AN EXAMINATION OF THE RELATIONSHIP BETWEEN COGNITIVE AND METACOGNITIVE FACTORS AND BULIMIC SYMPTOMS IN UNDERGRADUATE WOMEN

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Abstract

Rumination, a passive, perseverative, self-focused style of thinking about negative emotions and events, is a cognitive factor that has been empirically linked to a variety of harmful outcomes, particularly negative affect and depression. Recently, rumination has been proposed as a transdiagnostic risk factor that predicts numerous mental health conditions, including eating disorders. Taking into consideration the potential harm of rumination, researchers have sought to explain why individuals continue to ruminate. Metacognitive theories posit that negative and positive beliefs about rumination influence how frequently an individual ruminates and the consequences of repetitive, negative thinking. However, there is a dearth of evidence linking rumination and metacognitive beliefs to specific symptoms of eating disorders, such as binge eating and purging. The present study sought to examine the links between cognitive and metacognitive processes and bulimic symptoms, including how these variables relate in daily life. Individuals who endorsed bulimic symptoms showed higher levels of rumination and metacognitive beliefs about rumination (negative and positive). Rumination was found to partially mediate the relationship between beliefs about rumination (positive and negative) and bulimic symptoms. Daily (within-person) rumination tendency, daily negative affect, and baseline negative beliefs about rumination were found to significantly predict daily bulimic symptoms. These results provide further support for the application of metacognitive theory to eating pathology. The theoretical and practical implications of these findings are discussed.
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Examining the Role of Rumination and Metacognitive Beliefs in Bulimic Symptoms

Eating disorders, including bulimia nervosa and binge eating disorder, are serious and debilitating problems that have high costs to both the individuals suffering and society. Both bulimia nervosa and binge eating disorder are marked by episodes of binge eating, which is defined as: a) consuming an unusually large amount of food in a discrete period of time given the circumstances, and b) a sense of loss of control over the volume of food eaten. Bulimia nervosa is a disorder characterized by episodes of binge eating and engaging in behaviors intended to compensate for the caloric intake. Compensatory behaviors include but are not limited to self-induced vomiting, compulsive exercise, laxative abuse, and fasting (American Psychological Association, 2013). In binge eating disorder episodes of binge eating are not associated with compensatory behaviors, but often are followed by feelings of distress or guilt about the amount of food eaten (American Psychological Association, 2013).

Prevalence rates of bulimia nervosa, binge eating disorder, and related syndromes vary based on the population sampled. A recent review found that the lifetime prevalence of bulimia nervosa was approximately 1.6% before the age of 20, including 0.9-1.5% in women (Smink, van Hoeken, & Hoek 2012). These data were based on DSM-IV criteria for EDs, which were revised with the DSM 5 (American Psychological Association, 2013). Binge eating disorder appears to be more common, with prevalence rates of 3.5% in American women and 2.0% in American men (Smink, van Hoeken, & Hoek, 2012). In a prospective study that followed a community sample of young women, the lifetime prevalence rate by age 20 for DSM 5 bulimia nervosa was 2.6% and for binge eating disorder was 3.0% (Stice, Marti, & Rohde 2013).

Subclinical eating disorder symptoms are even more prevalent, with up to 25% of young adult women experiencing symptoms (Maine, 2006; National Eating Disorders Association
(NEDA), 2002). Striegel-Moore and colleagues (2009) found that 4% of adult women in a community sample endorsed self-induced vomiting “often” during the past three months to compensate for overeating. Stice and colleagues (2013) also found that the lifetime prevalence rate of subclinical bulimia nervosa was 4.4%, an important statistic because they found that subthreshold bulimic symptoms frequently escalated to threshold symptoms over time.

Empirical research has consistently found significant gender differences in most symptoms of eating disorders (Striegel-Moore et al., 2009) and higher incidence, lifetime and point prevalence rates of bulimia nervosa and binge eating disorder in females versus males (Smink, van Hoeken, & Hoek, 2012). Striegel-Moore and colleagues (2009) found that whereas men were more likely than women to report overeating, women were more likely to report loss of control over eating and meet binge eating criteria. Although research suggests that eating disorders in men are underdiagnosed for a variety of reasons, including underreporting of symptoms (Strother et al., 2012), these findings still suggest that women represent a particularly vulnerable population.

