EATING TO REGULATE EMOTION

IN THE CONTEXT OF LONG-TERM RELATIONSHIPS

by

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A Dissertation Submitted to the Faculty of the

DEPARTMENT OF PSYCHOLOGY

In Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

In the Graduate College

THE UNIVERSITY OF ARIZONA

2013

THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

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AUTHOR'S NOTE

The data for this project was provided by Emily Butler, Ph.D. and was collected as part of Relationships, Eating, and Emotions (REE) study in 2011. The REE project was partially supported by the Frances McClelland Institute for Children, Youth, & Families.

ACKNOWLEDGMENTS

I would like to thank Emily Butler for serving as my dissertation advisor and providing me with unequivocal support throughout this process. Her mentorship truly made this experience a positive one and helped me move towards graduation with a sense of accomplishment and professional satisfaction. I am also grateful for her willingness to provide me with exceptional data that was highly relevant to my research and clinical interests.

I thank all of the members of my dissertation committee for their support throughout my many transitions. I am grateful to Matthias Mehl for seeing me through graduate training and sharing his expertise in language analyses. I thank Dave Sbarra for his invaluable help in setting training goals and navigating the balance between clinical work and research. I thank Mary-Frances O'Connor for joining my committee and providing excellent feedback at this late stage.

I would also like to thank Evette Richardson whose expert help with data collection sped up completion of this project by many months. I am indebted to my friends Anya Kogan, Elaine Blank, Dave Weise, Autumn Wiley, and Spee Kosloff, for riding the graduate school rollercoaster with me. I thank my partner Greg for providing a luxurious shelter, delicious meals, and frequent entertainment during the years I spent on becoming a specialist in my chosen field. Finally, I thank my family for their patience and support.

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ABSTRACT

Most people have difficulty maintaining a healthy diet. Both social and individual factors play a role in shaping one's diet, and individual factors might be differentially associated with eating depending on social conditions. The present research focuses on eating to regulate emotion and body weight in the context of couple relationships.

Forty-three committed heterosexual couples reported on emotion-regulation strategies including the use of eating to regulate emotion (ERE). During a lab visit, participants discussed their health habits with their partners and their body composition was measured (e.g.: weight, height, percent body fat). Finally, participants completed daily diaries assessing their emotions as well as their food intake relative to their own normal eating. I first tested whether ERE was associated with other measures of emotion regulation as well as body composition at an individual level. As predicted, ERE demonstrated internal consistency, was moderately correlated with an established measure of emotion-eating, and uncorrelated with other measures of emotion regulation. High ERE was associated with higher body mass index, as well as higher waist circumference and percent body fat among older women, and with higher percent body fat among younger men.

Secondly, I tested whether self-reported ERE predicted connections between daily emotional fluctuations and eating. Consistent with my hypothesis, those who reported high ERE ate worse when they experienced negative emotions

or did not eat better when they experienced positive ones (which was the case among people with low ERE).

Finally, I tested whether ERE in couples was associated with body composition under specific relationship conditions. As predicted, when both partners had high ERE, women who used more we-talk during a discussion of health habits also had higher BMI. However, women who used high I-talk in such couples had lower BMI despite having high ERE. Moreover, in such couples expression of negative emotion by partners was associated with higher BMI.

Identifying individual and couple-level factors shaping dietary practices adds to development of interventions for poor health habits. It is an important step in shifting disease-focused models of medical care towards more comprehensive, patient-centered care.

CHAPTER I: INTRODUCTION

The prevalence of overweight and obesity in the US has been increasing since 1976 (Flegal, Carroll, Ogden, & Curtin, 2010). The rate of this increase has recently begun to slow down, but the proportion of people with unhealthy weight stabilized at an alarmingly high level (Flegal et al., 2010), suggesting the need for a more detailed investigation of factors contributing to high obesity levels. Food choices are affected by many large-scale societal forces such as advertising (Harris, Bargh, & Brownell, 2009), portion sizes, and availability and pricing of food (Rolls, 2003; Wansink & van Ittersum, 2003); however these factors are not easily influenced by individuals. To make change possible for motivated individuals, we need to focus on contributors to eating that are amenable to personal modification. The existing literature points to emotions (e.g., Adriaanse, de Ridder, & Evers, 2011; Evers, Marijn Stok, & de Ridder, 2010; Macht, 2008) and close personal relationships (e.g., Homish & Leonard, 2008; Markey, Markey, & Gray, 2007) as two such factors.

One theme that requires further exploration is the role of eating as a deliberate emotion regulation strategy, as opposed to an automatic response to emotional turmoil. Emotion regulation is amenable to change through intervention (see Berking & Wupperman, 2012, for a review), which makes this investigation pragmatic. Another promising endeavor is to take a more detailed look at weight-related processes occurring in a relationship context (e.g., Bove & Sobal, 2006; Markey, Gomel, & Markey, 2008). Relationship contributors to eating represent middle ground between personal and societal factors and exploring them may provide insight into the ways in which

relationship arrangements may either exacerbate or protect individuals against larger negative societal forces.

The overarching goal of this research is to clarify the connection between emotion regulation and eating in the context of close relationships by making use of existing data from a study that explored emotional processes and health behaviors in romantic couples. I first investigate whether eating to regulate emotion (ERE) demonstrates construct validity by assessing within-person associations between the use of ERE and 1) other measures of emotion-eating and emotion regulation, 2) daily covariation between emotion and eating, and 3) indicators of participants' body composition. At a relationship level, I examine whether romantic partners' combined, overall level of ERE or the differences between partners' ERE are related to their body composition. Furthermore, I examine whether couple's average ERE interacts with couples' health-related cohesion and conflict to determine body composition, as these factors may ameliorate or exacerbate poor eating habits. Based on evidence that eating may play a role in regulating couples' relationships (Butler, Young, & Randall, 2010) and that different couples may benefit from different types of therapy (Shoham, Rohrbaugh, Stickle, & Jacob, 1998), clarifying the role of emotion regulation and relationship factors in eating may contribute to designing more successful weight loss and weight maintenance interventions for obesity, diabetes, and any other conditions requiring dietary modification.

CHAPTER II: REVIEW OF THE LITERATURE

Weight loss and weight management are among the most controversial and sensitive topics in US healthcare. Although most people would like to be in good health and believe that maintaining a healthy diet is important (Margetts, Rogers, Widhal, de Winter, & Zunft, 1999; Merrill, Friedrichs, & Larsen, 2002; Rozin, Bauer, & Catanese, 2003); 68% of US adults are overweight or obese (Flegal et al., 2010), suggesting that only a small percentage of people adhere to the recommended diet. What are the factors determining what, how much, and when we eat? Why are eating habits so hard to change even when our own health or survival are at stake?

These questions have provoked heated debate, and answers often include large societal forces such as advertisement (Harris et al., 2009), along with low pricing and availability of unhealthy foods (Drewnowski & Specter, 2004; Rolls, 2003; Wansink & van Ittersum, 2003). While the macro-environment undoubtedly contributes to our choices, some people and families are able to better withstand these negative forces, while others fall prey to unhealthy lifestyles. This suggests that individual and family factors contribute to dietary choices as well, and may either serve a protective function or exacerbate the existing challenges of making healthy food choices. Investigation of these smaller-scale factors gains importance because they can be directly addressed within the framework of psychological science and intervention and are more amenable to change through the efforts of individuals than US economy and policy.

What, then, are these smaller-scale factors contributing to eating habits and food choices? Despite ample informal evidence of the links between emotion, eating, and

relationships, the majority of research on these topics addresses *either* the link between eating and emotion *or* the one between eating and relationships. The former literature shows that emotional experiences can be linked to eating (Arnow, Kenardy, & Agras, 1995; Cools, Schotte, & McNally, 1992; Davis & Fischer, 2013; Ganley, 1989; Gilboa-Schechtman, Avnon, Zubery, & Jeczmien, 2006; Macht, 2008; Macht & Simons, 2000), but largely omits the potential role of close relationships in moderating the associations between emotion and eating. Similarly, the literature on social relations and eating shows that eating is associated with social surroundings (e.g., Delormier, Frohlich, & Potvin, 2009; Herman, Roth, & Polivy, 2003; Salvy, Jarrin, Paluch, Irfan, & Pliner, 2007), but bypasses the exploration of the possible role of emotional processes. The present research begins to clarify the links between all three factors by exploring the connection between eating as an emotion regulation strategy and body composition measures in the context of close relationships.

Eating to Regulate Emotion at an Individual Level

Eating following emotion. The results of research on emotion and eating suggest a complex connection between emotional experiences and the foods consumed afterwards. While overeating in response to a negative emotion is often the case for restrained eaters (Heatherton, Herman, & Polivy, 1991), binge-eaters (Davis & Fischer, 2013), and individuals with obesity (Telch & Agras, 1996), nonclinical populations respond to negative emotions in different ways. Macht (2008) summarized results of studies on the link between negative emotion and changes in food intake in non-disordered populations and reported that participants in 15 of these studies demonstrated

an increase in the amount of food consumed after experiencing a negative emotion, in 12 studies there was a decrease, and in 8 there was no change in eating. This split suggests that people free of eating disorder pathology respond to negative emotions in ways that may not involve changes in food intake at all, but if these changes occur, they can go either way. These findings indicate that the relationship between emotions and eating may be influenced by other factors as well.

A closer examination of different methodologies used in the studies on emotion and eating provides insight into potential moderators. Namely, most studies done in a laboratory setting showed that self-reported emotional eating was *not* associated with increased food intake when negative emotions were induced (Adriaanse et al., 2011; Conner, Fitter, & Fletcher, 1999; Evers, de Ridder, & Adriaanse, 2009). In contrast, daily diary studies support this link. For instance, O'Connor, Jones, Conner, McMillan, & Ferguson (2008) collected daily diary data and showed that self-reported emotional eating did predict eating when participants experienced increased daily stressors. Another daily diary study showed that meals eaten by obese women in positive and negative moods were significantly larger than meals consumed in a neutral mood (Patel & Schlundt, 2001). Similarly, Macht and Simons (2000) conducted a daily diary study in which they showed that during experience of negative emotions people reported a heightened tendency to cope with these emotions through eating. This difference between results of laboratory and naturalistic studies becomes more meaningful if we consider the possibility that eating might be a *regulatory* strategy as opposed to a spontaneous reaction to an emotion. When emotions are induced in a lab, the resulting experiences

have to be mild enough to be ethical and are at least somewhat expected by the participants. Furthermore, experimental stimuli are usually designed to elicit specific emotions and are less likely to elicit mixed reactions or reactions that the participants may want to avoid or suppress as inappropriate or undesirable. The need to *regulate* these emotions may therefore be decreased. In contrast, in their daily lives, people may experience emotions that are more rooted, long-term, or unsuitable according to their own or societal values. These more complex and intense emotional states may create a need for more effortful emotion regulation, and people may be more likely to utilize a broader range of emotion-regulation strategies, including eating.

Eating as an emotion-regulation strategy. Indeed, more recent studies on the connection between emotion and eating suggest that it is not the emotion itself, but rather the way people deal with the emotion that results in changes in one's eating (Butler et al., 2010; Evers et al., 2010; Lavender & Anderson, 2010; Lavender, Anderson & Gratz, 2012; Wiser & Telch, 1999). According to this theory, eating plays a role not as a mere response to a negative emotion or increased stress, but rather plays a regulatory role. Direct evidence for the use of eating as an emotion regulation strategy comes from Macht and Simons' (2000) daily diary study described above that highlighted the possible use of eating as a form of emotion regulation to cope with negative emotions. It is therefore possible that eating comes about as a last-resort regulatory effort when other strategies fail to provide desired relief.

Indirect evidence also supports the assumption that eating may be used as an emotion-regulation strategy. In one study, emotion regulation difficulties accounted for

unique variance in both disordered eating and body dissatisfaction among college men, and these results remained significant after accounting for the variance associated with BMI and negative affect (Lavender & Anderson, 2010). The same pattern was observed among binge eaters, for whom greater difficulty identifying and making sense of emotional states, along with limited access to emotion regulation strategies, were primarily responsible for the link between emotional difficulties and binge eating (Whiteside et al., 2007). Yet another study showed that thought suppression in men fully mediated the relationships between negative affect and global eating disorder symptoms as well as specific symptoms of shape concern. Importantly, it also partially mediated the link between negative affect and the eating disorder symptoms of eating and weight concern (Lavender et al., 2012).

Similarly, Svaldi, Caffier, & Tuschen-Caffier (2010) showed that women with binge-eating disorder suppress more and reappraise their emotions less than those free of eating disorder pathology. Finally, in a study that incorporated both emotion regulation and relationship factors, Butler et al. (2010) showed that when overweight women suppressed their emotion, their male partners reported less negative feelings towards them, but these women also tended to eat more. Overall, these findings suggest that excessive eating may be associated with more frequent use of maladaptive emotion regulation strategies and decreased use of adaptive emotion regulation.

Why might eating be enlisted in an attempt to improve one's emotional state? Eating can, in fact, have a positive impact on mood, either through direct physiological pathways or due to its pleasurable qualities (Macht & Mueller, 2007), making it plausible

that when other regulatory strategies fail, people might turn to food as last resort. It therefore makes sense that people would use eating as a way to regulate emotion in the short term, but this strategy is likely to be ineffective in the long-term. Not only does it do little to help resolve the issues that are causing distress in the first place, the use of eating as a secondary emotion regulation strategy may have undesirable side effects. In one study, emotional suppression was followed by increased consumption of high-calorie and high-fat comfort foods (Evers et al., 2010), which may, overtime, lead to health problems such as increased weight (e.g., Danielsson et al., 2009), obesity, and diabetes (e.g., Brons et al., 2009).

The research reviewed above is suggestive that eating following an experience of negative emotions may be more of an attempt to *regulate* these emotions than a direct *result* of them. However, no studies that I know of used a specific measure of *eating as emotion regulation*. Such a measure would allow us to distinguish between a regulatory strategy and an emotional reaction and assess whether any of the relevant constructs are differentially associated with one but not the other. Macht and Simons (2000) came closest to measuring eating as emotion regulation by asking participants whether they had a "tendency to eat to relax" and "tendency to eat to feel better" when they experienced specific emotions. In my dissertation research, I expanded upon their approach and developed a measure that directly assesses whether people eat with the goal of regulating their emotion. This measure was designed based on the widely used Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). The original ERQ assesses individual differences in the use of expressive suppression and cognitive reappraisal to regulate

emotion. The new ERE measure consists of three face valid items parallel to the items in the ERQ, with the regulatory strategies listed in the original ERQ replaced with eating. This measure allowed me to assess whether eating serves an emotion-regulation purpose, aside from whether eating changes in response to a certain emotion. If eating has more to do with regulatory attempts than emotions per se, the use of this measure may get us closer to untangling the connection between emotions and eating.

Eating to Regulate Emotion at a Couple Level

Another important question is whether the association between ERE and body composition changes depending on the context of close relationships. Although abundant evidence suggests that the immediate social context plays an important role in eating (e.g., de Castro, 1994; Herman et al., 2003; Kristensen, Holm, Raben, & Astrup, 2002) and emotion regulation (e.g., McRae, Heller, John, & Gross, 2011), no studies I am aware of examine the role of social context in the *connection between* emotion and eating. When it comes to the link between social context and eating (ignoring emotion), Herman et al. (2003) reviewed the literature on the role of social facilitation, modeling, and impression management in eating and concluded that there is sufficient evidence confirming all three phenomena: people (a) eat more when in groups, (b) tend to mirror those who consistently eat large or small amounts when eating with them, and (c) eat less when they believe that they are observed or evaluated.

