seek help for eating issues in social support groups, such as Overeaters Anonymous (OA). In OA members attend meetings to discuss eating issues, emotions, and experiences. Each member also has a sponsor, a fellow member whom they can call for support if needed. Thus far, very little research has been conducted on the effectiveness of OA in weight loss, but there is some evidence that it may help individuals with bulimia abstain from compulsive overeating (Malenbaum, Herzog, Eisenthal, & Wyshak, 2009). Additionally, there is qualitative evidence that OA can help individuals change their world view. OA members report changes in their sense of self, such as becoming more able to tolerate not being in control at all times, increases in self

esteem, self acceptance, more positive relations with others, and learning to view overeating as an addiction that cannot be cured but instead something to learn to live with and keep in check. These benefits may indirectly help to control maladaptive eating patterns (Ronan & Libman, 2003). If the current intervention is successful, attachment anxiety should predict eating unhealthy food after ostracism within the control group and not within the target intervention group. This intervention is something an individual can do independently. It is also unique in that emotional eating is approached from an attachment perspective. The target intervention consisted of writing journal entries for five minutes a day for six days about feeling loved, cared for and supported. The intervention may also affect state attachment, i.e., an individual's levels of attachment anxiety, avoidance, and security in the current moment. A control group in which participants wrote about positive experiences was included to control for any positive affect created by the attachment journal writing. The positive journal writing was not expected to affect eating behavior. Writing about secure attachment experiences is expected to uniquely impact eating behavior separately from increased positive affect. Thus, there may be differences in mood between journal groups, but these differences are not expected to account for eating behavior. In the control group participants wrote about neutral experiences (conducting household chores). Half were ostracized and half were included.

Method

Participants

Rutgers undergraduates participated in this study for class credit (N=206, 64 males). Ages ranged from 18-53 with a mean of 21. BMI ranged from 16-47 ($M=24.5$, $SD=4.70$). The sample was ethnically diverse, with 22.3 % of participants identifying as Asian/Asian-American, 21.8 % Hispanic/Latino/a, 21.4 % White (not Hispanic), 13.6 % Other/Mixed, 11.7 % Black/African-American, , and 5.3 % Middle Eastern/Arabic/Persian,. If participants failed to send in a journal entry, they were excluded from the study. Thirty-three percent of participants were excluded for not complying with instructions. Because of the high exclusion rate a small number of participants were included who only completed 5 instead of 6 journals (N=10; Final N =206).

Procedure

Attachment anxiety and avoidance (ECR-R) and disinhibition in eating (See Study 1) were assessed during pre-screening. As a cover story, participants were told that they were participating in a study examining the effects of hunger on video game performance after “concentration training”. In the first session, participants came to the lab to receive instructions. Participants read and signed an informed consent statement, in which they were informed of the requirements of the study. The experimenter went over the informed consent with the participant to ensure that the participant was aware of the requirements of the study. They completed a measure of state attachment (SAAM) to measure their baseline attachment security, anxiety, and avoidance at the current point in time (Gillath, et al., 2009). They completed this measure three more times throughout the experiment and the order of the questions was shuffled each time. The intervention (concentration training) had three variations and required participants to write for five

minutes every night for six nights. Participants were given a handout of the instructions for journal writing and asked to read the handout (see appendix). Then, the experimenter went over the handout with the participant to ensure that the participant understood the requirements. In the attachment intervention, participants were told to write about a specific event during the day that made them feel supported, cared for or loved. In the neutral intervention, participants were told to write about the specifics of conducting household chores. In the positive intervention participants were told to write about a positive experience that was not explicitly social. Participants were instructed not to write about social experiences because social interactions could potentially be confounded with attachment related emotions and cognitions. Participants were required to email each entry to the experimenter by midnight each night. Participants who failed to send in a required journal entry were excluded from the study. Participants were informed of these criteria verbally, in the informed consent, and again in the journal instructions handout.

Participants were also provided with the following examples for what they could write about dependent on their journal condition:

Attachment

Today my friend baked cookies and brought me a big plate. She just showed up at my dorm room door and said "Surprise!" I thought it was really sweet that she did this out of the blue. It makes me feel like I am important to her. She baked me oatmeal cookies which are my favorite, and it made me feel really understood because she knows me so well. I felt closer to her because she had remembered that oatmeal cookies were my favorite, even though I had told her years ago. I felt really special because out of all her friends, she chose me to bake for. The fact that it was for no reason at all made me feel cared for and loved because it reminded me that my friend doesn't need a reason to do special things for me. I thanked her and told her that it made my day.

Positive

Today I found a five dollar bill on the ground. I was just walking to the bus stop, and I thought it was a leaf. As I got closer, I looked down and realized that it was a five dollar bill. I looked around and there was no one in sight, so it wasn't as if someone had recently dropped it. I felt happy and this really made my day! I decided that I would use it to buy breakfast at the deli which made me excited as I thought about the treats I

might buy. I felt good because I think it meant that today was my lucky day and it was during the morning so I felt like this day was off to a really good start. I felt excited thinking that if I was already lucky, other good things might happen and I looked forward to the rest of the day.

Neutral

Today I did a load of laundry. First, I put all my clothes from the hamper into a laundry basket. Second, I brought the laundry basket down to the laundry room. I loaded the clothes into the washing machine and poured in a cup of laundry detergent. I shut the door and put in the quarters. I turned the knob on the washing machine to “normal wash” and pressed start. I came back to my room and set a timer for 45 minutes. When the timer went off, I took the clothes out of the washing machine and loaded them into the dryer. I put in a dryer sheet and quarters. Then I shut the door and set the knob on the dryer and hit start. I went back to my room and set a timer for 1 hour. When the timer went off, I took the clothes out of the dryer and put them in a laundry basket which I brought back to my room to fold.