Peak onset for eating disorder symptoms appears to coincide with emerging adulthood, or the typical college years. Peak onset for bulimia nervosa is typically found to be late adolescence (age 16-20), whereas onset for binge eating disorder tends to peak slightly later (age 18-20) (Kessler et al., 2013; Stice et al. 2013). There is evidence that prevalence rates of disordered eating symptoms increase during adolescence and emerging adulthood (Davis, Ortiz, & Smith, 2017; Slane et al., 2014). Binge eating, in particular, has been found to increase from mid-adolescence to adulthood (Allen et al.,
Evidence from studies of the prevalence and course of ED demonstrate that college students may be a particularly useful target for research and intervention. Individuals with eating disorders also frequently meet criteria for comorbid disorders (Kaye et al., 2004; Wilfley et al., 2000; Zaider, Johnson, & Cockell, 2000), and health conditions such as chronic pain, diabetes, and hypertension (Kessler et al., 2013). These disorders are often burdensome for the individuals suffering, who experience drastically reduced quality of life (Mond et al., 2005; Spitzer et al., 1995) and impaired role functioning (Hudson et al., 2007; Kessler et al. 2013) relative to healthy controls. Possible complications of eating disorders include heart attack, gastrointestinal distress, anemia, osteoporosis, electrolyte imbalances, esophageal tears, hypertension, hyperlipidemia, among others (NEDA, 2002). Further, individuals with eating pathology often struggle with other comorbid mental health disorders, including depression and anxiety (O’Brien & Vincent, 2003; Yanovski et al., 1993). For these reasons, eating disorders such as bulimia nervosa and binge eating disorder are associated with substantial health care costs. In a systematic review by Stuhldreher and colleagues (2012), costs-of-illness for eating disorders (anorexia nervosa and bulimia nervosa) were found to be between $1,288 and $8,042 USD-purchasing party parities (PPP).

Because of the potential severity and the cost of these disorders, researchers have sought to identify risk and etiological factors involved in the development of clinical and subclinical eating pathology. Research has found a variety of factors involved in the etiology of bulimia nervosa, including body dissatisfaction (Stice, Marti, & Durant, 2011), negative self-evaluation, parental problems, risk factors for general psychopathology such as depression (Fairburn et al., 1997; Stice, Marti, & Durant, 2011), perfectionism (Fairburn et al., 1998), and dieting (Stice, Marti, & Durant, 2011). For binge eating disorder, identified risk factors include general risk
factors for psychopathology and obesity, adverse childhood experiences, parental depression, and repeated exposure to negative comments about weight and shape (Fairburn et al., 1998). Continued clarification of risk factors is important in order to inform treatment and prevention efforts. Further, identification of transdiagnostic risk factors can aid in the prevention of eating disorders and, more broadly, help prevent numerous mental health conditions, elucidate reasons for psychiatric comorbidity, and make treatments more efficient (Nolen-Hoeksema & Watkins, 2010).

Theories of Rumination

According to cognitive theories of psychopathology, dysfunctional beliefs, attitudes, and thoughts heighten an individual’s vulnerability for various mental illnesses (e.g., Beck, 1974; Teasdale, 1988). Specifically, Beck theorized that individuals prone to depression develop maladaptive schemas, or enduring, rigid, negative mental representations of one’s self in relation to the world (e.g., “I am unloveable” or “The world is dangerous”). These schemas, when activated, result in processing biases, or cognitive errors that cause the content of cognitions to be dominated by negative perceptions of one’s self, the world, and the future (i.e., the “cognitive triad”). The cognitive theory has been applied to numerous mental health problems including anxiety disorders (Beck, 1976; Tellegen, 1985), post-traumatic stress disorder (e.g., Foa, Steketee, & Rothbaum, 1989), and eating disorders (e.g., Fairburn, Cooper, & Shafran, 2003).

Within such cognitive theories, thought content in response to activating events is often emphasized. Recent theories, however, have highlighted the role of thought process – individuals’ style of responding to distress or negative events – in the development and maintenance of disorders. According to Nolen-Hoeksema’s Response Style Theory (RST; Nolen-Hoeksema, 1991), people who respond to negative emotions by repetitively
focusing on the causes, consequences, and meaning of negative emotions and events demonstrate a ruminative response style. Rumination is considered a process that it is distinct from – but related to – negative thought content (Ciesla & Roberts, 2007; Vanderhasselt & De Raedt, 2012).