Results of studies focusing on *familial context* are most consistent with social facilitation theory and suggest that people eat more when in company of their family. For instance, participants in a qualitative study reported enjoying eating to excess when

sharing meals with their families and close friends, but avoiding overindulgence when sharing meals with less familiar people (Kristensen et al., 2002). In a study specifically investigating differential social facilitation of food intake, de Castro (1994) found that people eat more when in presence of family members and close friends as opposed to other companions. It is therefore not surprising that romantic partners often report gaining weight after getting married (e.g., Anderson, Marshall, & Lea, 2004; Jeffery & Rick, 2002). Furthermore, research outlines several specific ways in which romantic partners affect each other's eating and other health habits. Studies show that partners influence each other both unknowingly, e.g., via automatically occurring convergence of dietary habits (Bove, Sobal, & Rauschenbach, 2003), deliberately, by means of social control (Lewis & Butterfield, 2007; Lewis & Rook, 1999; Markey et al., 2008; Rook, Thuras, & Lewis, 1990; Savoca & Miller, 2001), and by engaging in complex dyadic patterns involving eating and relationship processes such as cohesion and conflict. Each of these mechanisms is outlined below.

Habit exchange and convergence. In terms of simple exchange of dietary habits, Bove et al. (2003) demonstrated that diets of newly cohabiting partners tended to converge over the first few months of living together and became more similar even for the meals that the couple did not share. Of note, this change and convergence of dietary choices and eating habits appears to happen asymmetrically for men and women. Studies suggest that women tend to adhere to a healthier diet than men do (e.g., Beardsworth et al., 2002; Morse & Driskell, 2009; Wardle et al., 2004), but that they also tend to change

their diets to less healthy and gain more weight when they start cohabiting with a male partner (e.g., Bove et al., 2003; Savoca & Miller, 2002).

Social control. When it comes to direct social control, studies show that partners make deliberate attempts to influence each other and that these attempts may be positively or negatively emotionally charged (Lewis & Rook, 1999; Tucker & Mueller, 2000). These efforts may result in changes in health behaviors; however, these changes may not necessarily be consistent with the intent. One study examining social control of eating behaviors showed that negative control tactics (such as warning partners about negative health consequences of their behavior), used by partners of patients with diabetes were associated with poorer dietary adherence (Stephens, Rook, Franks, Khan, & Iida, 2010). In contrast, the use of positive tactics, such as encouragement, were linked to better adherence (Stephens et al., 2010). Research also suggests that negative partner influence may be associated with no change in the targeted health habit, but may increase distress and potentially negative emotions in the influenced partner (Lewis & Rook, 1999). Overall, this research indicates that partner influence may impact health behavior not only directly, but also by triggering emotional responses that in turn influence targeted health behavior. In this case, negatively charged social control tactics are likely to increase negative emotion in the partner, thus perhaps making it more likely that the person would engage in the health-compromising behavior even more, to self-soothe.

Similar to habit exchange, social control and responding to partner influence are also subject to gender differences. On the one hand, research shows that relationship factors such as marital quality and relationship satisfaction are more significant for the

health of women than of men (Coyne et al., 2001; Kiecolt-Glaser & Newton, 2001; Rohrbaugh, Shoham, & Coyne, 2006). On the other hand, several studies show that women are more likely to attempt influencing their partners' health behavior and use a wider repertoire of social control strategies that allow them to be more effective in facilitating health-related change (Tucker & Mueller, 2000; Umberson, 1992). Consistent with these results, women in one of our own studies (Skoyen, Blank, Corkery, & Butler, in press) had more helpful influence on their partner's diet and exercise than did men. Similar results were reported by Markey et al. (2008) who showed that women's, but not men's, attempts to regulate their partners' eating behaviors were associated with their partners' healthy dieting behaviors. Furthermore, although people of both genders acknowledge partner influence on their diets, men believe that their diets are influenced more so than women do (Bock et al., 1998), suggesting that men might be more amenable to direct partner influence. Overall, although the health of women is more influenced by relationship quality and women tend to adapt their male partner's eating habits more automatically then do men, women appear to make more direct attempts to influence their partner's health habits, making such direct influence more of a factor for men.

Dyadic patterns. The social context literature reviewed above largely ignores the role of emotion in eating, but the dyadic pattern perspective allows us to examine the connection between emotion and eating in a relational context. Prior research suggests two prominent dyadic patterns that involve relationship dynamics and health behaviors. The first pattern is known as symptom-system fit (Rohrbaugh, Shoham, & Racciopo, 2002). Symptom-system fit is a relational pattern in which an unhealthy behavior, or

"symptom" plays a role in relationship maintenance, or "fits the system," while potentially having a detrimental impact on one or both partners' health. A small body of literature supports the idea that health-compromising behaviors can benefit the couple under some circumstances. One study showed that when the couples were asked to smoke in the laboratory, dual-smoker couples demonstrated an increase in positive emotion, while single-smoker couples showed a decrease (Shoham, Butler, Rohrbaugh, & Trost, 2007). In a follow-up study, Rohrbaugh, Shoham, Butler, Hasler, and Berman (2009) demonstrated that affective synchrony increased in dual-smoker couples when both partners smoked and decreased in single-smoker couples when only one partner smoked. Overall, these studies provide indirect evidence that partners sharing health-compromising habits may benefit from them as a couple because these habits are associated with greater emotional synchrony, positive emotion, and cohesion, as well as decreased health conflict.

Although research on symptom-system fit has focused on smoking, we can extrapolate to what might happen in the case of partners sharing unhealthy eating habits. In this case, a couple may cherish eating indulgent meals together, because it provides them with a pleasant time away from daily hassles and potentially decreases conflict and increases their sense of cohesion. Although having mutually satisfying dinners with a partner does not necessarily lead to decreased health, if both partners tend to eat to regulate emotions and to feel better, they might engage in this behavior more frequently. In addition to eating to regulate emotions alone, they might offer each other meals and comfort foods to feel better, and might be more likely to have them easily available. Such

couples might also be likely to continue this habit despite weight gain. Consequently, over time, this habit could result in excessive weight and other undesirable changes in body composition. To summarize, it is conceivable that symptom-system fit applies to couples overeating together, with this behavior playing a regulatory role in the couple's wellbeing but perhaps also resulting in higher BMIs over time.

Another relational pattern that may involve ERE has been described in the literature as demand-withdraw (Christensen & Heavey, 1990). In this pattern, one of the partners engages in an unhealthy behavior and the other demands change by nagging, whining, or criticizing the other partner; in turn, the recipient of this influence withdraws from the interaction (e.g., Christensen & Heavey, 1990). In this case, the criticized partner may experience greater distress and higher negative emotion during marital conflict (Papp, Kouros, & Cummings, 2009), and may become more engaged in the undesirable behavior as an attempt to cope with their partner's demands. While this exact scenario has not yet been addressed, multiple studies show results consistent with this pattern. For instance, social control literature reviewed above suggests that negatively charged influence attempts may result in exacerbation of a health-compromising habit (e.g., Stephens et al., 2010). A crucial thing to consider here is that among people who regulate their emotions by eating, an increase in negative emotion due to partner criticism may have an ironic impact and become the very stressor that exacerbates emotional distress and increases the need to self-regulate by eating. In turn, one partner's problematic health behavior can elicit frustrating and intrusive comments from the other partner, which can increase distress and health conflict, and further exacerbate the

problematic behavior (e.g., Helgeson, Novak, Lepore, & Eton, 2004). Additional evidence for this pattern comes from studies on alcoholism, in which the expression of negative emotion by spouses of alcoholic patients leads to increases in drinking (e.g., Mattson, O'Farrell, Monson, Panuzio, & Taft, 2010; O'Farrell, Hooley, Fals-Stewart, & Cutter, 1998; Rotunda & O'Farrell, 1998). Going back to ERE, it may both trigger negative influence attempts in the partner and *be* triggered by negative emotion, and so it is feasible that ERE could become part of a demand-withdraw cycle.

Although the symptom-system fit and demand-withdraw patterns described above could be conceptualized with ERE playing the role of the unhealthy habit, there is no research directly describing symptom-system fit and demand-withdraw that involve eating. To examine whether these patterns emerge in the presence of unhealthy eating, we need to correctly identify couples in which this is likely to occur. The first requirement is the presence of ERE; and of particular interest is whether or not ERE is *shared* by both partners. Intuitively, couples with similarly high ERE are more likely to be involved in symptom-system fit, because they have a shared tendency and are more likely to build their relationship in a way that involves satisfying this tendency. Conversely, couples with divergent ERE are more likely to be involved in demand-withdraw, because having different health- and appearance-related habits might create conflict and distancing of health habits over time.

To test whether symptom-system fit and demand-withdraw emerge for a given couple, we would also need to examine whether this couple exhibits any signs of a close connection between relational processes and health habits. More specifically, partners

with similarly high EREs might me more likely to be involved in symptom-system fit *if* they also have a higher sense of health-related cohesion. Conversely, for those who have discrepant ERE, demand-withdraw would be more likely to emerge in the presence of health-related conflict. Literature on both health-related and relational processes alike suggests that one way to gage levels of cohesion and conflict is by analyzing the language couples use to discuss their health habits (e.g., Agnew, Van Lange, Rusbult, & Langston, 1998; Pennebaker, Mehl, & Niederhoffer, 2003; Rohrbaugh, Mehl, Shoham, Reilly, & Ewy, 2008; Simmons, Gordon, & Chambless, 2005). Namely, first-person pronouns (such as "we" vs. "I") can be used as an indicator of cohesion, and emotionally charged language (i.e., negative- and positive- emotion words) can serve as an indicator of conflict.

Language Use and Health

Pronoun use and health. First-person pronoun use, or "we-talk," has been used by many researchers as a reflection of dyadic processes. For instance, the percentage of we-talk in the overall speech has demonstrated associations with relational commitment, more effective problem-solving, and communal coping approach in couples (e.g., Agnew et al., 1998; Rohrbaugh et al., 2008; Simmons et al., 2005). One benefit of this measure suggested by Pennebaker et al. (2003) is that pronouns are less subject to deliberate word choice than nouns and verbs, which makes it a good measure for assessing sensitive matters such as couples' cohesion and conflict.

Although studies connecting pronoun use to eating are lacking, research suggests that pronouns reflect communal processes and are associated with relationship quality

and physical health. One study showed that we-talk during a marital interaction task was linked to more positive solutions to problems faced by the couple in which one of the partners was starting treatment for anxiety-spectrum mental illness (Simmons et al., 2005). Participants in another study were asked to record their thoughts about their current relationship and spontaneous we-talk in these records was linked to higher commitment in romantic relationships (Agnew et al., 1998). Similarly, in a study on long-term marriages, we-talk during a marital interaction task was associated with less negative emotion in both spouses, as well as and more positive emotion and lower physiological arousal in partners (Seider, Hirschberger, Nelson, & Levenson, 2009). Partner we-talk during discussion of coping with cancer was associated with better dyadic adjustment in breast cancer patients (Robbins, Mehl, Smith, & Weihs, 2012).

As for the connection between we-talk and physical health measures, one study showed that we-talk by the spouse, but not the patient, predicted positive change in the general health and specific cardiovascular symptoms of health failure patients (Rohrbaugh et al., 2008). Finally, in a smoking cessation study, we-talk by the patient's spouse predicted smoking abstinence 12 months after quitting and change in we-talk by both partners during the course of the intervention predicted cessation outcomes as well (Rohrbaugh, Shoham, Skoyen, Jensen, & Mehl, 2012).

Most of the above studies suggest that we-talk is associated with positive relational and health outcomes; however, it may also reflect unfavorable shared tendencies or behaviors, including those that undermine health. For instance, Rohrbaugh et al. (2012) showed that the prevalence of we-talk was higher among dual-smoker

couples than among couples in which only one of the members smoked. The authors suggest that this connection may reflect the couple being engaged in symptom-system fit, with smoking playing a positive role in relationship maintenance. Following this logic, in couples with high dyadic ERE, we-talk may reflect sharing the unhealthy tendencies associated with ERE, and might serve as an indicator of symptom-system fit. Consequently, partners in couples with high dyadic ERE and high we-talk would have higher BMIs, because ERE would serve some regulatory purpose in their relationship, thus exacerbating their tendency to eat for emotional reasons. In contrast, shared high ERE that is not manifested in communal language may not be as relevant to relationship functioning and hence may be less conducive to shared unhealthy behaviors and eventual weight gain.

Although literature on pronouns and health focuses on we-talk, singular first-person pronoun use, or "I-talk," is also addressed in several studies. The results of these studies are mixed. Some showed that I-talk was associated with negative outcomes; for instance, I-talk in poetry was associated with suicide among poets (Stirman & Pennebaker, 2001). Similarly, a study on an online support group for breast cancer demonstrated a positive relationship between use of first person pronouns and negative emotions (Shaw, Han, Hawkins, McTavish, & Gustafson, 2008). However, Simmons et al. (2005) found that spouses who used higher proportions of I-talk during a marital interaction task also tended to report greater marital satisfaction. Similarly, women's use of I-talk in instant messages was positively related to their own satisfaction, their partners' satisfaction, and relationship stability (Slatcher, Vazire, & Pennebaker, 2008).

Based on these findings, it is feasible that in the context of shared unhealthy tendencies I-talk may reflect the speaker's ability to maintain autonomy in making health-related decisions, and thus be associated with better health. Conversely, the lack of I-talk would be indicative of the lack of ability to disengage from shared health-compromising habits and would likely be linked to poorer health. Applied to the present study, this suggests that in couples with high shared ERE, individuals with high I-talk would be better protected from the impact of ERE than those with low I-talk, and thus would have lower BMI.

Emotion words and health. The second pattern that involves health habits and relationships, demand-withdraw, is characterized by conflict. Such conflict is likely to arise between partners who disagree on a given health behavior. In the context of ERE, one partner may be eating to regulate emotion, and the other partner may be unable to relate to this tendency and be concerned about its potential health consequences. If the latter partner expresses discontent about ERE in an unhelpful way, conflict might arise. Both discontent and conflict is likely to be manifested through an increased use of negative-emotion words. Once conflict arises, the person with high ERE is likely to become more withdrawn and distressed, and is likely to attempt regulating emotion by using familiar emotion-regulation skills, which include eating. More criticism from the partner is likely to follow, creating a full demand-withdraw cycle. Overtime, this cycle might perpetuate increases in BMI in the high-ERE partner and, likely, further prolong health-related conflict. Based on this, I suggest that the use of negative emotion words in

the context of divergent ERE would mark conflict related to this habit and would exacerbate manifestation of ERE.

CHAPTER III: RESEARCH AIMS AND HYPOTHESES

The overarching goal of this project was to examine the use of eating as an emotion-regulation strategy at individual and dyadic levels. The first aim of the study was to investigate ERE and its correlates at an individual level. The second aim was to examine how ERE plays out in the context of close relationships and whether it becomes part of complex patterns involving relationships and weight. Based on the literature suggesting gender differences in eating and partner influence, I included gender in all of the analyses for exploratory purposes.