The journals were analyzed for their secure base content based on procedures outlined by Mikulincer, Shaver, Sapir-Lavid, and Avihou-Kanza, (2009). Two independent raters blind to the journal condition were asked to read each journal entry and assign it a score based on how much the journal adhered to the secure base script of 1 (*not at all*) to 5 (*very much*). Scores from each rater were averaged. Briefly, the secure base script consists of three components. First, “If I become distressed or encounter an obstacle I can approach an attachment figure for help.” Second, “That relationship partner will be available and supportive.” Third, “Relief and comfort will result from reaching out to the attachment figure.”

For the second session, participants were asked not to eat for two hours before the experiment. They were told that they had completed the concentration training and could now participate in an experiment to test how well their training worked. First they were asked to complete two questionnaires measuring positive and negative affect using the PANAS (Watson D., Clark, L.A., & Tellegen, A., 1988) and state attachment using the SAAM (Gillath, et al., 2009). Then, they played cyberball, following the same procedures as in Study 2. Immediately after this, participants were given the SAAM and two

questionnaires designed to measure state anxiety (Egloff & Schmukle, 2002; Schmukle & Egloff, 2004). After this they were given a snack (M&M's, pretzels, and plain potato chips) and a bottle of water. Participants were told that they may eat since they were told not to eat before the experiment while the experimenter left to tally the scores of the video game. The experimenter came back into the room after eight minutes and gave the participant questionnaires focusing on how the participant felt about cyberball (Zadro, et al., 2004), state attachment (SAAM), their preferences and liking of the food, and positive and negative affect (some participants were asked how they felt immediately after playing cyberball, some participants were asked how they felt immediately after eating). The experimenter left the room for another 8 minutes and upon re-entering stated that they would like to weigh the participants and measure their height for the demographic data. After this, the experimenter debriefed the participant following the debriefing procedures used in Study 2.

Results

Manipulation Check

An ANOVA was conducted to explore levels of secure base content between journal groups. A significant main effect was discovered ($F(2,194)= 447.35, p=.000$) and post hoc Tukey tests demonstrated significant differences between all journal groups. The attachment journal group contained the highest level of secure base content ($M=3.5$) followed by the positive journal group ($M=.92$) and the neutral journal group ($M=.10$).

Within the neutral journal groups the ostracized participants reported significantly lower levels of control ($t(92)=-7.60, p=.000$), self-esteem ($t(92)=-2.50, p=.000$),

meaningful existence ($t(91)=-6.80, p=.000$), and belonging ($t(92)=-6.16, p=.000$) than included individuals.

An ANOVA was conducted to explore levels of positive and negative affect after the intervention between journal groups. There was no main effect for positive affect. A significant main effect was discovered for negative affect ($F(2,198)= 3.28, p=.04$) and post hoc Tukey tests demonstrated significant differences between the positive journal group ($M=1.4, SD=.37$) and neutral journal group ($M=1.6, SD=.65$) in that participants in the positive journal group reported lower levels of negative affect than participants in the neutral journal group.

Main Results

The overall design of this study was a 3 x 2 x 2 model in which the predictor variables consisted of journal group (attachment, positive, and neutral), global attachment anxiety (high/low), and condition (ostracized and included). Global attachment anxiety was measured as a continuous variable and journal group and condition were measured as categorical variables. Journal group and condition were dummy coded. The dependent variables of interest consisted of state attachment (subscales: anxiety, avoidance, and security) and amount of food eaten. All the dependent variables were continuous variables. Moderated multiple regressions were predicted to discover main effects of journal group and global attachment anxiety (model 1) and a significant interaction of journal group and global attachment anxiety (model 2) on changes in state attachment from baseline to immediately after the intervention. Moderated multiple regressions were also predicted to discover main effects of global attachment anxiety and condition (within

the neutral journal groups) (model 1) and a significant interaction of global attachment anxiety and condition (model 2) on amount of food eaten. If there is a significant interaction of attachment anxiety and condition upon food eaten, a moderated multiple regression will be conducted in which main effects of journal group, global attachment anxiety, and condition (model 1) are expected to be discovered for amount of food eaten. Additionally, significant two way interactions of global attachment anxiety and condition, global attachment anxiety and journal group, and journal group and global attachment anxiety are expected for amount of food eaten. Last, a significant three way interaction between global attachment anxiety, condition, and journal group is expected to be found upon amount of food eaten. Other dependent variables were self-reported hunger (continuous) and liking of the food (continuous).

Difference scores of state attachment were calculated by subtracting the state attachment score at each time point from the state attachment score of the previous time point. Thus, a negative number would indicate that the individual's state attachment increased from one time point to the next and a positive score would indicate a decrease. Larger numbers indicate bigger increases/decreases.

State Attachment Anxiety

A moderated multiple regression was conducted to determine the effects of the intervention and global attachment anxiety on changes in state attachment anxiety from baseline to immediately after the intervention (thus, not including condition). Model one, in which the difference scores of state attachment anxiety between baseline and time two (after the intervention) were regressed onto journal group and global attachment anxiety

was not significant ($F(3,205)=1.47, p=.224, R^2=.02$). Model two included two way interactions between journal group and global attachment anxiety and was not significant ($F(2,200)=.03, p=.97, R^2\text{change}=.000$).

State Attachment Security

A moderated multiple regression was conducted to determine the effects of the intervention and global attachment anxiety on changes in state attachment security.

Model one, in which the difference scores of state attachment security between baseline and time 2 (after the intervention) were regressed onto journal group and global attachment anxiety was significant ($F(3,205)=3.89, p=.01, R^2=.06$). In model one, there was a main effect of attachment anxiety ($\beta=.14, t=2.68, p=.01$) and no effect of any journal groups. Model two included two way interactions between journal group and global attachment anxiety and was not significant ($F(2,200)=.67, p=.69, R^2\text{change}=.003$). Attachment anxiety significantly predicted a decrease in attachment security (bigger, positive scores indicate a decrease) but the attachment or positive journal groups had no effect compared to neutral journal writing.