Response Style Theory identifies the tendency to ruminate as a trait-like response to distress (Nolen-Hoeksema, 1991) that is a prominent cognitive risk factor for depression (Aldao, Nolen-Hoeksema, & Scheizer, 2010). Rumination is hypothesized to increase both the duration and severity of depressed mood in response to events by heightening negative affect through increased accessibility of negative schemas and reducing functional behaviors such as active problem-solving (Nolen-Hoeksema, 1991). Beginning in adolescence, girls and women are more likely to engage in ruminative response styles than boys and men (e.g., Nolen-Hoeksema, 2001), perhaps explaining some of the observed gender differences in mood disorders.

Throughout the past three decades several other theories have emerged in efforts to explain the link between rumination and psychopathology (for review, see Smith & Alloy, 2009). In their theory of self-regulation in recovery from stress, Beckman and Kellman (2004) posited that rumination is a homeostatic, “state-oriented” tool in response to stress that can impede self-regulation. Conversely, according to their theory, an action orientation can facilitate volitional components of self-regulation, such as motivation and self-discipline, and improve recovery from stress. Similar to the stress recovery theory, other theories (e.g., Garnefski, Kraaij, & Spinhoven, 2001; Matheson & Anisman, 2003; Matthews & Wells, 2004) have framed rumination as a cognitive emotion regulation strategy or emotion-focused coping skill.

If rumination is conceptualized as an emotion regulation strategy, this suggests that, on some level, rumination must feel like an effective way to modulate or decrease difficult emotions. A more recent theory by Giorgio and colleagues (2010) framed rumination as a form
of experiential avoidance. This theory was based on the experiential avoidance model of generalized anxiety disorder (Borkovec, Ray, & Stöber, 1998), which posits that worry serves as a form avoidance by providing a false, and reinforcing, sense of control over emotions. Applied to rumination, the experiential avoidance model describes rumination as a strategy that individuals use to avoid or distract from emotionally threatening material. However, the strategy backfires because avoidance prevents full processing of emotional material (Cribb, Moulds, & Carter, 2006; Kashdan et al., 2006) and avoidance and suppression can paradoxically increase avoided content (e.g., Wenzlaff & Wegner, 2000).

Although most of the theoretical and empirical work on rumination has emphasized its negative consequences, a few have highlighted its potential advantages. Control theories conceptualize rumination as “conscious thoughts involving a common instrumental theme that recur in the absence of immediate environmental demands” (Carver & Scheier, 1981; Martin & Tesser, 1996, p. 7). The Goal Progress Theory (Martin, Tesser, & McIntosh, 1993) views rumination as a response to perceived discrepancy between one’s current state and some standard or “ideal” state (e.g., Martin & Tesser, 1996; Moberly & Watkins, 2010; Pyszczynski & Greenberg, 1987). Rumination about perceived discrepancies can be a harmful form of self-focused thought, particularly when the discrepancy is chronic or cannot be resolved (Mor & Winquist, 2002; Watkins, 2008). This suggests that rumination is not a harmful process by nature. In fact, rumination can be helpful under certain circumstances, particularly when it is concrete and facilitates problem-solving (Watkins, 2008). However, analyzing and perseverating over negative, abstract themes (e.g., perceived defects in one’s self) may increase risk for negative outcomes.
Linking the Response Styles and Control Theories of rumination, Watkins and Nolen-Hoeksema (2014) proposed a Habit-Goal Framework of rumination. The authors proposed that, through repeated episodes of self-focused, repetitive thinking in response to goal discrepancy, the response (i.e., rumination) is automatically associated with the context (e.g., physical location, mood). The harmful, depressive form of rumination develops when the contingent response is a “passive focus on negative content and abstract construal” (Watkins & Nolen-Hoeksema, 2014, p. 26). According to the Habit-Goal framework, ruminative tendency is not a trait, but a habit that is learned over time.