Aim I: Individual-Level ERE

The first step was to create a measure to assess eating to regulate emotion and demonstrate its internal reliability. The second step was to demonstrate convergent and divergent construct validity for the new measure. Because ERE should reflect the connection between emotion and eating, I hypothesized that **(H1a)** ERE would demonstrate convergent validity by being moderately positively correlated with an established emotion-eating scale (EES) that assesses the tendency to eat spontaneously in response to emotion. Furthermore, although I conceptualized ERE as an emotion regulation strategy, it is quite different from other emotion-regulation measures in that it involves an act of physical ingestion of a substance that alters physical and often emotional state, and is distinctly different from cognitive or emotion-focused strategies that are neither observable nor physical in nature. Based on this, I hypothesized that **(H1b)** ERE would demonstrate divergent validity by being uncorrelated with other measures of emotion regulation. Finally, because ERE reflects one specific way of

regulating emotion, I did not expect it to be associated with overall emotionality. Thus, I hypothesized **(H1c)** that ERE would not be correlated with trait positive and trait negative emotions.

Having established reliability and convergent/divergent validity, the next step was for the ERE measure to demonstrate that it reflects an actual connection between emotional fluctuations and eating on a daily level. I suggested that people who use ERE more frequently would eat more when they experience any emotions that they want to regulate (compared to those who do not use ERE). More specifically, I hypothesized that **(H2)** people who report higher ERE would eat more food in general and/or foods of lower healthiness on days when they experience more negative and less positive emotion.

Finally, I suggested that ERE would be associated with objective body composition measures such as BMI, percentage body fat, and waist circumference. Again, because ERE has not been explicitly studied, it is unclear whether ERE is related to long-term effects of excessive eating such as increased weight and size. In addition to assuming the connection between ERE and eating, another assumption is that changes in eating habits due to ERE would be relatively small, and so the effects of these changes would only be noticeable over time and would be more likely to be manifested in older populations. In younger populations, the effects of ERE may not have had a chance to be manifested yet, and they may also be "cancelled out" by the use of other weight-related emotion-regulation strategies, such as exercising or food restriction. Based on these considerations, I hypothesized that **(H3)** those reporting higher ERE would have less healthy weight status, as measured by BMI, percent body fat, and waist circumference,

and this relationship would be moderated by age, with the relationship being stronger in older people.

Aim II: Dyadic-Level ERE

The second aim of this study was to investigate ERE at a dyadic level, specifically the relationship between partners' use of ERE, couple's health cohesion and conflict, and weight measures. Based on the literature outlined above, I conceptualized two dyadic patterns involving ERE. The first pattern, described as one form of symptom-system fit, involves both partners using ERE and exhibiting a high level of dyadic cohesion. The second pattern, similar to demand-withdraw, involves partners having divergent ERE and related conflict. In both cases, partners with high ERE are likely to have higher BMI, not only because ERE might result in weight gain over time, but also because their ERE tendencies are in one way or another perpetuated by their close relationships. In the first case (symptom-system fit), both partners gain comfort from eating, which may also be a soothing activity they engage in together. When shared, this activity is likely to occur more frequently and increase their sense of health-related cohesion and overall relational wellbeing. In the second case (demand-withdraw), the partner using ERE would be more likely to overeat, which may result in influence attempts from their low-ERE partner as well as arguments and negative emotions in both partners. If one partner's health habit becomes a source of conflict, the likelihood of this habit changing is rather low, and may be particularly low among people who tend to regulate their emotions by eating. In either scenario, high ERE in one of the partners might be exacerbated and maintained by either

health-related cohesion (symptom-system fit) or health-related conflict (demand-withdraw).

Based on the literature suggesting the presence of symptom-system fit in couples in which both partners share an unhealthy habit, I hypothesized that **(H4a)** partners in couples with high dyadic ERE and a high level of cohesion (as indicated by "we-talk) will have higher BMIs than those in couples that have lower levels of dyadic ERE or cohesion. In contrast, I predicted that **(H4b)** couples with high dyadic ERE and low cohesion (as indicated by I-talk) would have lower BMIs than those with low I-talk, because I-talk may serve a protective function against engaging in a shared health-detrimental habit.

Finally, based on the literature that indicates the presence of demand-withdraw cycle in couples in which one partner has an unhealthy habit, I suggested that in couples with divergent ERE, the presence of conflict would perpetuate ERE use in one of the partners and exacerbate its impact, overtime resulting in higher BMI. Based on this, I hypothesized that **(H5)** in couples with divergent ERE, use of negative-emotion words will be associated with BMIs of those with high ERE.

CHAPTER IV: METHODS

Basic Paradigm

A community sample of 43 committed heterosexual romantic couples provided baseline measures of their use of emotion regulation strategies, including the new measure of eating to regulate emotion (ERE), along with trait emotions. They then participated in a laboratory-based videotaped discussion of their health habits and each other's role in maintaining a healthy lifestyle; their body composition measures were recorded as well. Finally, they provided reports of their emotions and the relative healthiness of their diet compared to their own typical eating twice a day for a week. I used these data to validate the new measure of ERE and demonstrate its connection with other emotion regulation measures, daily fluctuations in emotions and eating, weight measures, and relational processes reflected in language.

Participant Recruitment

The participants were recruited by an ad posted on Craig's List. The ad called for couples in which one or both partners were concerned about maintaining a healthy weight, or either partner was struggling to lose weight. In addition, participating couples had to meet the following criteria: (1) both individuals were over the age of 18, (2) both individuals were willing to participate in a study, and (3) the individuals had been in a romantic relationship for at least six weeks. Participants who completed all portions of the study received $90.

While no exclusion criteria were used, for the second half of the study priority was given to couples in which one or both partners were overweight, to get a more even

representation of couples that have similar (high), similar (low), and dissimilar BMIs. This recruitment strategy benefits the proposed study because if my prediction about the relationship between ERE and BMI is correct the sample with a higher proportion of people struggling with weight will also have a higher proportion of people who use ERE. Following the same logic, this strategy increases the proportion of couples in which either one or both partners use ERE, providing a larger sample of couples appropriate for addressing the study's second aim.

Participant Characteristics

The resulting community sample included 43 heterosexual committed couples; all 43 had the needed survey data but only 32 couples completed all of the measures necessary for the proposed daily diary analysis. Therefore, the sample used in this study includes 43 dyads for all hypotheses except H2, for which 32 couples were used. The couples had been in the relationship from 4 months to 39 years (M = 6.2, SD = 7.1), 57.7% of them were cohabiting, and approximately 47% of the sample was married. The participants' age ranged from 18 to 69 years (M = 32.2, SD = 13.0). Eighty percent of the sample self-identified as Caucasian, 2.5% as African-American, 2.5% as Asian-American, and 15% as Other; 12.2 percent of the sample identified as Hispanic. On average, participants were well-educated, with 15.7% holding a graduate degree, 28.9% college graduates and 44.8% having attended some college.

Procedures

All of the data used in this study was collected as part of the Relationships, Eating, and Emotions (REE) study. Additional data processing specific to the present

study involved transcribing the videotapes of the couples' health conversations and applying automatic word analysis to the transcripts. Data collection for the REE study involved three steps: participant survey, laboratory session, and daily diary. Couples that responded to a Craig's List ad were mailed an informed consent form and a packet with baseline questionnaires, including a demographic questionnaire, the Emotion Regulation Questionnaire (Gross & John, 2003) expanded to include ERE items (Butler, 2009a), the Emotional Eating Scale (EES; Arnow et al., 1995), the Rumination subscale from Trapnell & Campbell's (1999) Rumination-Reflection Questionnaire, and the Trait Emotion Questionnaire (Butler, Lee, & Gross, 2007). Partners were instructed to complete their questionnaires separately and to abstain from discussing their answers with their partner until after they had completed the survey. The questionnaires took approximately 1 hour to complete, and the participants returned them to the research assistant at the laboratory session.

The laboratory session included, among other steps not relevant to the present study, a one-on-one couple discussion regarding leading a healthy lifestyle. During this discussion, the participants were seated in a room in front of each other, provided with a list of conversation topics and video-recorded. Participants were asked to discuss the following questions: (1) How important do you think it is to live a healthy lifestyle? In other words, how important is it to you that you eat a healthy diet, get enough exercise and sleep, and so on? (2) How willing are each of you to make sacrifices (e.g. spend more money, take time out from other activities) in order to live a more healthy lifestyle? (3) What are some of the things you do that have a *negative* impact on each other's lifestyle

or on each other's attempts to be healthy? What aspects of your shared lifestyle cause problems for you when it comes to being healthy? (4) What are some of the things you do that have a *positive* impact on each other's lifestyle or on each other's attempts to be healthy? What aspects of your shared lifestyle are helpful for you when it comes to being healthy? The participants were instructed to spend up to 20 minutes discussing these questions. The actual duration of discussions ranged from 3 to 20 minutes, with the average time being 10.5 minutes (*SD* = 5.1 minutes).

Upon completion of the laboratory session, couples were asked to complete a 7-day diary, which assessed participants' emotions, along with relative amounts and quality of eating. Couples were asked to complete their diaries two times per day (once around the middle of the day (e.g. 12:00pm) and the other in the evening (e.g. 6:00pm), in order to account for the interpersonal nature of emotions changing over the course of the day (Laurenceau & Bolger, 2005). For each item, participants responded with respect to either the time period since they last completed the questions or, for the first day's entry, since they awoke that morning. To avoid participant burden and increase compliance, all constructs in the daily diary were assessed with single face valid items.

Measures

Baseline survey measures.

Demographic data. Standard demographic data were collected, including age, gender, ethnicity, race, educational level, marital status, and relationship duration.

Emotion Regulation Questionnaire (ERQ). The ERQ assesses individual differences in the habitual use of two emotion regulation strategies, expressive

suppression and cognitive reappraisal. The Expressive Suppression subscale contains 4 items like “I control my emotions by not expressing them” and “I keep my emotions to myself.” Mean scores on the Expressive Suppression subscale were 2.8 for women (*SD* = 1.1) and 3.4 for men (*SD* = 1.2), and this difference was statistically significant ($F(1,83) = 6.14$, $p = .02$). The Expressive Suppression subscale demonstrated acceptable internal consistency (Cronbach’s $\alpha = .71$ for women and .70 for men). The Cognitive Reappraisal subscale contains 6 items such as “When I’m faced with a stressful situation, I make myself think about it in a way that helps me stay calm” and “When I want to feel less negative emotion (such as sadness or anger), I change what I’m thinking about.” Mean scores for this subscale were 4.7 for women (*SD* = 1.3) and 4.5 for men (*SD* = 1.2), with no gender differences ($F(1,83) = .6$, p = .n.s.). Cognitive Reappraisal demonstrated good internal consistency ($\alpha = .90$ for women and .87 for men).

***Eating to Regulate Emotion* (*ERE*).** ERE is a new measure of Eating to Regulate Emotion and was developed specifically for this study. ERE was assessed via three face-valid questions added to the ERQ and worded to parallel the other ERQ items: 1) When I want to feel more positive emotion (such as joy or amusement), I eat something; 2) When I want to feel less negative emotion (such as sadness or anger), I eat something; and 3) When I’m faced with a stressful situation, I eat something, and that helps me stay calm. To indicate their agreement or disagreement with each of the above statements, the participants used a Likert scale ranging from 1 = “strongly disagree” to 7 = “strongly agree.” Cronbach’s alpha was .89 for women and .79 for men, demonstrating good

internal consistency. Mean ERE scores were 3.3 for women (*SD* = 1.7) and 2.6 for men (*SD* = 1.4), and this difference was statistically significant, $F(1,83) = 4.22$, $p = .04$.

Emotion Eating Scale (EES). The EES is a widely used measure to assess the intensity of the desire to eat in response to a set of negative emotions (Arnow et al., 1995). The participants rate their desire to eat in response to different emotions, such as guilt, anger, helplessness, worry, or boredom. To include a wider range of emotions, positive emotions such as happiness, calmness, pride, and engagement were added to the measure by Butler (2009b), resulting in a list of 34 emotions total. The measure uses a five-point Likert scale, ranging from 0 = "no desire to eat" to 4 = "an overwhelming urge to eat." Mean EES scores were 1.1 for women (*SD* = .6), and .8 for men (*SD* = .6); this difference was marginally significant ($F(1,83) = 3.71$, $p = .06$). Internal consistency of the full scale was excellent for women ($\alpha = .96$) and for men ($\alpha = .92$). When the scale was broken down into positive and negative emotional triggers, Cronbach's alpha was excellent for both negative emotion ($\alpha = 0.95$ for men and $\alpha = 0.93$ for women) and positive emotion subscales ($\alpha = 0.95$ for both men and women). The subscales were positively correlated, $r = 0.22$, $p = 0.04$.

Rumination Questionnaire. The 13-item Rumination subscale of Rumination-Reflection questionnaire was used to assess the tendency to repeatedly self-focus on one's past actions (Trapnell & Campbell, 1999). The items included statements such as "I tend to "ruminate" or dwell over things that happen to me for a really long time afterward," and "I spend a great deal of time thinking back over my embarrassing or disappointing moments." The participants indicated their level of agreement with these

statements on a 5-point Likert scale, ranging from 1 = “strongly disagree” to 5 = “strongly agree.” Mean scores on the Rumination Questionnaire were 4.1 for women (*SD* = 1.3), and 3.9 for men (*SD* = 1.3); the difference was not statistically significant ($F(91,83) = .4$, p = n.s.). The internal consistency of this scale was good for both men and women, $\alpha = .89$.

Trait Emotions. To measure habitual emotional experience, participants rated the frequency with which they typically felt each of 22 groups of emotions by using a 5-point Likert scale ranging from 0 = “never” to 4 = “almost every day.” Negative emotions included, for instance, disgust, sadness, guilt/shame, anger/irritation/annoyance/ frustration, and boredom. Positive emotions included calmness/relaxation/peacefulness, pride/self-confidence, and happiness/joy. Mean scores on Trait Negative Emotions were 1.7 for women (*SD* = .7), 1.3 for men (*SD* = .5), and the difference was not statistically significant ($F(1,83) = 1.1$, p = n.s.). For Trait Positive Emotions they were 3.2 for women (*SD* = .7), and 3.2 for men (*SD* = .5); there was no gender difference ($F(1.83) = .04$, p = n.s.). The scale demonstrated excellent to acceptable internal consistency for positive emotions ($\alpha = .89$ for women and $\alpha = .68$ for men) and negative emotions ($\alpha = .88$ for women and $\alpha = .79$ for men).

Daily Diary Measures.