The same analysis was repeated using global attachment avoidance as a predictor instead of anxiety. Model one was not significant ($F(3,205)=1.50, p=.22, R^2=.02$). Model two included two way interactions between journal group and global attachment avoidance and was not significant ($F(2,200)=.26, p=.77, R^2\text{change}=.003$).

State Attachment Avoidance

A moderated multiple regression was conducted to determine the effects of the intervention and global attachment avoidance on changes in state attachment avoidance.

Model one, in which the difference scores of state attachment avoidance between baseline and time 2 (after the intervention) were regressed onto journal group and global attachment avoidance was not significant ($F(3,205)=.07, p=.98, R^2=.001$). Model two included two way interactions between journal group and global attachment avoidance and was not significant ($F(2,200)= 1.14, p=.32, R^2=.01$).

Additional moderated multiple regressions were performed to determine the effects of the journal writing and attachment insecurity on differences in state attachment between baseline and after ostracism, controlling for state attachment at time two. Moderated multiple regressions were also performed to determine the effects of the journal writing and attachment insecurity on differences in state attachment between baseline and after eating, controlling for state attachment at time two and time three. Journal group did not predict difference scores of state attachment anxiety, avoidance, or security or interact with global attachment anxiety or avoidance.

Eating

A moderated multiple regression was conducted on only the neutral groups to determine the effects of attachment anxiety and condition on eating. Since measures of food eaten were skewed, standardized z scores were used. These regressions did not produce significant results. They were repeated standardizing the food scores by BMI, again with no effects. The outcome variable was changed to *liking* of the food, rather than food eaten. These analyses also did not yield significant results. When disinhibition was included in the model, there were no significant results again.

However, a moderated multiple regression conducted to determine the effects of attachment anxiety and condition on *hunger* (within the neutral journal groups) yielded significant effects ($F(2,91)=3.8, p=.03, R^2=.08$) for model one. There was a main effect for condition ($\beta = .83, t = 2.66, p=.009$) but not attachment anxiety ($\beta = -.11, t = -.75, p=.45$). Model two was significant ($F(1,88)=4.30, p=.04, R^2\text{change}=.04$). There was a significant interaction effect for condition and attachment anxiety ($\beta = -.64, t = -2.07, p=.04$). The simple slopes were tested and the slope for included individuals was significant ($t = -2.00, p=.05$). Global attachment anxiety is a significant predictor of hunger in that individuals who reported higher levels of attachment anxiety are more likely to report less hunger, but only among included individuals (see Figure 4 below).

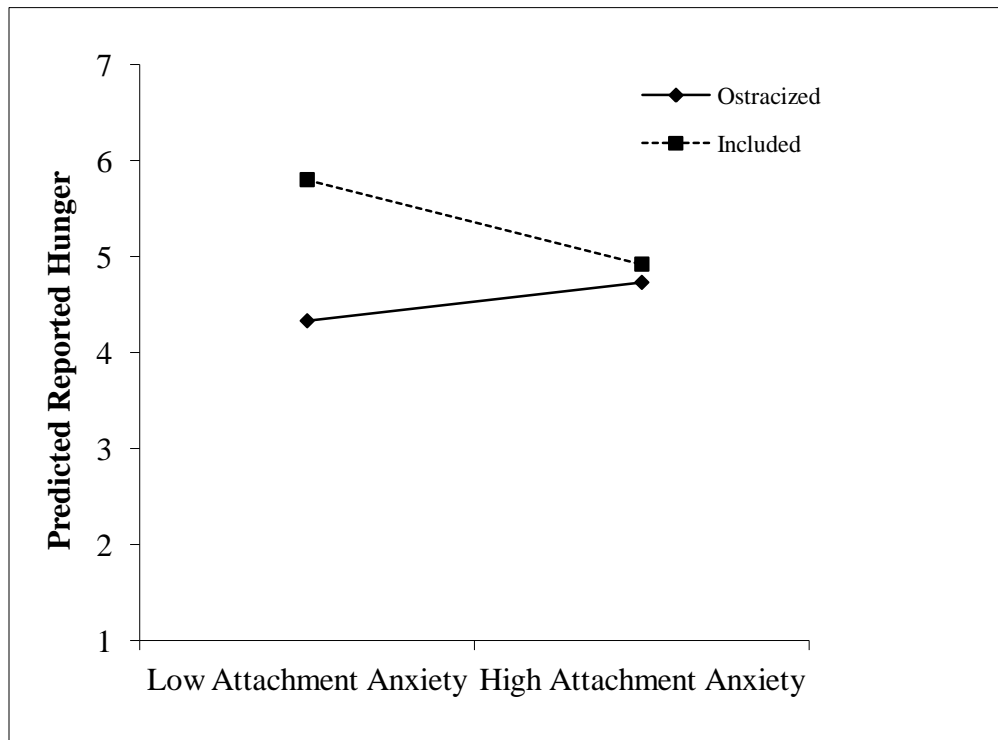


Figure 4. Interaction of global attachment anxiety and condition on perceived hunger. Global attachment anxiety negatively predicted reported hunger in that individuals who reported higher levels of global attachment anxiety were more likely to report lower levels of hunger, but only among included individuals.

Discussion

As expected global attachment anxiety and avoidance were positively associated with negative affect, and global attachment avoidance was negatively associated with positive affect. Additionally, attachment anxiety significantly predicted decreases in state attachment security, also as expected. Overall journal writing did not predict affect with one exception. Participants in the positive journal writing group reported lower levels of negative affect than participants in the neutral journal writing group.