Rumination as a Transdiagnostic Risk Factor

Rumination is associated with a variety of negative outcomes. A greater tendency to engage in self-focused attention or rumination is associated with more severe and long-lasting depressed mood (Carver & Scheier, 1990; Nolen-Hoeksema, 1991). Cross-sectional studies have shown that rumination is strongly associated with depressive symptoms and anxiety (for reviews, see Nolen-Hoeksema et al., 2008; Thomsen, 2006; Watkins, 2008). In experimental study, inducing rumination has demonstrated negative effects on cognitive-affective factors. Rumination inductions have been shown to impair executive processing (Philippot & Brutoux, 2008; Watkins & Brown, 2002), and prolong depressed mood (Nolen-Hoeksema & Morrow, 1993). After ruminating, individuals are less able to generate solutions to interpersonal problems and more likely to endorse pessimism about the future (Lyubomirsky & Nolen-Hoeksema, 1995). Further, rumination appears to impede working memory and disengagement from irrelevant information (De Lissnyder., Koster, & De Raedt, 2012; Koster et al., 2011) and there is suggestion that it may interfere with corrective learning (Reilly et al., 2018).
Longitudinal evidence demonstrates that increases in rumination predict increases in symptoms of depression and anxiety (Michl et al., 2013). Many of these studies have framed rumination as a mechanism linking stressful life events or other unhelpful processes (e.g., negative social comparisons) to distress and psychopathology (Feinstein et al., 2013; Michl et al., 2013). Ecological momentary assessment and experience-sampling methods have also found that momentary increases in rumination predict increased distress (Genet & Siemer, 2012; Moberly & Watkins, 2008).

Early theoretical work and empirical research on rumination has focused on its role in major depressive disorder and other mood disorders. More recently, researchers have identified rumination as a transdiagnostic risk factor, or a factor that underlies multiple forms of psychopathology (e.g., Nolen-Hoeksema & Watkins, 2010), for example depression, anxiety, and post-traumatic stress disorder. From this perspective, rumination is a distal risk factor – a factor that sets the stage for a particular condition – but the specific outcome is dictated by the more proximal risk factors that represent immediate vulnerability.

Emotion regulation-based theories of behavior can partially account for the link between rumination and maladaptive behaviors, including disordered eating. Escape theory (Heatherton & Baumeister, 1991) posits that maladaptive, impulsive behaviors occur in response to “aversive self-awareness,” or the negative cognitive and emotional state associated with perceiving discrepancy between one’s current and ideal states. Individuals experiencing such aversive emotions feel an urge to escape and do so by engaging in a behavior that is rewarding or distracting, such as the physical sensations involved in binge eating (Heatherton & Baumeister, 1991). Numerous theories of
rumination highlight the role of self-discrepancy in rumination’s harmful effects. It is plausible that repetitive, negative thinking enhances the sense self-discrepancy or aversive self-awareness, that prompts escape behaviors.

Similarly, according to the emotional cascades model (Selby, Anestis, & Joiner, 2008), rumination plays a role in behavioral dysregulation, including binge eating. They propose that ruminative responses initiate a positive feedback loop, wherein rumination induces negative affect, which prompts further rumination. These dramatic increases in negative affect – called “emotional cascades” – are then alleviated through engaging an impulsive behavior. Empirical tests of this model have found that rumination and negative affect demonstrate a reciprocal relationship (Selby, Anestis, & Joiner, 2008; Selby et al., 2016). Individuals may engage in impulsive behavior, including binge eating, to interrupt these reciprocal processes (Selby & Joiner, 2013; Selby et al., 2008). Therefore, the tendency to ruminate is implicated in a variety of dysregulated behaviors.

**Rumination and Eating Disorders**

Numerous studies have investigated the relationship between rumination and disordered eating attitudes and behavior. Disturbances in body image – a potent risk factor for eating disorders (Stice, Marti, & Durant, 2011) may be related to a tendency to ruminate. Mezulis, Abramson, and Hyde (2002) compared gender differences in rumination and found that women were more likely to ruminate about negative events related to body image and physical appearance. Negative rumination, especially about physical appearance, has been found to predict greater body dissatisfaction (Maraldo et al., 2016).

Experimental studies also support the link between rumination and body dissatisfaction. Etu and James (2010) investigated the effects of a rumination induction following the reading of
a negative body image-related passage. They found that participants in the rumination
condition showed increased levels of body part anxiety and state body dissatisfaction,
suggesting that negative rumination about one’s physical appearance can lead to greater
body image distress (Etu & James, 2010). These findings are consistent with control and
Goal Progress theories of rumination, as attainment of an “ideal” body image may
represent a goal discrepancy that is chronic or unresolvable (Thompson et al., 1999),
therefore making rumination particularly pernicious in individuals with salient concerns
about body image and physical appearance (Mor & Winquist, 2002; Watkins, 2008).

In addition to body dissatisfaction, rumination has also been shown to predict
disordered eating symptoms. Empirical tests of the emotional cascades model have found
a reciprocal relationship between rumination and negative affect, which predicts
dysregulated behaviors, including binge eating (Selby et al., 2009). Similarly, Naumann
and colleagues (2015) found that, in patients diagnosed with bulimia nervosa, rumination
following a sadness induction predicted increased desire to binge compared to a
distraction condition. Cross-sectional research has demonstrated that rumination is
associated with higher levels of dietary restraint (Dondzilo et al., 2017) binge eating
(Mason & Lewis, 2016), and more general measures of disordered eating (Dondzilo et
al., 2015; Hilt, Roberto, & Nolen-Hoeksema, 2013; Riviere & Douilliez, 2017;
Szymanski & Mikorski, 2017).