Emotional experience. The daily diaries included 4 items assessing positive and negative emotions experienced either due to one’s partner or due to something or someone else. The emotion items took the form: “To what extent did you experience positive (negative) feelings such as joy or relaxation (anger or sadness) *due to your*

partner?" and "To what extent did you experience positive (negative) feelings such as joy or relaxation (anger or sadness) *due to something or someone else* (i.e. not due to your partner)?". These scales ranged from 0 = "not at all" to 10 = "extremely." The mean experience of positive emotion due to partner was 6.5 (*SD* = 2.6) for women and 6.6 (*SD* = 2.7) for men. Gender difference was not statistically significant, $F(1,916) = .3$, p = n.s.. Mean negative emotion due to partner was 1.3 (*SD* = 2.2) for women and 1.7 (*SD* = 2.4) for men. Gender difference was statistically significant in this case, $F(1,903) = 6.14$, p = .01. For emotion due to factors other than partner, mean positive emotion was 5.0 (*SD* = 2.9) for women and 4.6 (*SD* = 3.1) for men. Gender difference was significant, $F(1,904) = 4.0$, $p = .05$. Mean negative emotion due to other factors was 2.0 (*SD* = 2.7) for women and 2.2 (*SD* = 2.6) for men. Gender difference was not significant, $F(1,903) = 1.16$, p = n.s.

Food intake. Participants indicated the amount and quality of food eaten relative to their own normal behavior on a Likert scale from -2 = "much less" to 2 = "much more" for relative amount and -1 = "less healthy" to 1 = "more healthy" for relative quality. While this measure does not provide any information about the objective quality and amounts of food eaten, it has several benefits important for this study. First, detailed daily monitoring of actual dietary intake has a documented effect on peoples' eating behavior (e.g., Hollis et al., 2008). When people record details of their daily diet, they are more likely to reduce their overall intake and eat healthier foods. Therefore, a detailed food diary for a week may poorly reflect what participants normally eat. In this study, the participants reported briefly on their relative dietary quantity and quality, which

minimized the effect of the measurement procedure onto the behavior being measured. The second potential benefit of using brief single-item measures is that it decreases participant burden and increases compliance.

It is also important that we are interested in dietary *changes* that people make in an attempt to regulate their emotions and such changes will not be easy to track if we simply had a list of foods someone ate throughout the day, because the same item may be a dietary improvement for one person and a junk food for another. The use of a relative measure may be a limitation because it does not allow for between-person comparisons, but it fits perfectly with the focus on within-person fluctuations. The mean relative amount of food consumed was -0.2 (*SD* = 1.0) for women and - 0.2 (*SD* = 1.0) for men. Mean relative quality of food was .006 (*SD* = .6) for women and -.05 (*SD* = .6) for men. Gender difference for these relative daily eating measures were not statistically significant, $F(1,917) = .08$, p = n.s. for eating amount, and $F(1,903) = 2.64$, p = n.s. for eating quality.

Laboratory Measures.

Measures of body composition. Participants' weight, height, waist circumference, and percentage of body fat were recorded at the end of the lab session. Percent body fat was measured via an impedance scale. Participants' BMIs were calculated based on the standard BMI formula: BMI = (weight in pounds) x 703 / (height in inches)^2. I used BMI based on laboratory measurement of height and weight to reduce potential bias in self-reported measures, though results for self-report based BMI were very similar. The participants' BMIs ranged from 17.6 to 42.1; the average BMI was 25.4 (*SD* = 5.3).

About 9.3% of female participants were underweight, 46.5% were normal weight, 25.6% overweight, and 18.6% obese. For men, none were underweight, 48.8% were normal weight, 26.8% were overweight and 24.4% were obese.

Linguistic measures. Couples' health cohesion and conflict were assessed based on the language used by partners during their discussion of their health habits. Specifically, couples' cohesion was indicated by their use of first-person pronouns (We-talk vs. I-talk), and conflict was reflected in their use of emotion words (negative vs. positive). In order to prepare the linguistic data for analysis the videos of couples' conversations were transcribed verbatim and double-checked for accuracy. To increase time-efficiency and decrease transcription errors we used professional transcription equipment and software. The equipment included an Olympus Transcription foot pedal which allows the transcribers to start, pause, fast forward and rewind the video without taking their hands off the keyboard. The software included the driver for the foot pedal and standard word-processing software in which the transcript was created. This software also allowed the transcriber to reduce white noise in the video, as well as play it at a decreased rate.

All of the identifying information, such as proper names, dates, and the names of specific locations, were removed from the transcripts. Raw transcript data were then subjected to Linguistic Inquiry Word Count (LIWC; Pennebaker, Francis, & Booth, 2001). To assure accurate count of the word categories of interest (pronouns and emotion words), the data was prepared in the following way: (1) raw transcripts were split by speaker and all information other than the actual speech and an identifying marker was

removed; (2) filler words and expressions that may contain either pronouns or emotionally charged words that do not carry independent meaning were marked in a way that prevented LIWC from counting them towards this category. Examples of such instances include the word "I" in "I mean, that's great," or the word "well" in "Well… how about we stay home?" These methods have been successfully used in previous studies to assure accurate LIWC counts (e.g., Rohrbaugh et al., 2012).

Resulting word percentages were as follows: I-talk constituted on average 6.5% of total speech for women (*SD* = 1.7) and 6.4% for men (*SD* = 2.5); the difference between women's and men's use of I-talk was not statistically significant ($F(1,84) = .02$, p = n.s.). We-talk constituted 3.2% of all speech for women (*SD* = 1.6) and 2.6% of all speech for men (*SD* = 1.6); gender difference was significant, $F(1,84) = 4.74$, $p = .03$. Percentages of positive and negative emotion words in total word count were as follows: positive emotion words constituted 3.8% of total speech for women (*SD* = 1.3) and 4.2% for men (*SD* = 1.9). Negative emotion words were .9% of total speech words for women (*SD* = .5) and .9% for men (*SD* = .7). No gender differences were found in the use of emotion-words, $F(1,84) = 1.02$, p = n.s. for positive-emotion words, and $F(1,84) = 0.001$, p = n.s. for negative-emotion words.

CHAPTER V: ANALYSIS AND RESULTS

Hypothesis I

My first hypothesis stated that the measure of ERE would demonstrate convergent and divergent construct validity. Hypothesis 1a said that ERE would demonstrate convergent validity by being moderately positively correlated with Emotion-Eating Scale. This hypothesis was supported. As shown in Table 1, ERE was positively associated with EES (r = .57, p <.0001 for women, and r = .55, p = .0002 for men). Table 1 also shows that when EES was broken down into eating triggered by negative vs. positive emotion, ERE was strongly positively correlated with emotion-eating due to negative emotions (r = .62, p <.0001 for men and p = .69, p <.0001 for women), and uncorrelated with eating due to positive emotions. These correlations are consistent with ERE measuring eating in order to *improve* emotional state for the better, as opposed to *maintaining* a positive state.

[TABLE 1 ABOUT HERE]

Consistent with Hypothesis 1B, ERE was uncorrelated with other measures of emotion regulation, such as Reappraisal, Suppression, and Rumination scales (Table 1). Finally, consistent with Hypothesis 1C, ERE was uncorrelated with trait positive and trait negative emotion scales.

Hypothesis II

Hypothesis 2 stated that self-reports of eating to regulate emotion would be associated with daily covariations of emotion and eating. I predicted that among people who self-report higher ERE, daily reports of high levels of negative emotion or low levels of positive emotion would be associated with concurrent increases in eating amount and

decreases in health quality of food consumed. I tested this hypothesis separately for eating amount and eating quality and also separately for each of the four daily emotion variables: (1) negative emotion due to partner, (2) positive emotion due to partner, (3) negative emotion due to other factors, and (4) positive emotion due to other factors.

Due to the nesting of time within person and person within couple, I used repeated measures dyadic models to test this hypothesis (Kenny, Kashy, & Cook, 2006). The complexity of the models calls for a more detailed description. I tried a number of different error structures and the only model that converged was the one specified below. There was not enough random between-couple or between-person intercept variance for the model to converge with random intercepts. This lack of variance may have arisen due to the nature of dependent variables. Participants reported amount and quality of eating relative to their normal intake, which resulted in low between-person variability for average intake, as most people *on average* reported eating about the same amount and quality of food as usual. Although such low variance limits analytical options, it also suggests that the participants were using the measure as we intended – on average, they reported average eating amount and quality, but they also reported fluctuations around the norm. The intra-class correlations (ICC) for partners' eating amount was 0.01, suggesting that 99% of the variance was due to within-person differences, and only 1% was due to between-person differences. The ICC for partners' eating healthy was 0.08, indicating that 92% of the variance was due to within-person, and 8% to between-person differences. Because the daily section of the present study focuses on within-person

effects of emotion on eating variability, even such low between-person variability in eating amounts and quality does not present a problem.

Because of insufficient random intercept variance, a random intercept model is not appropriate, and so instead I used a correlated residuals approach described below (Kenny et al., 2006). The correlated residuals approach includes using the repeated command to allow separate residuals for men and women. These residuals are then allowed to correlate between partners, thereby accounting for between-partner dependence. I initially tried allowing residuals to be auto-correlated, but none of the models in which auto-correlation was allowed converged. In the final model, I used the following fixed predictors: daily reports of actor and partner emotions, ERE, and all the 2-way and 3-way interactions, and used separate intercepts for men and women to model potential gender differences. I also included the main effect of time, but did not include interactions. By including the main effect of time, I allowed for linear trends in eating across the week. Analysis of these potential monitoring effects (i.e. people eating more or less over time due to reporting on their eating) suggests one marginally significant interaction between time and gender ($F(1,879) = 3.79$, $p = 0.05$), with men (but not women) eating slightly more as time progressed. Eating quality was not subject to monitoring effects in either gender. These results are consistent with previously reported decreases in eating amounts when monitoring begins (e.g., Hollis et al., 2008), but due to an unobtrusive nature of the reports used in the present study, participants increased their food intake over the course of data collection.

The final model is presented below. I tested this model for each of the different emotions, one at a time. The outcomes were eating amount and eating quality, also tested one at a time.

```
proc mixed empirical data = data covtest method = ml;
class dyad sexf ;
model eating = male  female  time  male*ERE  female*ERE
                        male*actor-emotion   female*actor-emotion
                            male*partner-emotion  female*partner-emotion
                                male*actor-emotion*ERE
                                    female*actor-emotion*ERE
                                        male*partner-emotion*ERE
                                            female*partner-emotion*ERE / s noint;
repeated sexf / sub = dyad type = cs;
run;
```

I ran this model without including any control variables and then added the following controls one at a time: BMI, percent body fat, waist circumference, and emotion eating. The results were largely the same across the models that included different weight measures, and the same with and without controlling for emotion eating. Based on these preliminary analyses, I selected a model that controlled for actor BMI only. I also ran the models with BMI as a moderator, and the results were the same as the model in which BMI was included as control only. Finally, I ran several actor-partner interaction models that included interactions between actor and partner emotions. The results of these models were the same (with some of the simple slopes being less interpretable) and so I only report the results from the simpler models. With each tested model, I started by including all of the interaction terms. Whenever higher-order interactions were not significant, I removed them from the models, leaving main effects and lower-order interactions. Thus, reports of main effects for a given model suggest that

none of the interaction terms in it were significant. Finally, as the use of relative measures to test this hypothesis prevented me from making meaningful between-person comparisons, I focused on interpreting within-person results.

In addition to concurrent analyses (i.e., morning emotion with morning eating and evening emotion with evening eating), I also conducted the same analyses with time-lagged variables to test whether emotion is associated with eating at a later point in time. The results of these analyses generally corresponded with the results of concurrent analyses and where they differed they were less interpretable, and so I only report the concurrent results. One important consideration is that participants varied in the exact time of day when they filled out their daily diaries. As a result, the time that passed between their early afternoon and evening reports varied greatly, begging the question of whether changes in eating (should they be related to fluctuations in emotion in the first place) happened in response to emotions reported at a previous time point, or those reported at the same time point. However, for emotions and eating reported at the same point in time, we can assume that they occurred within a few hours of one another, regardless of the exact time of day when they were reported.

Positive emotion due to partner. Positive emotion due to partner had a partner main effect on *eating amount* among men, $F(1,815) = 5.41$, $p = 0.02$. Men ate significantly more when their female partners felt positively due to them, as compared to times when their partners experienced less positive emotion due to them ($b = 0.05$, $p = 0.02$). Positive emotion due to partner also had an actor main effect on *eating healthy* for both men, $F(1,856) = 13.80$, $p = 0.0002$, and women, $F(1,856) = 10.46$, $p = 0.001$. Both

men and women ate significantly healthier when they felt more positive emotion due to partners, $b = 0.05$, $p = 0.0002$ for men, and $b = 0.03$, $p = 0.001$ for women. Put simply, when men made their partners happy, these men were more likely to eat a large meal. Both men and women who felt happy due to their partner were more likely to eat a healthy meal.

Negative emotion due to partner. The interaction between ERE and negative emotion due to partner was significant for *eating healthy* for men, $F(1,777) = 5.72$, $p = 0.02$ (Figure 1).

[FIGURE 1 ABOUT HERE]

Men with high ERE ate significantly less healthily when they felt negatively due to partner as opposed to times when they did not feel negatively due to partner, $b = -0.04$, $p = 0.002$. Men with low ERE ate foods of about the same healthiness regardless of their emotion due to their partners. In other words, men prone to eating to regulate their emotions ate more healthy foods when they were content with their partners.

Positive emotion due to other factors. The interaction between ERE and positive emotion due to factors other than partner was significant for *eating amount* for women, $F(1,788) = 3.88$, $p = 0.04$ (Figure 2).

[FIGURE 2 ABOUT HERE]

Women with low ERE ate significantly more when they experienced a lot of positive emotion due to factors other than their partners, as compared to when they experienced little positive emotion due to these factors, $b = 0.08$, $p = 0.04$. For women with high ERE, eating amount was unrelated to positive emotions due to other factors.

These results suggest that women who did *not* regulate emotions by eating, ate more when they felt happy about the world and less when they were not as happy.

The interaction between ERE and partner's positive emotion due to outside factors was also significant for *eating amount* for women, $F(1,362) = 5.59$, $p = 0.02$ (Figure 3).

[FIGURE 3 ABOUT HERE]

Women with high ERE tended to eat less when their partners felt positively due to factors other than them, while women with low ERE tended to eat more under the same circumstances – however, neither simple slope was significant. The results indicate that when presented with a happy partner, women who ate to regulate emotion responded by eating less, potentially because they had "nothing to eat about." Women who did not regulate emotion by eating, tended to eat more when their partner felt good, perhaps due to being in a more relaxed atmosphere or having more festive meals.

Negative emotion due to factors other than partner. The actor main effect of negative emotion due to factors other than partner on *eating amount* was significant for women, $F(1,857) = 7.22$, $p = 0.007$. On days when women experienced a lot of negative emotion due to factors other than their partner, they ate significantly less than when they felt little negative emotion due to other factors ($b = -0.05$, $p = 0.007$). The interaction between ERE and negative emotion due to factors other than partner was significant for *eating healthy* among women, $F = (1, 775) = 3.96$, $p = 0.047$. For women with low ERE, negative emotion due to other factors was marginally associated with eating more healthily ($b = 0.04$, $p = 0.06$); however, none of the simple slopes were significant. One possibility is that low-ERE women attempt to eat more healthily when faced with

additional frustrations and challenges in order to stay healthy and meet increased demands.