The positive relationship between attachment anxiety and eating found in Study 2 was not replicated in the current study. This study was not an exact replication of the previous study (different foods were used, the current study included two parts and involved journal writing, and different questionnaires were used). However, these differences are not theoretically likely to be important factors. In fact, using a number of highly palatable, unhealthy foods (as opposed to saltines and carrots in Study 2) was expected to amplify the effects. The exclusion rate in this study was high (33%). Participants were excluded for not complying with instructions (failing to write a journal entry). It is possible that despite the large sample size, this was not a representative sample. One possible explanation for the null results with regard to eating may be that there was some un-assessed factor moderating the relationship between attachment anxiety and eating. This trait might be present within many of the participants in Study 2. It is possible that it may also exist among subjects who tended to not complete the journals and these individuals were excluded from the sample. Participants with this trait

may have been present in the sample in Study 2, thus the correlation between attachment anxiety and eating was discovered. Participants with this trait may have been weeded out of Study 4, and therefore, this finding could not be replicated. It cannot be known exactly what this trait could be, as it was most likely something that was not measured. It could possibly be something related to self regulation.

There was an effect of hunger in that global attachment anxiety negatively predicted hunger, but only among included individuals. Individuals who reported higher levels of global attachment anxiety were more likely to report less hunger, if included. The simple slope for ostracized individuals was not significant. Perhaps being included in the cyberball game had an important effect. Study 1 found that the relationship between attachment anxiety and emotional eating is mediated by perceived hunger (Alexander & Siegel, 2013). Individuals who report higher levels of attachment anxiety also report higher levels of emotional eating because they think they are hungrier. In the current study, individuals with higher levels of attachment anxiety were more likely to report less hunger among included individuals but not ostracized individuals. Individuals with higher levels of attachment anxiety perceive the world as a threatening place, i.e., others will not always be supportive or available to them. Perhaps feeling “ostracized” is the norm for those who report higher levels of attachment anxiety, and thus being included in a game of cyberball could be very meaningful for these individuals who are more sensitive to rejection. Thus, if low levels of ostracism are expected, the ostracism manipulation may not have been enough to trigger emotional eating, but being included, which is unexpected and maybe even infrequent, may have been powerful enough to curb hunger.

All participants in the attachment and positive journal groups were ostracized, so it was not possible in this current experiment to determine the effects of journal writing on inclusion, but future studies could explore this. Writing about secure attachment experiences may increase a sense of belonging and amplify these effects.

The intervention did not affect state attachment or eating behavior, but there are a number of ways this intervention could be modified to become effective in the future. Increasing the intensity of the intervention may work for future studies. For instance, having participants write for longer durations over a longer period of time. In the current intervention, participants wrote about secure experiences for five minutes a day for six days. This exercise is much longer in duration than previous attachment interventions conducted in which attachment security was primed. However, in other emotional eating interventions participants are dependent on a therapist, whereas the journal writing was something that individuals could do independently and in a shorter period of time. Related to this, many emotional eating interventions provide participants with concrete tools, exercises or handbooks to help them along the way (Cook-Cottone, Tribble, & Tylka, 2013; Taitz, 2012). Perhaps, including a visualization exercise, for example, spending a few minutes visualizing secure experiences might have made the intervention effective.

The method used was unique from many other priming studies in that participants were being primed outside of the lab, and then completing the rest of the study in the lab. A unique aspect of this study is that it has ecological validity because participants were primed in their homes and complete the rest of the study in a novel setting (they were in a room they have never been in before). However, this may also be a limitation. Carnelley

and Rowe (2007) note that context is important and being in the same environment that an individual was primed in can make the prime more accessible. The cover story for this intervention was that the experimenter was studying the effects of “concentration training” upon hunger. If the purpose of the journal writing was to create feelings of support, comfort, and love, the words “concentration training,” may have reduced the impact. Participants may have not been fully experiencing the positive emotions of writing that were expected.

The current study did not prime a relationship-specific attachment style. Participants were simply asked to think of experiences that induced security (thinking of being cared for, loved, and supported). Not priming a relationship specific attachment style, as some studies have done (Rowe & Carnelley, 2003), may be another way that increased the ecological validity of the current study for a number of reasons. First, insecurely attached individuals may not have many secure relationships. If they do have others to whom they are securely attached, they may not see them very often. The methodology of the current study asked participants to think of *aspects* of any relationships that are secure. This may be more appropriate for individuals who are not surrounded by secure others. In summary, no effects of emotional eating were found in this study but there is some evidence that inclusion may affect perceived hunger.

Table 4

PRESCREENING	Attachment Anxiety	Attachment Avoidance
Disinhibition	$r = .24^{***}$	$r = .19^{**}$
BMI	$r = -.07$	$r = .09$
Secure Base Content	$r = -.13$	$r = -.03$
Attachment Anxiety	--	$r = .36^{***}$

ATTACHMENT	Attachment Anxiety	Attachment Avoidance
Potato Chips	$r = .19$	$r = -.02$
M & M's	$r = -.08$	$r = .01$
Pretzels	$r = -.21$	$r = -.29^{*}$
Belonging	$r = -.28^{*}$	$r = -.15$
Meaningful Existence	$r = -.19$	$r = -.17$
Self Esteem	$r = -.38^{**}$	$r = -.31^{*}$
Control	$r = -.29^{**}$	$r = -.15$
POSITIVE	Attachment Anxiety	Attachment Avoidance
Potato Chips	$r = .04$	$r = -.02$
M&M's	$r = .06$	$r = -.08$
Pretzels	$r = .02$	$r = .17$
Belonging	$r = .07$	$r = -.06$
Meaningful Existence	$r = .007$	$r = -.02$
Self Esteem	$r = .11$	$r = -.02$
Control	$r = -.11$	$r = .03$