[FIGURE 4 ABOUT HERE]

To briefly summarize, several of the results support the hypothesis that reports of eating to regulate emotion are associated with eating greater amounts and lower quality of foods when distressed. A more pronounced pattern that emerged, however, is that positive emotion *generally* co-occurred with an increase in eating amounts, especially among those who *do not* regulate their emotions by eating, whereas negative emotion co-occurred with a decrease. In other words, general populations, and especially those who *do not* use ERE, tend to eat more (or better) when happy and less (or worse), when distressed. These results suggest that this specific pattern of altering food intake based on emotional state is not only widespread, but could feasibly be more adaptive, because eating more and better in safety might have evolutionary advantages. If this is the case, ERE may be manifested either by *not* altering food intake in this adaptive way, or by altering it *in the opposite direction*. Both of these manifestations are evident from the results.

Hypothesis III

Hypothesis III stated that people with high ERE will also have high BMIs, percentage body fat, and waist circumference, and this relationship will be moderated by age, with the link being stronger in older participants. I used the following standard cross-sectional dyadic model to test this hypothesis (Kenny et al., 2006); predictors included ERE, gender, age, and interactions between the three, and the outcomes were BMI,

percent body fat, and waist circumference (tested one at a time). Including partner variables did not significantly change the results, and so the final models include only actor variables.

```
proc mixed empirical data = data       covtest method = ml;
class dyad sex;
model weight = ERE sex age sex*ERE sex*age
                    age*ERE sex*ERE*age / s ddfm = bw;
repeated sex / type = cs sub = dyad;
run;
```

Body-mass index. There was a main effect of age on BMI, $F(1,35) = 8.80$, $p = 0.005$ and a significant main effect of ERE on BMI, $F(1,35) = 3.99$, $p = 0.05$. Consistent with my hypothesis, older individual and those with high ERE had higher BMI; however, none of the interactions between age, gender, and ERE were significant.

Waist circumference. The interaction between ERE, gender, and age was significant for waist circumference $F(1,30) = 5.35$, $p = 0.03$ (Figure 5).

[FIGURE 5 ABOUT HERE]

As predicted, for women over 30, those with high ERE had significantly higher waist circumference ($b = 2.19$, $p < .0001$). For younger women, ERE was not associated with waist circumference, $b = -0.14$, p = n.s. Also, older women with high ERE had significantly higher waist circumferences than younger women with high ERE, $b = 0.17$, $p = 0.005$. The relationship between age and waist circumference was not significant among women with low ERE, $b = -0.12$, p = n.s. None of the simple slopes were significant for men.

Percentage body fat. The interaction between ERE, gender, and age was marginally significant for percentage body fat, $F(1,30) = 3.54$, $p = 0.070$ (Figure 6). Consistent with my hypothesis, For women over 30, high ERE was associated with higher percent body fat, $b = 2.67$, $p = 0.02$. For younger women, ERE was not associated with percent body fat, $b = 0.77$, p = n.s. Among women with high ERE, those over 30 had higher percent body fat than those under 30, $b = 0.20$, $p = 0.03$. This relationship was not significant for women with low ERE, $b = -0.03$, p = n.s.

[FIGURE 6 ABOUT HERE]

Among younger men, those with high ERE had significantly higher percent body fat, $b = 2.09$, $p = 0.02$. The relationship between ERE and percent body fat was not significant for men over 30. Younger men with low ERE had significantly lower percent body fat than older men with low ERE, $b = 0.40$, $p = 0.02$. This relationship between age and percent body fat not significant among men with high ERE, $b = 0.11$, p = n.s.

Dyadic Hypotheses: Preliminary Results

Hypotheses 4a and 4b, and 5 all focused on the interaction between dyadic ERE and pronoun use predicting BMI. Earlier in this manuscript, I suggested that couples' ERE averages and differences alone would not be sufficient to predict BMI, and that several language categories could be used to distinguish between couples in which high ERE would be associated with higher BMI. As part of preliminary analyses, I first calculated intra-class correlations for the key variables. The ICC for partners' ERE was .08, suggesting that only 8% of the variance was due to between-couple differences and 92% was due to differences between partners. In other words, partners' ERE scores were

not generally correlated. The ICC for we-talk was .37, suggesting that 37% of the variance was due to between-couple differences, suggesting a fairly strong correlation between partners. For I-talk, ICC equaled .16, indicating that 16% of the variance was due to between-couple differences. Finally, the ICC for both positive- and negative-emotion words were 0.25, indicating that 25% of the variance in these categories was due to between-couple differences.

Second, I ran several models to test whether ERE was associated with language use in couples. All of these models included couple's ERE averages and differences and gender as predictors and 4 language categories as the outcome, one at a time. The results showed that gender had a main effect of we-talk, $F(1,42) = 8.51$, $p = 0.006$; women used we-talk more frequently than men. Couple's average ERE had a main effect on we-talk $F(1,40) = 6.05$, $p = 0.02$; those with higher dyadic ERE used more we-talk, $b = 0.53$, $p = .02$. For positive-emotion words, the interaction between ERE difference and gender was significant $F(1,39) = 4.25$, $p = 0.05$. Men who had higher ERE than their partners tended to use more positive emotion words than those who had lower ERE than women, whereas the opposite trend was observed for women; however, simple slopes for neither gender were significant. This suggests that high-ERE men use slightly more positively charged language than their low-ERE partners; whereas high-ERE women and their partners use about the same percentage of positive-emotion words. Finally, for negative-emotion words, no interactions or main effects were significant. Overall, the results failed to demonstrate a clear connection between ERE averages, differences, and language use, supporting the need for analyses of interactions between them.

Hypothesis IV

Hypothesis 4a stated that partners in couples with high dyadic ERE and high we-talk (symptom-system fit couples) would have higher BMIs than those with low we-talk and those with low ERE. To test this hypothesis, I initially used a standard cross-sectional average-difference dyadic model (Kenny et al., 2006). This model included both the average and difference between partners' ERE scores as predictors, along with gender and pronoun use. However, analyses showed that ERE difference did not meaningfully contribute to the results, and so it was taken out of the model. The final model (presented below) therefore included the following predictors: couple's average ERE, gender, and we-talk. Based on findings that suggested a differential connection between health and pronoun use by the same person vs. their partner (Rohrbaugh et al., 2008; Rohrbaugh et al, 2012), I included both actor and partner pronoun use in each model.

```
proc mixed covtest data = data;
class dyad gender;
model BMI = gender Average-ERE we-talk partner-we-talk
                gender*we-talk gender*partner-we-talk gender*Average-ERE
                    we-talk*Average-ERE partner we-talk*Average-ERE
                        gender * we-talk * partner we-talk / s ;
repeated gender/ type = cs sub = dyad;
run;
```

Results showed that the interaction between we-talk, average couple ERE, and gender was significant, $F(1,33) = 13.37$, $p = 0.0009$. Figure 7 illustrates that among women in couples with high average ERE, those with high we-talk had significantly higher BMIs than those with low we-talk ($b = 2.57$, $p = 0.0002$). For women in couples with low average ERE, we-talk was not associated with BMI. For men, regardless of their dyadic use of ERE, we-talk use was not associated with BMI ($b = -0.41$, $p =$ n.s.). These

findings support the hypothesis that couples with high dyadic ERE may find themselves in patterns resembling symptom-system fit. For women with high ERE, being in a relationship with a partner with high ERE and having a sense of cohesion (as reflected in we-talk) is linked to higher BMI.

[FIGURE 7 ABOUT HERE]

Hypothesis 4b suggested that partners in couples with high average ERE who use I-talk will have lower BMI than those with low I-talk. The model used to test this hypothesis was identical to the one used for we-talk (described above), except percentages of we-talk were replaced with percentages of I-talk. The results indicate that I-talk by average couples' ERE by gender interaction was significant, $F(1,33) = 8.09$, $p = 0.008$. As shown in Figure 8, women with high I-talk had significantly lower BMIs than those with low I-talk. This pattern was true both for women in couples with high average ERE ($b = -2.28$, $p = .001$), and women in couples with low average ERE ($b = -1.11$, $p = .04$), and was stronger in the former couples. These findings are consistent with the idea that I-talk may be associated with lower BMI among women, and that this connection is particularly pronounced among women with high ERE, and especially those who have partners who also show high ERE.

[FIGURE 8 ABOUT HERE]

Figure 9 shows that the interaction between I-talk and ERE was also significant for men. Among men in couples with low average ERE, those who used high I-talk had significantly lower BMIs than those who used little I-talk ($b = -.91$, $p = .04$). This finding was similar to the one for women in that higher I-talk was associated with lower BMI;

however, this was only observed in men in couples with low ERE. Because men had lower ERE overall than women did, one explanation for this finding is that men who use I-talk are defending themselves from their partner's higher ERE tendencies.

[FIGURE 9 ABOUT HERE]

Hypothesis V

The last hypothesis stated that in couples with divergent ERE, the use of negative-emotion words (by both actors and partners) will be associated with BMIs of those with high ERE. To test this hypothesis, I used a cross-sectional average-difference dyadic model, which included percentages of positive and negative-emotion words, gender, as well as the average ERE and difference between ERE scores as predictors. Even though the hypothesis focused on the difference between ERE scores, I also included couples' average ERE, to control for the overall ERE level. I tested different emotion word categories one at a time, and included separate measures for actor and partner use of emotion words.

Contrary to my hypothesis, none of the interactions between the *difference* in partners' ERE and the use of emotion words were significant. However, analyses revealed a number of significant interactions between *average* dyadic ERE and the use of emotion words. Thus, the final model was the same as the one used for pronoun use, and included average ERE, gender, and language as predictors, except pronouns were replaced with emotion words.

The interaction between actor negative emotion, couple's average ERE, and gender was significant, $F(1,32) = 5.05$, $p = 0.03$ (Figure 10). Figure 10 shows that among

women who expressed less negative emotion when discussing health behaviors with their partner, those with high ERE had significantly higher BMIs than those with low ERE, b = 1.8, p = 0.04. For women who expressed high negative emotion during discussion of health habits, couples' average ERE was not associated with BMI, b = 0.08, p = n.s. The interaction between ERE and negative emotion words was not significant for men. Here, two interpretations are possible. First, it is feasible that women expressing low negative emotion might be suppressing them, and using other emotion-regulation strategies to cope. In those with high ERE, this would result in more eating and higher BMI, which is consistent with the findings. It is also possible, however, that women expressing little negative emotion are simply content with their tendencies and do not feel negatively about their own or their partner's health habits. Again consistent with our findings, those with high ERE and this sense of content are likely to have higher BMI than those with low ERE.

[FIGURE 10 ABOUT HERE]

The interaction between partner's negative emotion, gender, and couple's average ERE was significant, $F(1,32) = 4.49$, p = 0.04 (Figures 11 for women and 12 for men). As shown in Figure 11, for women whose partners expressed a lot of negative emotion during discussion of health habits, those in couples with high average ERE had significantly higher BMIs than those in couples with low average ERE, b = 2.92, p = 0.004. For women whose partners did not express negative emotion, couples average ERE was not associated with BMI, b = -0.28, p = n.s. This finding suggests that for women who had partners discontent with their health habits, those with high ERE were

heavier than those with low ERE. This is consistent with the idea that when presented with a displeased partner, women with high ERE would eat more to cope with their partners' negativity, whereas those with low ERE would use a different coping strategy to regulate their emotions.

[FIGURE 11 ABOUT HERE]

As shown in Figure 12, for men whose partners expressed a lot of negative emotion during discussion of health habits, those in couples with high average ERE had significantly lower BMIs than those in couples with low average ERE, b = -0.58, p = 0.02. For men whose partners did not express negative emotion, couples average ERE was not associated with BMI, b = -0.14, p = n.s. While this interaction contradicts the general connection between high ERE and high BMI, it might reflect either emotional bluntness in people with high ERE, or gender differences in partner influence. Both of these possibilities are discussed later.

[FIGURE 12 ABOUT HERE]

CHAPTER VI: DISCUSSION

Summary of Findings

The new ERE measure demonstrated good reliability and validity. As predicted, it was linked to an established measure of emotion-eating and unrelated to other measures of emotion regulation, as well as trait emotions. Hypothesis testing revealed several interesting findings. First, a close look at daily fluctuations of emotion and eating suggested that eating more when feeling well and less when feeling badly was prevalent among general populations and especially those with low ERE, and thus could be normative and adaptive. On the contrary, high ERE was associated with eating more when distressed and *not* eating more when feeling happy, thus suggesting an abnormal and potentially maladaptive pattern. Eating to escape negative emotion only provides temporary relief and does little to resolve the problem causing this emotion. In addition, frequent use of ERE might lead to weight gain which, in the context of the contemporary US society, might further increase stress in the individual experiencing it.

Second, ERE was linked to different weight measures, and some of these relationships were moderated by age and gender. As expected, high ERE predicted high BMI across different genders and age groups. Also consistent with my hypotheses, women over 30 (but not younger ones) with high ERE had higher percent body fat and higher waist circumference. Surprisingly, men under 30 (but not older ones) with high ERE had higher percent body fat. Overall, findings indicate that eating to regulate emotion is linked to poorer body composition, with women and older populations being particularly vulnerable to its effects.

Third, I found that ERE interacts with couple dynamics, allowing us to predict BMI based on ERE and linguistic indicators of couple cohesion and conflict. Specifically, among women in couples with high average ERE, we-talk was associated with higher BMI, whereas I-talk was linked to lower BMI. These results suggest that ERE might have different impact on weight depending on the dyadic context. The effects of ERE are most pronounced in couples with high cohesion (and high we-talk), perhaps because dyadic engagement in ERE makes it a stronger and longer-lasting habit. On the contrary, ERE does not have as strong of an impact in couples with low cohesion (indicated by high I-talk), even if both partners experience it. This suggests that some degree of independence in health-related decisions might be beneficial for women in high-ERE couples. In addition, in couples with high dyadic ERE, health-related conflict (as indicated by negative-emotion words) was associated with higher BMI. Interestingly, negative-emotion words spoken by one's partner had a stronger connection with one's BMI than their own expression of negative emotion. These and other findings are discussed in more detail below.

Individual-Level Findings

The main goal of this project was to evaluate whether a new measure of eating to regulate emotion was associated with daily fluctuations between emotion and eating as well as weight measures. Having created the new measure of eating as an emotion regulation strategy, I first assessed its internal consistency as well as convergent and divergent validity. High internal consistency suggested that those who regulate one emotion by eating are highly likely to use the same strategy to regulate both positive and

negative emotions. This indicates that, if used at all, eating to regulate emotion is used as a general way of altering emotional experience rather than being emotion-specific.

Second, the new ERE measure demonstrated convergent validity in expected ways. The moderate connection between the ERE measure and the Emotion-Eating Scale (EES), an established measure of emotion eating, suggests that both these measures tap into similar but not completely overlapping constructs. Indeed, both assess a specific act of food consumption that is somehow related to one's emotional state. The main difference between ERE and EES is that EES assesses a *passive* act of eating in response to an emotion, without any indication that the person wishes to change this state by eating, whereas ERE taps into *actively*, and *knowingly*, eating with the goal of changing emotion. One might argue that the difference between these two is whether or not the person is aware of the connection between eating and emotion and able to use it as an active strategy. Although some level of awareness would be needed to report either EES or ERE, those reporting ERE might have a somewhat enhanced ability to use eating as a regulatory strategy.

Although small, this difference between ERE and EES might have implications for future research and intervention development. Should ERE prove to be a better reflection of the link between emotion and eating, it could be used in assessment of individuals seeking weight loss or other dietary modification treatment. Such an assessment would allow interventionists to identify individuals who might benefit from incorporating work on emotion regulation into their weight reduction treatment. Furthermore, based on demonstrated connections between ERE and weight in the

relational context, the ERE measure could be administered to the patients' significant others. Combined with conducting a brief interview on health habits, administering ERE to significant others would allow interventionists to assess whether an individual or a couples approach might be more appropriate for a given case.

Additionally, collecting results of *both* EES and ERE measures might prove fruitful in weight loss or eating disorder intervention. Those actively using eating to regulate emotional states (and thus having equally high ERE and EES scores) might benefit from a slightly different set of intervention techniques than those whose emotion-eating happens outside of their awareness (with high EES but low ERE scores). For the more aware group, intervention might be focused on building up more adaptive emotion-regulation skills. In contrast, less aware individuals might start by learning to first identify situations and emotions that trigger episodes of emotion-eating, and only then proceed to learning alternative coping skills.

Daily connections between emotion and eating. The results relevant to the second hypothesis on the connection between ERE and daily covariations between emotion and eating are intriguing. To recap, I found two main effects and a number of interactions. The main effects suggested that, on a day-to-day level, having a happy partner was linked to bigger meals for men, whereas feeling positively towards said partner was linked to eating healthier meals for both men and women. In addition, when women felt negatively towards factors other than their partners, they ate less. Both of these connections were observed regardless of ERE levels. As for the interactions that include ERE, women with low ERE ate significantly more when they experienced

positive emotion due to factors other than their partners. In addition, these women tended to eat more when their partners felt positively about life in general. In contrast, women with high ERE tended to eat less under the same circumstances. Similarly, men with high ERE ate significantly less healthily when they felt negatively due to their partners. Overall, results suggest that across ERE levels, and especially among those with low ERE, positive emotion in self and partner was associated with eating larger and healthier meals – a pattern not observed in those with high ERE.

While the main effects described above do not fully match my hypotheses, they provide some insight into the difference between emotion-and-eating links among those who do and do not eat to regulate emotion. Namely, these results make good sense if we consider the possibility that altering the amounts and quality of food in response to emotion may be adaptive, especially when people eat *more* or *better* when they are *happy* and eat *less* or *worse* when they are *distressed*. From the evolutionary standpoint, it is better to eat in safety, surrounded by well-meaning others (e.g., family), than eat while being hunted or alone. Interestingly, threat might be linked to decreases in eating both directly, via physiological stress-related mechanisms, and indirectly, when people decrease food amounts to restore their sense of self-esteem after experiencing a social threat (Pliner, Rizvi & Remick, 2009). The direct connection is evidenced in the fact that human digestion is designed to slow down in situations of acute stress (e.g., Sapolsky, 2004). This suggests that we are simply not built to eat much or digest properly when we are in distress. As for the indirect links between stress and digestion, research shows that even relatively minor differences in perceived levels of threat result in changes in eating

amounts. For instance, those who eat with family are likely to eat more, whereas those who eat with strangers are likely to eat less (e.g., de Castro, 1994; Kristensen et al., 2002). These decreases in eating amounts are even more pronounced when the individual's self-esteem is threatened (e.g., Pliner et al., 2009; Robinson, Tobias, Shaw, Freeman & Higgs, 2011). If even such minute differences in perceived levels of threat and stress change one's food intake, it is not surprising that strong emotions would do the same. Neither is it surprising that eating more in safety and less in distress might be common among highly social species. Overall, this evidence makes it plausible that eating more when happy and surrounded by safety and less when distressed or in danger might be not only wide-spread, but in some ways adaptive.

If we consider that adjusting eating amount and quality based on emotional state in a way described above is adaptive, it makes sense that the lack of this connection might reflect a maladaptive pattern. In this case, connections between emotions and eating can be manifested in two different ways: not only by eating *more* when feeling *badly*, but also by *not* eating more when feeling fine. The former suggests that people with high ERE would eat more in response to a negative state; the latter would be manifested as a blunted response to a positive state. The significant interactions that emerged in the present study generally confirmed this pattern, suggesting the possibility that one way high ERE might be manifested is through *not* responding to positive emotion by increasing food intake.

An alternative way of interpreting these blunted responses to emotion among people with high ERE is to consider that these people may not only have diminished

emotion-regulation skills, but also decreased emotional awareness. In this case, people with high ERE would be more likely to underreport fluctuations of their emotions. In support of this, eating disorders literature suggests diminished emotional regulation skills in populations with eating disorders (e.g., Svaldi et al. 2010) and shows that people with eating disorders report less negative emotion such as anger (e.g., Joos et al., 2012). In addition, people with high ERE might also be less accurate in reporting fluctuations in food intake, or might be more likely to have a skewed perspective on what their normal intake is (which is important because participants reported on food intake relative to their own norm). In either case, this decreased emotional and dietary awareness might have resulted in those with high ERE underreporting daily changes in emotion and eating, thus resulting in a blunted effect as compared to those with low ERE.

ERE and body composition measures. The next set of findings concerned the connection between ERE and body composition measures including BMI, percent body fat, and waist circumference. Findings supported the idea that those with high ERE would have less desirable weight and body composition, and that this connection would be particularly strong in older individuals. This moderation by age makes sense if we consider that the actual changes in eating amounts and quality due to ERE might be very small. Those who eat to regulate emotion might indeed eat less healthily when an uncomfortable emotion arises, but these changes alone might be too small to immediately make a noticeable difference. Overtime, even these small differences in eating might accumulate, however, resulting in significant changes in weight and body composition.

From this standpoint, it makes sense that older (but not younger) women with high ERE had higher percent body fat and higher waist circumference.

It is surprising, however, that younger (but not older) men with high ERE had higher percent body fat. One possibility is that emotion-eating might have less of an impact on actual eating habits of men than those of women. At a younger age, ERE tendencies might be manifesting similarly in men and women, with both genders eating less healthily. However, younger women, who face the most societal pressure to be thin, might be offsetting potential weight gain by dieting or exercising. In addition, it is possible that women who use eating to regulate emotion would also use food restriction or dieting to do so, thus slowing down weight gain associated with emotion-eating. On the contrary, mild weight gain in young men might not be associated with as much social stigma, so they might let it take its course. An alternative explanation of this phenomenon is that, on average, young men have lower percentage body fat than other groups, and so ERE might have a more noticeable effect on their body fat measures.

Dyadic-Level Findings

After I established the connection between ERE and weight at an individual level, the next logical step was to examine this connection in the context of close relationships. The link between relationships and health is well recognized and the role of relationships might be particularly pronounced in eating, which is frequently shared with significant others (e.g., de Castro, 1994; Herman et al., 2003; Kristensen et al., 2002). Similarly, eating is related to emotion regulation (e.g., McRae et al., 2011); however, no studies to date have addressed the compound impact of emotion-eating as it occurs in the relational

context. Of particular interest was the question of whether relational processes such as health-related cohesion and conflict differentially affect ERE-related weight gain.

ERE and pronoun use. The first set of dyadic findings addresses the interaction between ERE and language use and its connection with BMI. I found that we-talk in couples with high shared ERE was associated with higher BMI among women, but not among men. This suggests that for women the impact of a health-detrimental habit may be compounded by partners engaging in this habit *as a couple* and developing a sense of health-related cohesion, which is reflected in high we-talk during discussions of health behaviors. These results underscore that partners sharing an unhealthy habit and experiencing higher cohesion related to this habit are more likely to engage in it more fully and thus suffer more negative consequences of their behavior.

Similarly, in couples with high shared ERE, higher levels of I-talk were associated with lower BMI among women, but not men. This indicates that in the context of health-related discussions, I-talk may serve a protective function for women, despite both themselves and their partners having high ERE. High I-talk in such women may reflect their ability to resist sharing unhealthy habits with their partners, which, in turn, may prevent them from eating to regulate emotion as often as they may have otherwise been. Although no studies I am aware of directly address the connection between I-talk and eating, previous literature on the potential benefits of I-talk suggests that higher I-talk is associated with positive relational characteristics, such as higher marital satisfaction and relationship stability (Simmons et al., 2005; Slatcher et al., 2008). Combined with findings suggesting that women tend to maintain a healthier diet than men do

(Beardsworth et al., 2002; Morse & Driskell, 2009), I-talk may be linked to these women's adherence to a diet that naturally appeals to them, as opposed to sharing less healthy habits with their male partners. This difference may be even more pronounced among couples with high ERE, because in addition to reflecting a certain level of independence in adhering to a more stereotypically "feminine" diet, I-talk in such couples may reflect a degree of separation from a dyadic habit of eating for emotional reasons. Interestingly, for men, I-talk was related to BMI only in couples with low average ERE. One possibility is that with women having higher ERE in general, I-talk among men in low-ERE couples might protect them from their partner's somewhat higher ERE.

Combined, these findings serve as another piece of evidence pointing towards the presence of symptom-system fit in couples dealing with unhealthy habits. The findings on we-talk being related to higher BMI in the context of shared high ERE are consistent with previous studies describing symptom-system fit. Several studies suggest the presence of this pattern in couples with at least one of the partners engaging in an unhealthy habit such as cigarette smoking (Shoham et al., 2007; Rohrbaugh et al., 2009) or excessive alcohol use (Dunn, Jacob, Hummon, & Seilhamer, 1987). Overall, published research indicates that sharing unhealthy habits and especially engaging in them together is linked to more positive emotion, greater emotional synchrony, and greater relational cohesion, despite these habits potentially undermining one or both partner's health. Similarly, the results of the present study also indicated that, when shared, the "symptom" of eating to regulate emotion is perpetuated by the couple's mutual engagement in emotion-eating. If a couple continues to share this habit despite its

apparent downsides, one can assume that they do benefit from it in some way, and thus emotion-eating "fits the system." If, on the other hand, one of the partners is able to step out of this dyadic habit (reflected in I-talk), their own ERE is no longer associated with BMI. In this case, the symptom no longer serves a cohesive function in a relationship, and symptom-system fit is no longer present.

ERE and Emotion Language. The second dyadic hypothesis suggested that in couples with highly discrepant ERE and health-related conflict (manifested by high use of negative-emotion words), those with high ERE would have higher BMI. The results were intriguing. On the one hand, my prediction that the impact of highly *discrepant* ERE would be exacerbated by conflict was not supported. On the other hand, the pattern predicted for *divergent* ERE emerged for those who had high *dyadic average* ERE instead. Namely, in couples with two emotion-eaters, negative emotions expressed by individuals were weakly linked to their own, and more so, to *their partners'* BMI. Again, this link was not observed at an individual level or in couples with divergent ERE.

Although my initial conceptualization of demand-withdraw included couples with *discrepant* ERE and high conflict (expressed through high percentage of negative-emotion words), the data suggested that this pattern is present only in couples with high *dyadic* ERE. This does not necessarily negate the presence of demand-withdraw in couples dealing with ERE. Instead, it suggests that for conflict between a demander and a withdrawer to be sufficiently heated to evoke strong negative emotions and subsequent changes in eating, both people need to have high ERE. One explanation for these findings could be that ERE might become grounds for more conflict and disagreement when *both*

partners are familiar with it. I had originally hypothesized that ERE would trigger conflict in couples in which one partner emotion-eats, and another one is unable to relate to the habit but is upset by related changes in weight and appearance. However, the data suggests that expression of negative emotion is linked to BMI only among those sharing the tendency with their partner. It is possible that in couples with discrepant tendencies, emotion-eating does not get discussed as much, because it remains unnoticed or unrecognized by the partners, or because it is too sensitive of an issue to bring up. Consequently, the conflict in ERE-discrepant couples might not be as high or as explicit as previously hypothesized. On the contrary, in couples with high *dyadic* ERE, open discussion of this topic might be more likely. Furthermore, additional frustration might arise from one of the partners attempting to control the habit while the other partner is giving in. For the one keeping ERE in check, overeating by another partner might create an additional challenge in coping with his or her own tendencies, thus resulting in more frustration and upset. With both partners being familiar with the tendency and the challenges of controlling it, the discussion might become more explicit, and heated enough to trigger more eating and BMI changes over time.

The results indicating that the use of negative-emotion words by one's partner makes a bigger difference in BMI than their own use of negatively charged language also fit well with the literature on emotional expression in couples. Several studies provide evidence that the use of emotionally charged language might be related to health (e.g., Lepore & Greenberg, 2002; Pennebaker, Mayne & Francis, 1997; Smyth, 1998); however, there is little agreement on whether expression of negative vs. positive emotion

has differential impact on health. On the one hand, Pennebaker et al. (1997) showed that a higher ratio of positive to negative emotion words was associated with better health, suggesting that a lower proportion of negative expression is beneficial. However, research also suggests that expressing (vs. suppressing) negative emotion might lead to improved health and wellbeing. For instance, a meta-analysis by Smyth (1998) showed that expression of negative emotion through writing had the potential of improving physical health among healthy adults. Based on these results, one would not anticipate a strong connection between expression of negative emotion and weight changes. Indeed, the results of the present study demonstrated a connection between ERE and BMI among women who did not express much negative emotion, but did not reveal any connection between emotional expression and BMI among women in either low-ERE or high-ERE couples. Overall, these results indicate that on average, expression of negative emotion makes little difference in that individual's weight.

In contrast, the connection between one's BMI and *their partner* expressing negative emotion was more pronounced (albeit, again, only among women). This finding is consistent with the notion that that having a displeased or critical partner might not only be detrimental to health by increasing stress levels, but might also exacerbate the use of health-compromising habits (e.g., Mattson, et al., 2010; O'Farrell, et al., 1998; Rotunda & O'Farrell, 1998). Overall, these findings support the idea that expressing one's negative emotion does not have a strong effect on weight change, perhaps because it can entail both relief from emotional suppression and exacerbation of negative emotions. However,

dealing with partner's negative emotions towards health practices has a more clear-cut negative impact on weight gain among those with high ERE.

Discussion Summary

To briefly summarize, ERE demonstrated good internal consistency and reliability. On a daily level, eating more when feeling well and less when feeling badly was prevalent among the entire sample and especially those with low ERE. Among those with high ERE, the connection between emotion and eating was different – they either did not change their food intake based on emotion, or changed it in the opposite direction from those with low ERE. These results suggest that some ways of altering eating based on emotion might be normative and perhaps adaptive, whereas high ERE deters people from doing so and dictates a different, less adaptive pattern.

Next, I demonstrated that ERE was associated with poorer weight measures, especially in women and people over 30. Last, I have shown that relational processes such as health cohesion and conflict might exacerbate the manifestation of ERE and result in greater weight gain among women. Specifically, women in high-ERE couples had higher BMI when they used more we-talk, an indicator of couple's cohesion. Consistent with the notion of symptom-system fit, I suggested that such couples might engage in ERE together, allowing ERE to become intertwined with the relationship, and thus exacerbating its impact on weight. Also consistent with this theory, people with high I-talk (and lower health cohesion) had lower BMI, suggesting that some degree of independence in the context of a shared unhealthy tendency might serve as a protective factor against weight gain. Finally, in high-ERE couples, partner expression of negative

emotion was linked to high BMI among women, more so than individual's own expression of negative emotion. This suggests that proximity of a displeased and critical partner exacerbates ERE, perhaps by creating additional distress without providing alternative means of regulating negative emotion resulting from it.