NEUTRAL OSTRACIZED	Attachment Anxiety	Attachment Avoidance
Potato Chips	$r = -.02$	$r = .05$
M&M's	$r = -.07$	$r = -.01$
Pretzels	$r = .05$	$r = -.01$
Belonging	$r = -.07$	$r = .25$
Meaningful Existence	$r = -.04$	$r = .24$
Self Esteem	$r = -.26$	$r = .06$
Control	$r = -.16$	$r = .10$
NEUTRAL INCLUDED	Attachment Anxiety	Attachment Avoidance
Potato Chips	$r = -.08$	$r = .19$
M&M's	$r = .12$	$r = -.02$
Pretzels	$r = -.17$	$r = -.43^{**}$
Belonging	$r = -.05$	$r = -.10$
Meaningful Existence	$r = -.06$	$r = .04$
Self Esteem	$r = -.08$	$r = -.12$
Control	$r = -.19$	$r = -.03$

Correlations between attachment anxiety, avoidance, and dependent measures

$*p < .05$, $**p < .01$, $***p < .001$

General Discussion

The goal of these studies was to provide evidence for a link between attachment anxiety and unhealthy eating behavior. In Study 1, attachment anxiety was positively related to self-report emotional eating. Furthermore, the association between attachment anxiety and emotional eating was mediated by perceived hunger. This finding was related to the psychosomatic theory of obesity which posits that obese individuals eat more because when stressed, they mislabel their internal physiological sensations as hunger (Van Strien & Ouwens, 2003; Kaplan & Kaplan, 1957). Individuals with higher levels of attachment anxiety might have difficulty correctly discerning their internal physiological sensations and mislabel these signals as hunger and eat more when in distress.

Study 2 extended these findings through observations of eating behavior. Attachment anxiety was positively related to eating unhealthy food. Individuals who reported higher levels of attachment anxiety not only ate more, but only ate more of the unhealthy food. However, this relationship was not moderated by ostracism. Can the behavior in Study 2 be called emotional eating even if the emotional episode created did not affect eating behavior? There is reason to assert that this was emotional eating. In Study 3 it was discovered that individuals with higher levels of attachment anxiety experienced more negative affect and less positive affect. Individuals who report higher levels of attachment anxiety may typically feel negatively about social situations, perhaps even always feel slightly ostracized. Additionally, participating in a laboratory experiment is a social situation and can be stressful and individuals with higher levels of attachment anxiety use hyperactivating strategies of emotion regulation and over react to distress. Thus, the ostracism manipulation may not have been out of the norm for these

individuals, yet they may still have been eating emotionally. The purpose of Study 3 was to explore underlying mechanisms between attachment anxiety, eating, and ostracism. Attachment anxiety was positively associated with rejection sensitivity, emotional reactivity strategies, negative affect, and negatively associated with positive affect. Global attachment anxiety predicted decreases in negative affect from baseline to after eating, when controlling for negative affect after cyberball. However, the relationship between attachment anxiety and eating unhealthy food was not replicated, possibly because affect was measured immediately before eating. This raises an interesting issue. Perhaps focusing on the specific mood one is experiencing can suppress emotional eating. This can also be related to the issues discussed in Study 1. If individuals who report higher levels of attachment anxiety are eating more because they perceive that they are hungrier, perhaps because they mislabel internal physiological signals, then exercises in which an individual focuses on what they are feeling may be a viable way to prevent emotional eating. Future research would be needed to explore this further.

The purpose of Study 4 was to conduct an intervention to prevent emotional eating after ostracism. The intervention consisted of writing for five minutes a night for six nights about experiences of feeling supported, comforted, and loved. These journal entries contained high levels of secure base content. It was predicted that writing about secure feelings and experiences would create a buffer to reduce amount eaten after cyberball. Additionally, this study used all highly palatable, highly caloric, i.e., “junk foods,” in order to amplify eating effects, but no eating effects were found. One reason may be the sample was not representative because of the high exclusion rate. The journal

writing did not affect state attachment scores and no relationship was found between global attachment anxiety and eating unhealthy food.

Across the three studies which used cyberball, ostracized individuals did not eat more than included individuals, which contradicts prior research (Oaten, et al., 2008; Baumeister, et al., 2005). The ostracism manipulation was effective in that ostracized participants reported feeling more rejected, less accepted, and lower fundamental needs than included participants. Ostracism was still used in Study 3 and 4 because there was a good theoretical background to expect that ostracism would affect eating. A number of studies have found that ostracized participants eat more unhealthy food than included participants.(Oaten, et al., 2008; Baumeister, et al., 2005).. These results have been replicated using the cyberball paradigm as well as other methods of social exclusion and across various domains of self-regulation: eating, procrastination,etc. These findings are amplified among the socially anxious. Thus, it is surprising that ostracism did not affect eating, especially among individuals who reported higher levels of attachment anxiety.

Even though Studies 3 and 4 found that *inclusion* affected state attachment, mood and hunger, one would still expect to see differences between the ostracized and included groups, even if it could not be determined whether the differences were due to the positive experience of inclusion or the negative experience of ostracism. Thus, it is not known for sure why ostracism did not have effects on eating, especially since the manipulation affected other constructs like the four fundamental needs and state attachment. Oaten et al. (2008) who used the cyberball paradigm and found eating effects conducted their study at Macquarie University in Australia whereas the current studies were conducted in Newark, New Jersey, in the United States. There might be cultural

differences, or differences between the samples in terms of sensitivity to ostracism. Oaten and colleagues did not report the ethnic variation of their sample, but it is possible that their sample was more homogenous, whereas the samples in the current studies were very diverse.

Some interesting effects were found with regard to inclusion in Studies 3 and 4. State attachment anxiety levels tended to decrease from before to after cyberball for included individuals who reported lower levels of attachment anxiety. Additionally, included individuals reported larger decreases in negative affect from before to after cyberball. In Study 4, it was discovered that among included individuals, those who reported higher levels of global attachment anxiety reported less hunger than individuals who reported lower levels of attachment anxiety. This was not found among ostracized individuals.

There is a large amount of evidence that ostracism is a highly negative experience. Ostracism has often been shown to have a number of detrimental effects, specifically: lowering of the four fundamental needs: belonging, control, self esteem, and meaningful existence and more negative mood, especially sadness and anger (Williams, 2007; Williams & Zadro, 2005; Smith & Williams, 2004; Gonsalkorale & Williams, 2007). Cyberball is a widely used paradigm and has repeatedly demonstrated that ostracized individuals experience these negative effects compared to included individuals (Williams, 2007; Zadro, 2004; Eisenberger, Lieberman & Williams, 2003). The current studies found differences between the included and ostracized groups in the four fundamental needs, which would suggest that the ostracism was having detrimental effects. However, these between group differences may have been a result of the

inclusion manipulation increasing the four fundamental needs, or an interaction of both. This point should be considered because when exploring within group differences, many interesting effects were found within the included group and not the ostracized group.

Although a number of previous studies have found between group differences for ostracism and inclusion in mood and the four fundamental needs, within group differences were not explored (Zadro, 2004; Smith & Williams, 2004; Gonsalkorale & Williams, 2007). However, the current studies found a number of within subject effects which were unique to the inclusion condition and not the ostracism condition. Individuals in the included condition reported decreases in negative affect and decreases in state attachment anxiety (for those with lower global attachment anxiety). In Study four, it was also found that individuals with higher levels of attachment anxiety reported less hunger than individuals with lower levels of attachment anxiety, but only within the included group. Thus, it is possible that the included condition may have had a suppressive effect upon hunger. The included group may not be a completely neutral control for ostracism. Taken together, these effects suggest that this condition is worth exploring further and considering in addition to the ostracism condition, perhaps looking more at within subject effects. Inclusion manipulations may be more important than previously thought.

It is possible that individuals who report higher levels of attachment anxiety may feel that they experience chronic levels of ostracism in daily life, even if they are not intentionally ostracized, and perhaps have become less sensitive to ostracism and more sensitive to inclusion. The experience of rejection is dependent on whether the individual perceives that his/her relational value has dropped below a minimum criteria (Williams, 2007). Given that individuals who report higher levels of attachment anxiety have

negative views of self, it is likely that these individual would perceive that his/her relational value is low in the eyes of others (Bartholomew & Horowitz, 1991). Thus an experience of exclusion in which the excluder may not intentionally be excluding the individual may be perceived as rejection in the eyes of an individual who reports higher levels of attachment anxiety. Additionally, attachment anxiety is correlated with social anxiety, trait anxiety, and sensitivity to social rejection (Dilmac, Hamarta, Arslan, 2009; Picardi, Caroppo, Toni, Bitetti, & Di Maria, 2005; Aderka, Weisman, Shahar & Gilboa-Schechtman, 2009; Ronan & Baldwin, 2010). These associations between attachment anxiety and other forms of anxiety may also predispose an individual who reports higher levels of attachment anxiety to be more expectant of ostracism in daily life. Individuals who report higher levels of attachment anxiety are more vigilant, expect rejection, experience increased levels of general anxiety, hold negative views of self and positive views of others (Bartholomew & Horowitz, 1991; Mikulincer & Shaver, 2007). Thus, these individuals may expect rejection in everyday life. If an expectation and perceived experience of chronic ostracism is the norm for individuals who report higher levels of attachment anxiety, ostracism through cyberball may not have been as meaningful. However, inclusion may have been a much more meaningful experience.

The unexpected effects with regard to inclusion may also have interesting implications for alternative interventions. It was expected that ostracism would increase emotional eating and that journal writing would serve as a buffer against the ostracism. It is possible though, that ostracism and attachment style did not interact because individuals with higher levels of attachment anxiety may expect and perceive ostracism, thus ostracism was not very impactful. Inclusion, however, may have been impactful, and

furthermore, may have actually served as a buffer against any stress created by the experiment and suppressed emotional eating. Future interventions might capitalize on an inclusion intervention. For example, an intervention in which group cohesiveness is increased may give an individual the resources they need to stop emotional eating. Twelve step groups, such as Overeaters Anonymous (OA) may be doing just this (Weiner, 1998). In OA, individuals who have issues with eating meet frequently to share their emotions, experiences, lend help and emotional support, and share in a sense of solidarity with others who have the same issues. Being a part of this group may target emotional eating via increasing a sense of belonging, among other things. In this sense, OA might be especially impactful for individuals with higher levels of attachment anxiety. Future studies could explore the impact of attending OA meetings specifically upon individuals with attachment anxiety.