Limitations and Future Directions

The key limitation as well as the strength of this study is that I used a new brief measure of eating to regulate emotion. The use of this measure is a strength because it had not been developed and validated yet, and this project was the first step in doing so. The ERE measure demonstrated reliability and validity as predicted, and thus is worth developing and examining further. The use of this measure is a limitation, however, because it has not been previously validated. Additionally, it consists of three face-valid items and thus only taps into three broad emotional states (positive, negative, and stressed), whereas other measures of emotion-eating address a much broader spectrum of emotion.

To capitalize on preliminary results of the present study, we have developed a more detailed ERE measure that includes a wider and more balanced spectrum of emotions that people attempt to regulate by eating. Such a measure will allow us to more rigorously test whether ERE can indeed serve as an emotion-regulation strategy (vs. being an automatic, poorly controlled response to an emotion). Even though the present ERE measure was not correlated with other emotion regulation strategies, it would also make sense that a more detailed version of the ERE measure would be differentially related to adaptive vs. maladaptive emotion regulation strategies. If we continue

conceptualizing ERE as a maladaptive emotion regulation strategy, it might be positively correlated with other maladaptive strategies, and negatively correlated with adaptive emotion regulation. It is also possible that these connections might be stronger in some groups than others.

Another potential shortcoming of this study is that I used the *relative* quality and amount of food consumed by the participants to assess daily fluctuations in their diets, and did not use any objective measures reflecting the actual content of their meals. Although such measures may have allowed me to assess the accuracy of participants' perceptions, they would have also raised the problem that daily monitoring of actual dietary intake has a documented effect on peoples' eating behavior (e.g., Hollis et al., 2008). Recording details of food eaten during the day usually reduces the overall intake and makes it likely that people would eat healthier foods, and so a detailed food diary for a week would poorly reflect what participants normally eat. Instead, having the participants report briefly on their *relative* dietary quantity and quality allowed me to minimize this effect.

Another consideration is that the relatively small sample size used in this study may have limited the statistical power. Additional results may have emerged with more participants, so using a larger sample is advisable for future studies. Another potential limitation of the present sample is that it had a lower percentage of overweight and obesity than the general US population. Only 44.2% of the females and 51.2% of the males in the study sample were overweight or obese, as compared to 68% of the general population reported by Flegal et al. (2010). Given the connection between ERE and BMI,

it is likely that the sample with average BMI lower than that of the general population would also have lower levels of ERE than the general population. Nonetheless, given that I found significant links between ERE and BMI under certain conditions, I believe that these connections would only be more pronounced in a sample with higher prevalence of overweight, obesity and, likely, ERE. To test this assumption, future studies would benefit from using a more representative sample in regard to overweight and obesity.

Another potential limitation of the sample is the wide range of relationship duration among participating couples. I ran the main models controlling for relationship duration and got results very similar to the ones resulting from the models that did not include relationship duration. Based on this, I reported the results without including relationship duration, to simplify interpretation. Although analyses revealed no connection between relationship duration and any of the key variables, relationship dynamics might be different in long-term married couples versus those just beginning to date. Furthermore, other measures of relationship quality might play a role in the connection between relationship factors and health and thus future studies would benefit from including such measures. Based on this, future research would benefit from including relationship duration, as well as measures of overall relationship quality and the quality of health-related interactions in the analysis. One important consideration, however, is that since BMI is usually correlated with age, and so is relationship duration, it would be important to account for age whenever relationship duration is included in the model.

The final potential limitation of the study is the use of qualitative linguistic analyses performed by automatic software (LIWC). One of the common criticisms of LIWC is that it does not process speech content and therefore might not detect some important differences in language use. In the present study, for instance, LIWC would not be able to detect the differences between "we" referring to the couple (e.g., "we had salad last night"), "we" referring to one's family of origin (e.g., "we used to eat a lot of chicken," and "we" referring to the partner in a condescending way (e.g., "well, we haven't done that yet, have we?"). Although I assured that only pronouns that carried independent meaning were counted by the LIWC software, all of the above categories of we-talk are counted as one category. Despite these limitations, previous studies have shown illuminating results using the exact same methodology. This suggests that the benefits of looking at pronoun use as an implicit indicator of communal processes outweighs some limitations in detecting sub-categories of pronouns.

Conclusions

The new ERE measure demonstrated good reliability and validity. A close look at daily fluctuations of emotion and eating suggests that eating more when feeling well and less when feeling badly is prevalent among those with low ERE and might be adaptive. On the contrary, high ERE is associated with eating more when distressed and not eating more when feeling happy, thus suggesting a maladaptive pattern. Furthermore, ERE is linked to weight measures, and the relationship is moderated by age and gender, suggesting a need for further examination of these relationships. Finally, ERE interacts

with couple dynamics, allowing us to predict weight based on ERE and linguistic indicators of couple cohesion and conflict.

The brief version of the ERE presented in this study demonstrated potential and is worth developing further. Based on these results, we have developed a more detailed ERE measure that includes a longer list of emotions that people tend to regulate by eating. This measure might help further clarify complex connections between emotion and health and will be evaluated once the data become available. In addition to being used in basic research, the ERE measure can be used in assessment of individuals seeking treatment for weight loss and eating disorders. In both cases, teaching more adaptive emotion-regulation strategies to individuals with high ERE might not only improve immediate treatment outcomes, but also result in longer-lasting changes in their lifestyle and health status.

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TABLES

Table 1

*Correlations between ERE, Emotion Eating, and other measures of emotion regulation**

	ERE Pos	ERE Neg	ERE Stress	ERE	EmEat Pos	EmEat Neg	Reappr	Suppr	Rumin	Trait Pos	Trait Neg
Eat to Feel More Positive (ERE Pos)		0.57 <.0001	0.40 0.009	**0.79** **<.0001**	0.34 0.03	0.49 0.0009	-0.03 0.86	0.06 0.69	0.31 0.05	-0.13 0.41	0.37 0.01
Eat to Feel Less Negative (ERE Neg)	0.72 <.0001		0.69 <.0001	**0.90** **<.0001**	0.04 0.82	0.56 0.0001	0.14 0.37	0.22 0.16	0.16 0.32	-0.29 0.06	0.19 0.23
Eat to Fell Less Stressed (ERE Stress)	0.67 <.0001	0.81 <.0001		**0.82** **<.0001**	0.27 0.08	0.52 0.0004	0.21 0.19	0.33 0.03	-0.02 0.90	-0.33 0.03	-0.03 0.86
ERE 3-item (ERE)	**0.87** **<.0001**	**0.93** **<.0001**	**0.92** **<.0001**		**0.26** **0.10**	**0.62** **<.0001**	**0.13** **0.43**	**0.24** **0.12**	**0.18** **0.25**	**-0.30** **0.06**	**0.22** **0.17**
Eating due to Positive Emotion (EmEat Pos)	0.19 0.21	-0.22 0.15	-0.05 0.74	**-0.04** **0.80**		0.49 0.00	0.08 0.62	0.20 0.21	0.08 0.62	-0.19 0.24	0.04 0.82
Eating due to Negative Emotion (EmEat Neg)	0.61 <.0001	0.66 <.0001	0.60 <.0001	**0.69** **<.0001**	0.08 0.60		0.10 0.54	0.27 0.08	0.30 0.06	-0.43 0.004	0.34 0.03
Reappraisal (Reappr)	-0.07 0.67	-0.12 0.46	-0.14 0.36	**-0.12** **0.44**	0.09 0.58	-0.11 0.48		-0.09 0.55	-0.16 0.32	0.35 0.02	0.05 0.75
Suppression (Suppr)	0.02 0.92	0.05 0.76	0.06 0.70	**0.05** **0.76**	0.01 0.96	0.05 0.74	-0.30 0.05		0.14 0.38	-0.28 0.07	0.04 0.81
Rumination (Rumin)	0.25 0.11	0.16 0.30	0.17 0.28	**0.21** **0.18**	-0.07 0.68	0.19 0.21	-0.46 0.002	0.17 0.27		-0.30 0.05	0.56 0.0001
Trait Positive Emotion (Trait Pos)	-0.10 0.54	0.00 0.98	0.03 0.87	**-0.02** **0.89**	-0.20 0.19	-0.24 0.12	0.52 0.0004	-0.27 0.07	-0.14 0.37		-0.04 0.80
Trait Negative Emotion (Trait Neg)	0.36 0.02	-0.04 0.78	-0.04 0.78	**0.09** **0.58**	0.06 0.68	0.22 0.16	-0.27 0.08	0.09 0.56	0.54 0.0002	-0.30 0.05	

*Women (bottom left, shaded); Men (top right, unshaded); ERE correlations appear in boldface.

FIGURES

Figure 1

ERE by Negative Emotion due to Partner: Men

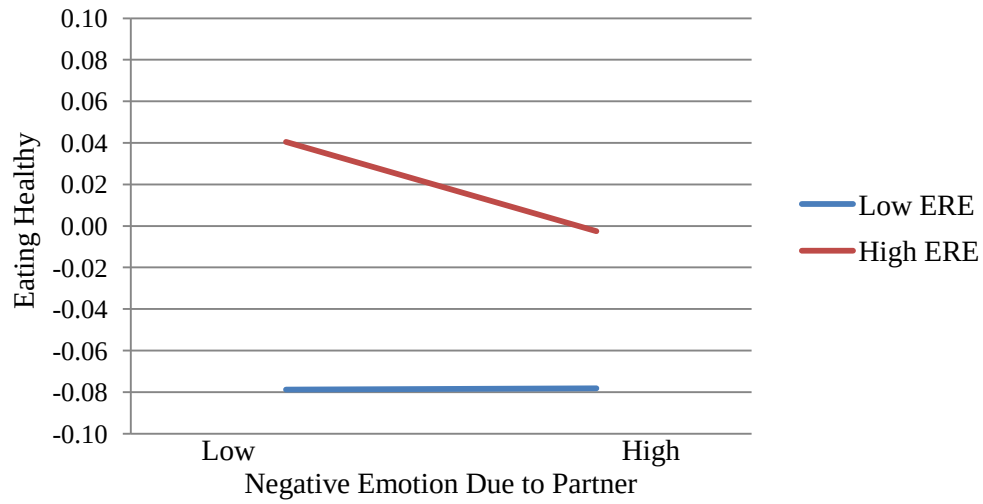

Figure 2

ERE by Positive Emotion due to Other Factors: Women

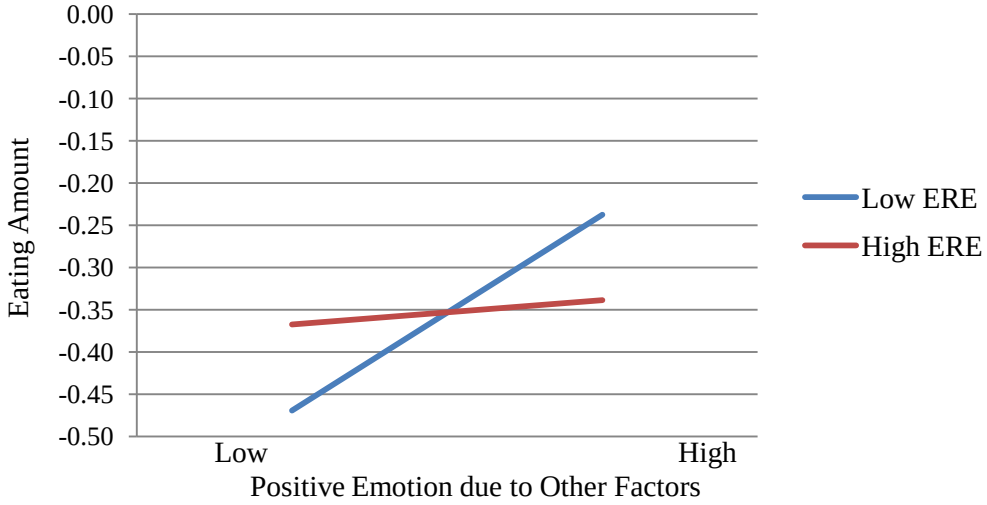

Figure 3

ERE by Partner's Positive Emotion due to Other Factors: Women

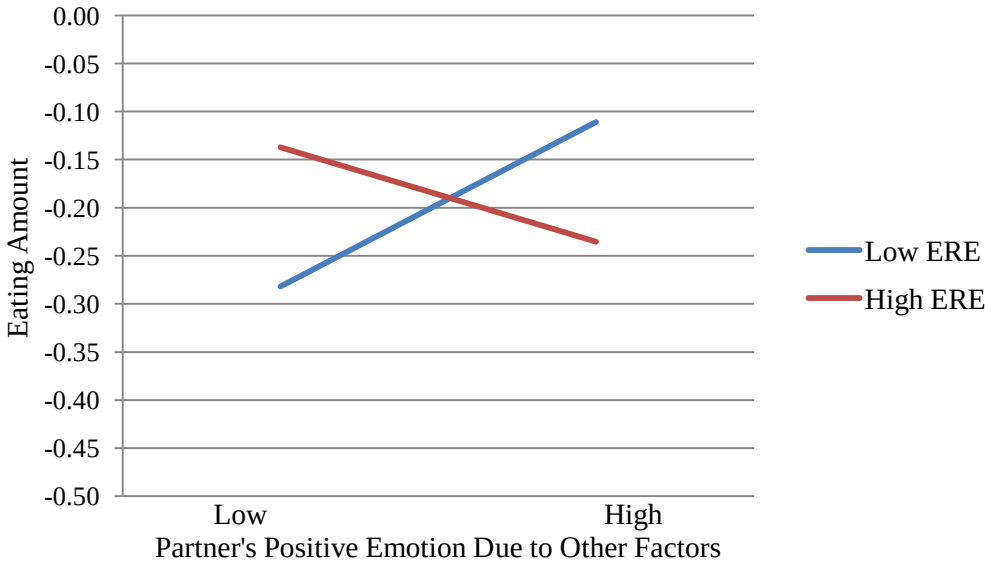

Figure 4

ERE by Negative Emotion due to Other Factors: Women

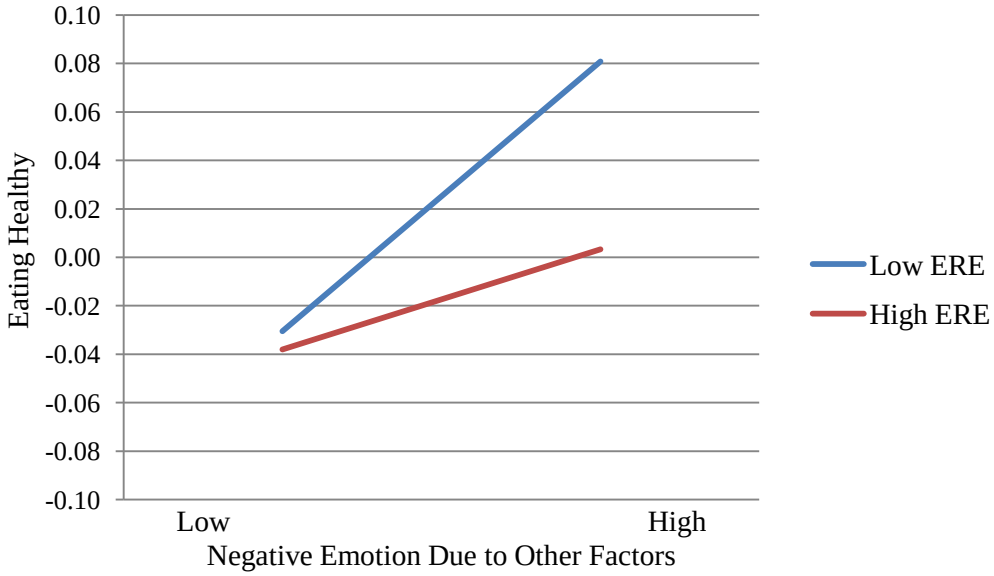

Figure 5

ERE by Gender by Age Interaction: Waist Circumference

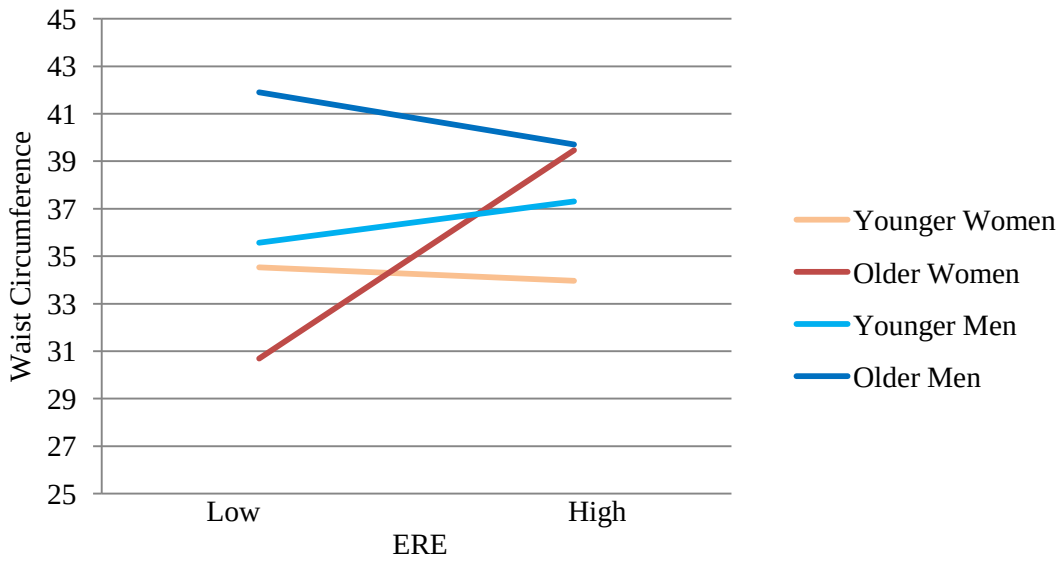

Figure 6

ERE by Gender by Age Interaction: Percent Body Fat

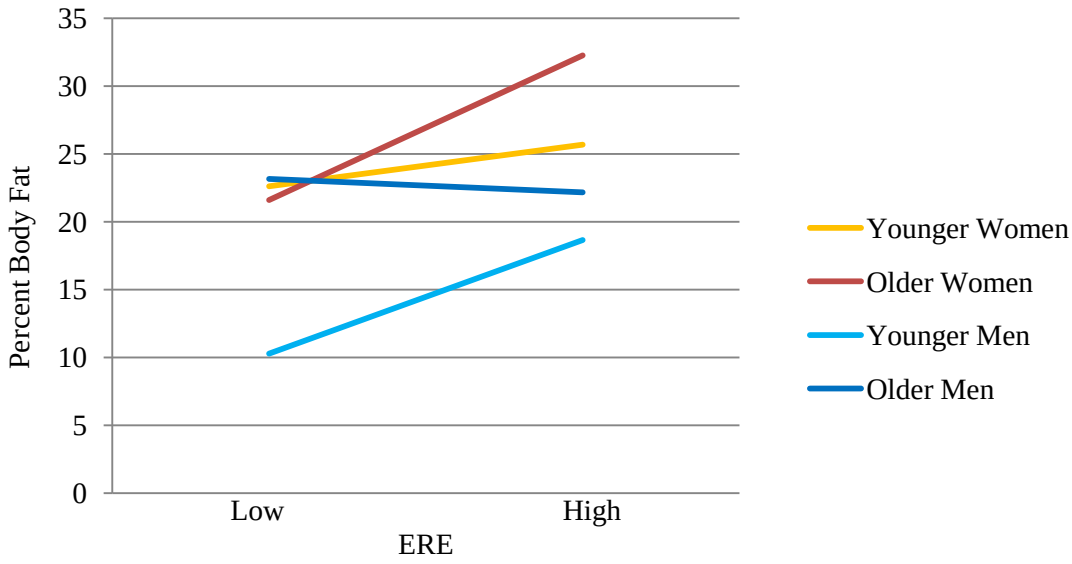

Figure 7

We-talk by Couples' Average ERE Interaction: BMI among Women

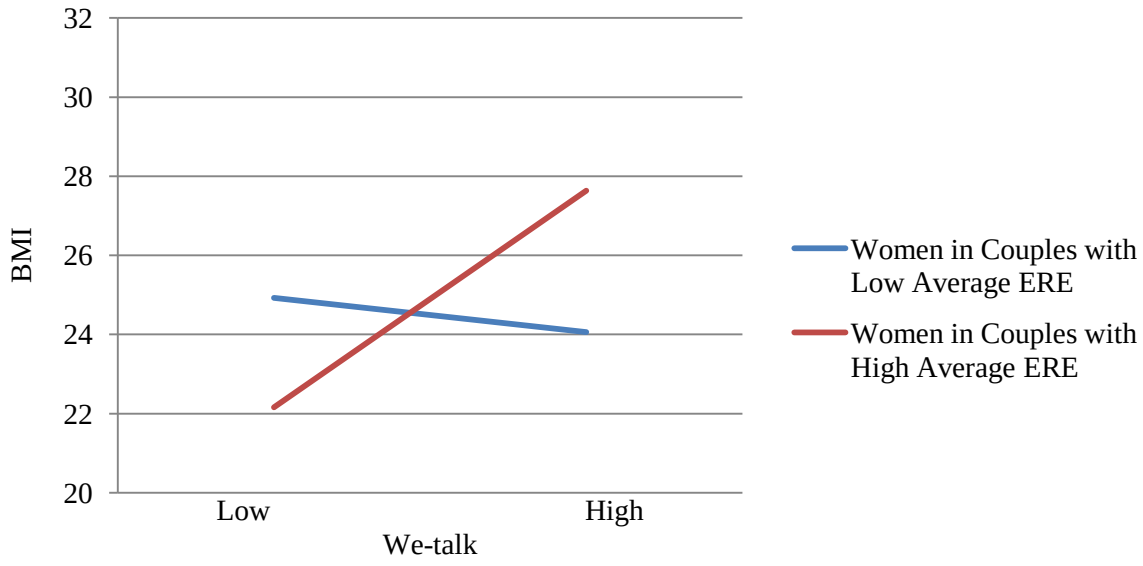

Figure 8

I-talk by Couples' Average ERE Interaction: BMI among Women

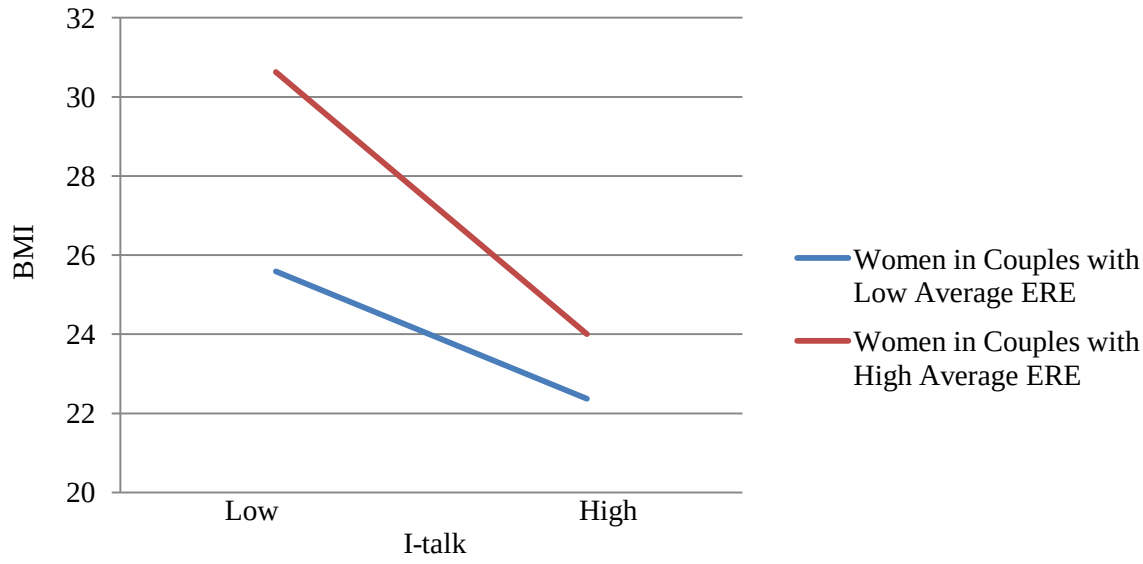

Figure 9

I-talk by Couples' Average ERE Interaction: BMI among Men

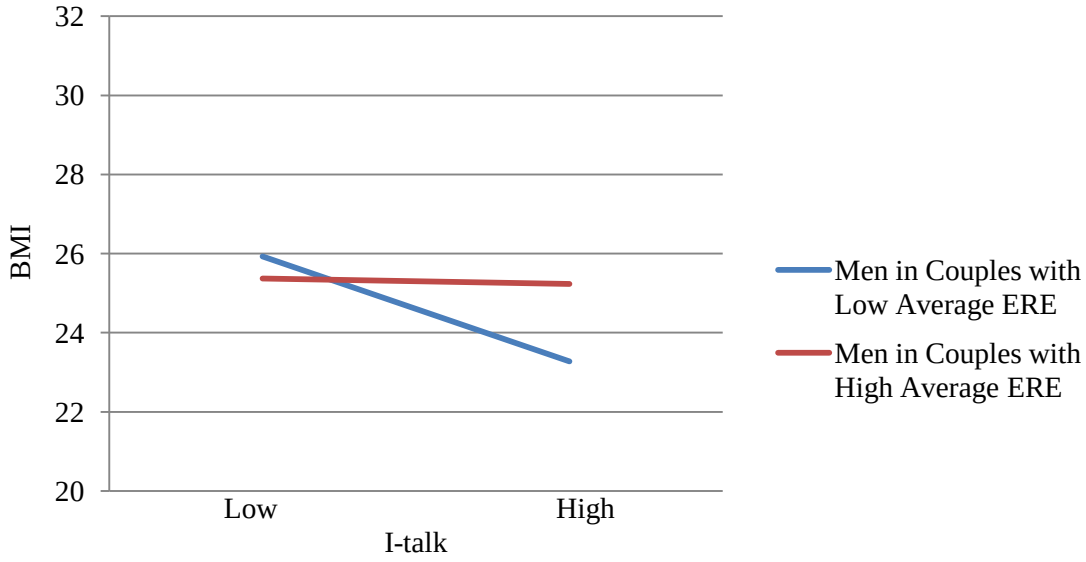

Figure 10

Negative Emotion Words by Couples' Average ERE: BMI among Women

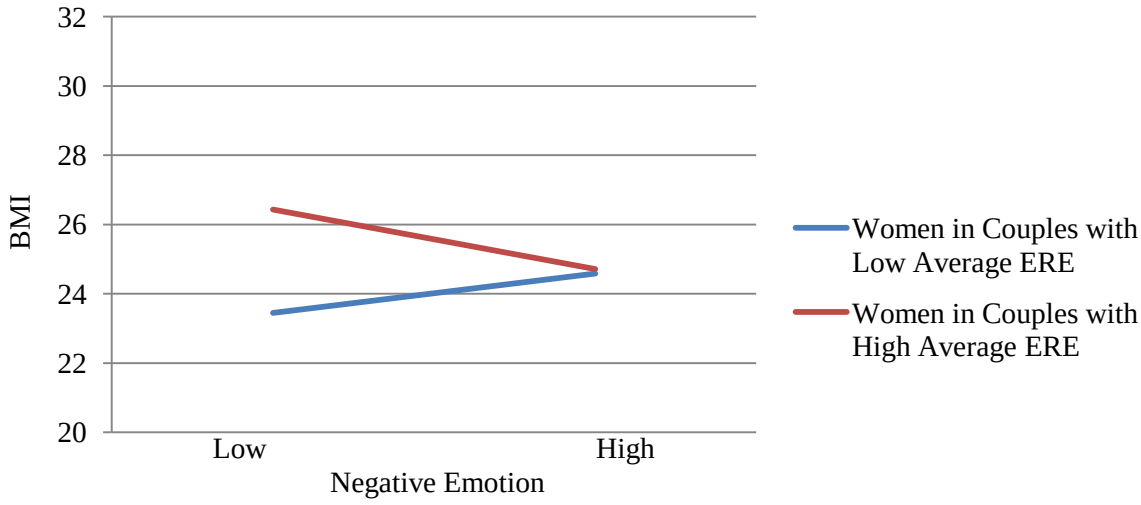

Figure 11

Negative Emotion Words by Partner by Couples' Average ERE: BMI among Women

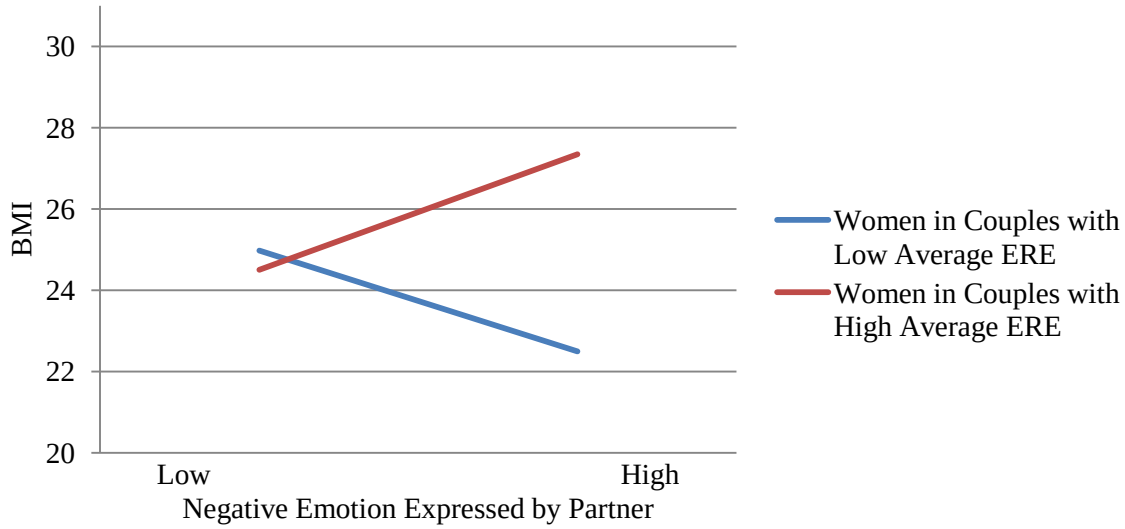

Figure 12

Negative Emotion Words by Partner by Couples' Average ERE: BMI among Men