Emotional Eating and Attachment Avoidance

The null effects for food consumption of individuals scoring high on attachment avoidance in Study 1 and 2 deserve some consideration. A question that has been raised in the attachment literature is how individuals with high levels of attachment avoidance are affected by attachment related distress. Those high on avoidance tend not to show feelings of distress. Wei, Vogel, Ku, and Zakalik (2005) found that attachment avoidance is significantly and positively associated with the affect regulation mechanism of emotional cutoff, or removing oneself from others and emotions. Additionally, emotional cutoff was found to mediate the link between attachment avoidance and interpersonal

problems and negative affect. Thus, avoidant individuals experience more negative affect and interpersonal problems because they tend to use this emotional cutoff method of affect regulation (Wei et al., 2005). However, it is not known whether avoidant individuals are suppressing these emotions, whether they do not even experience them in the first place (because they are so used to dismissing their feelings), or whether they experience them on some level and are not aware of them. There is some conflicting evidence on this issue. Feeney and Kirkpatrick (1996) subjected participants to a stressful mental arithmetic task while measuring heart rate, systolic and diastolic blood pressure during baseline and during the task. Half the participants performed the task with their partner present first, then again with their partner absent and vice versa for the other half of participants. Attachment style was measured in terms of anxious-non anxious and avoidant-secure and then participants were categorized into 4 attachment styles. The authors found that all participants had increased physiological arousal during the task as compared to baseline regardless of attachment style. However, the anxious as compared to the non-anxious participants had much higher physiological measures when their partner was absent first and this continued into the partner present condition. In other words, the anxious participants displayed higher levels of physiological arousal to begin with and not only during the mental arithmetic task. Importantly, the results were similar for those on the avoidant secure dimension. The authors recognized that these results could be interpreted in a number of ways but one would be that the insecure participants experienced heightened levels of separation anxiety when their partner was absent, and were not calmed when their partner was present. They compared this to Ainsworth's strange situation task in which the avoidant children appear as if they are indifferent to

their mother leaving the room. However, subsequent studies, for instance Sroufe and Waters (1977), found that avoidant infants' physiological activity was not subdued when the mothers left the room as was their covert behavior.

Fraley and Shaver (1997) question whether adult avoidant individuals completely deactivate their attachment systems, or if like the infants, they only appear to do so externally. Fraley and Shaver asked individuals to write freely about their feelings and emotions (a stream of consciousness exercise) for 5 minutes, while trying to suppress thoughts of their romantic partner leaving them. Then, they were asked to write freely again for 5 minutes without suppressing any thoughts and report (as a check mark) every time a thought occurred to them having to do with their partner leaving them. In the control condition, participants were first asked to write freely and then asked to suppress. Suppression of thoughts often leads to increased occurrences of these thoughts later on, known as the rebound effect. However, if individuals are practiced in suppressing certain thoughts, the rebound effect diminishes. If the defense mechanism for avoidant individuals allows for the successful suppression of thoughts, then avoidant individuals should not demonstrate the rebound effect, which would be evidenced by fewer thoughts of partner separation after the suppression period. If the avoidant defense mechanism does not allow for the successful suppression of thoughts, then one would expect avoidant individuals to evidence more thoughts after the suppression period. The authors found that avoidance was correlated with fewer thoughts during the expression period after the suppression period. This correlation was lower than that of the control group, where the expression period occurred first. In contrast, the opposite effect was found with preoccupied individuals. Here, a correlation was found between preoccupation and more

thoughts in the expression period, and this correlation was higher than that of the control condition. In other words, these results suggest that avoidant individuals are able to successfully suppress thoughts related to separation and loss, implying a deactivation of the attachment system.

A follow up experiment was performed where participants were asked to suppress a neutral thought or thoughts about their partner leaving them and then verbally express thoughts about their partner leaving them. In this case, skin conductance level (SCL) was measured. It was found that avoidance level was negatively correlated with SCL. This study implies that avoidant individuals are able to deactivate their attachment system when confronted with the thought of separation. However, Feeney and Kirkpatrick (1996) found that avoidant individuals had higher physiological arousal when separated from partners.

In comparing these studies, numerous factors should be considered. Perhaps, the avoidant individuals are able to suppress unwanted thoughts and emotions when they are aware that the situation is not real. Additionally, heart rate and SCL are different measures and it might not be best to directly compare them. Another issue may be that the avoidant individuals did not think of very anxiety producing thoughts in Fraley and Shaver's study. Avoidant people devalue relationships, and it may have been more challenging for them to think of thoughts of their partner leaving them in the first place. These two studies also used different methods/scales of measuring attachment. Regardless, the evidence is conflicting and the question still remains whether avoidant individuals feel completely detached from attachment figures or whether they just behave as if they do. It is also possible that more avoidant individuals will underreport their

emotions, especially considering the disconnect they may have between their physiological signals and self-reported emotions. Future studies could use physiological measurements to address this. The subjective nature of an avoidant individual's experience of ostracism remains a complicated question to answer. More avoidant individuals may under report or not report their true feelings on self-report questionnaires, even if physiological measures show increased arousal, the avoidant individuals may not be aware of their physiological arousal, or may misinterpret their physiological arousal, and it would be difficult to discern which is actually happening, if they are not aware themselves.

In studies 1 and 2, attachment anxiety was found to be related to emotional eating and eating unhealthy food, but there was no relationship between attachment avoidance and eating. It is hypothesized that individuals with higher levels of attachment anxiety are more prone to emotional eating because of their tendency to use hyperactivating strategies of emotion regulation and individuals with higher levels of attachment avoidance use deactivating strategies, characterized by suppressing emotion. However, it is interesting that Evers, Stok, and Ridder (2010) found that coping strategies which involve suppression were related to emotional eating. It could be that individuals with higher levels of attachment anxiety are using food as a vehicle to suppress overwhelming emotions, whereas individuals with higher levels of attachment avoidance are suppressing emotions early on, perhaps even so practiced at suppressing, that they lack emotional awareness to begin with and thus have less need to use eating as a coping strategy. **Emotional Eating and Obesity**

The relationship between emotional eating and obesity is not straightforward. There are numerous studies that have found differences in emotional eating between obese and normal weight participants and numerous studies that have not (for a review, see Ganley, 1989). Ganley (1989) states that 4 of the 6 studies that have not found emotional eating differences between the obese and normal weight have used crackers which are not a particularly palatable food. However, 5 of the 7 studies that did find differences used foods which are considered more conducive to emotional eating like M & M's and ice cream. Type of food may be an important determinant of emotional eating, and Mckenna (1972) did in fact report evidence to support this assertion. Braet and Van Strien (1997) found that obese children scored higher on the emotional eating scale of the DEBQ than non-obese children. Giliebter and Aversa (2003) found that overweight individuals reported eating more than normal weight and underweight individuals during negative emotional states and situations and less than normal weight and underweight individuals during positive emotional states and situations. On the other hand, underweight individuals reported eating less than overweight and normal weight individuals during negative emotional states and situations and more than overweight and normal weight individuals during positive emotional states and situations. Blair, Lewis and Booth (1990) found a significant positive correlation between BMI and self-reported emotional eating. Interestingly, they also found that individuals who reported reductions in their levels of emotional eating over a year also reported more weight loss than individuals who maintained a high level of emotional eating. Furthermore, individuals who increased their emotional eating had significantly more trouble reaching their desired weight than individuals who maintained a low level of emotional eating.

However, Nguyen-Rodriguez et al. (2008) did not find any differences in self-reported emotional eating between normal weight participants and overweight participants. Stress was found to be significantly related to emotional eating, but BMI was not found to moderate this effect. Additionally, Ricca, et al. (2009) found that binge eating severity is significantly correlated with emotional eating, but did not find any relationship between BMI and emotional eating. These studies could be interpreted to suggest that even people who are not obese eat emotionally.

Although some studies have found a relationship between emotional eating and obesity and some have not, emotional eating may still be a contributing factor to obesity. A research participant who tends to eat emotionally may not be obese at the time of testing, but his/her emotional eating may lead to obesity or weight gain later on in life. As some researchers have found, distress can lead to impairments in self-regulation which increases eating (Oaten, et al., 2008; Tice, et al., 2001). Nederkoorn, Houben, Hoffman, Roefs and Jansen (2010) found that weight gain over the course of a year could be predicted by an interaction between low response inhibition and implicit preference for snack food. If distress can impair many forms of self-regulation, lead to increased eating, and many individuals tend to prefer snack foods during times of stress (Wansink, et al. 2003), it is easy to see how those who already have less effective response inhibition and implicit preference for snack food would tend to gain weight. An emotional eater may not be overweight at all times because they may have other compensatory activities, e.g., exercising, that balances the extra intake of calories. Furthermore, emotional eating refers to eating not in reaction to a physiological hunger state, but a psychological state. Therefore, individuals are most likely consuming extra, unneeded calories when eating

emotionally. This is underlined by the findings that people tend to crave unhealthy comfort foods during episodes of emotional eating (Wansink, et al. 2003). Even though emotional eating is not correlated with BMI, it may lead to weight gain in the long run. Even more simply, it is likely to be an unhealthy behavior. If individuals are eating in order to cope with negative experiences, this may not be an ideal coping mechanism. Some studies have found that individuals may believe that eating will make them feel better, but in actuality it does not (Herman & Polivy, 1975; Tice, et al., 2001; Mckenna, 1972).

Even though technically, eating does not *need* to be social, eating is social for humans. Eating is an integral part of celebrations and sad occasions. People usually eat with others and some even consider it sad to eat alone. The social nature of eating easily allows for attachment styles to influence eating behavior. Those who possess attachment anxiety have a heightened need to feel close to and loved by others. Perhaps eating, which is frequently associated with close others (Troisi and Gabriel, 2011), can provide feelings of emotional intimacy when these feelings are lacking.

Food may provide comfort and may even be a substitute for relationships when a person is distressed, as Troisi and Gabriel (2011) suggest. However, there may be other contributing factors. Perhaps, the food is rewarding and therefore provides a distraction from the distress. It is also not known whether eating suppresses negative feelings or increases positive feelings or both. It is possible that individuals think eating will make them feel better and are mistaken. It is also possible that eating might make individuals feel worse, especially if they are attempting to restrict (as most people do with junk food) and are not able to control themselves. Troisi and Gabriel (2011) proposed that food is an

actual social surrogate, however, their data really only show that individuals *associate* food with relationships and comfort food fulfills the need to belong. This is a different idea than food actually being a *substitute* for a relationship. The question remains whether it is possible for individuals to have a relationship or an actual attachment towards food. Associating food with relationships and considering food to be a relationship are different and imply different directions for researchers to take. If individuals associate food with relationships, then perhaps other activities can substitute for the emotional eating, something that conjures associations with relationships but is not food.

Future Directions

The next logical step in this line of work would be to conduct a true replication to confirm the eating effects discovered in Study 2. Additionally, a different social exclusion manipulation might be used. Examples others have used are to tell participants that they will be lonely in life or that no one in a group of peers wants to work with them (Baumeister et al., 2005). Another possibility is to explore experiences of ostracism and emotional eating in more of a long term sense. Studies 2 through 4 induced a temporary experience of ostracism but some individuals experience chronic ostracism, which can have debilitating consequences (Williams, et al., 2005). Additionally, the studies in this dissertation only measured emotional eating at one point in time, equivalent to a state measure of emotional eating. Studying individuals who identify as possessing the trait of emotional eating as well as harboring feelings of chronic ostracism could reveal deeper connections and relationships between the two constructs.

Both eating behavior and attachment are complicated processes. Maladaptive behavior patterns within these constructs, such as emotional eating, obesity, and insecure attachment will require multifaceted solutions drawing from numerous fields, theories and methodologies. This work provides evidence that attachment anxiety plays a role in emotional eating and unhealthy eating behavior. While there is information available on healthy eating and nutrition, there is little awareness of attachment theory among the general population. Perhaps educating individuals who have trouble regulating their calorie intake about their attachment styles and the attachment related triggers which provoke them to eat can give them an advantage in maintaining a healthy weight.

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