Longitudinal research has also supported the findings that rumination is
associated with eating disorder symptoms. In a study of adolescents, girls were more
likely to engage in rumination and higher levels of rumination predicted bulimic
symptoms at one-year follow-up (Nolen-Hoeksema et al., 2007). Sarin and Nolen-
Hoeksema (2010) followed a community sample, including survivors of childhood sexual abuse, across a three-year span. Researchers examined participants’ distress levels, rumination tendencies, and consumptive coping (including eating to cope) at three time points, each one year apart, and found that rumination partially mediated the relationship between childhood sexual abuse and consumptive coping (Sarin & Nolen-Hoeksema, 2010). These results indicate that rumination may be a risk factor in the development of eating pathology.

Individuals who engage in disordered eating often attend more to stimuli related to food and weight (Sackville et al., 1998) and thin-ideal images (e.g., Janson, Nederkoorn & Mulkens, 2005; Smith & Rieger, 2006; for review, see Dobson & Dozois, 2004). One study, applying attentional bias theories of rumination (e.g., impaired disengagement hypothesis; Koster et al., 2011) to eating pathology, found that rumination mediated the relationship between attentional biases to thin-ideal images and dietary restraint (Donzilo et al., 2017). The authors suggested that a tendency to ruminate may be linked to impairment in cognitive disengagement, or difficulties shifting attention from a stimulus of interest (Donzilo et al., 2017), which is supported by experimental research on depressive rumination’s effects on attention and cognitive processes (Philippot & Brutoux, 2008; Watkins & Brown, 2002). For individuals with vulnerability to eating disorders, bodies representing the thin ideal represent a relevant, self-referent attentional target. Individuals who ruminate and who also exhibit disordered eating attitudes or symptoms may have difficulty shifting cognitive focus from stimuli related to food, weight, and shape.

Much of the research on rumination and disordered eating has been based on cross-sectional or retrospective data. Few researchers, however, have used more naturalistic and experiential methods to capture these phenomena as they occur in individuals’ daily lives. Daily diary and other ecological momentary assessment methods are ideal ways to assess within-
persons relationships between cognitive processes, such as rumination, and eating behaviors as they occur in everyday life. Ecological momentary assessment is a measurement approach that collects real-time data by using repeated assessments over time, thus reducing biases and limitations of retrospective self-report measurement and increasing ecological validity (Trull & Ebner-Priemer, 2009).

Kubiak and colleagues (2008) assessed the relationship between rumination, daily hassles, and emotional eating in a sample of 16 obese adolescents who were under restricted dietary conditions. Using experience sampling methods, they found that rumination and negative affect mediated the relationship between daily hassles and emotional eating, suggesting that the experience of daily stress can increase rumination and negative affect, leading to disordered eating symptoms (Kubiak et al., 2008).

Sala, Brosof, and Levinson (2019) conducted an ecological momentary assessment study in a clinical sample of individuals with eating disorders. Their findings also demonstrated a link between repetitive negative thinking and eating disorder behaviors. Results showed that higher momentary repetitive negative thinking predicted higher subsequent weighing and body checking. Contrary to hypotheses, they found that higher mealtime repetitive negative thinking did not predict compensatory behaviors, but suggested that participants were more likely to ruminate at mealtime if they were not engaging in compensatory behaviors, which would have alleviated distress and, in turn, decreased ruminative processes (Sala et al., 2019). They proposed that repetitive negative thinking may prompt reassurance-seeking behaviors, such as weighing and body checking, which, if successful, may serve to prevent disordered eating symptoms such as purging or binge eating. To our knowledge, there have been no examinations of the daily
relationship between rumination and bulimic symptoms a non-clinical sample of young adults.

In sum, there is a new body of emerging literature that establishes rumination as a transdiagnostic risk factor that is associated with many forms of psychopathology, including disordered eating. Although the precise mechanisms through which rumination influences eating behavior are not yet clear, rumination may be an important target for clinical intervention within a variety of disorders, including binge eating disorder and bulimia nervosa. To help us better understand rumination, metacognitive theories have emerged.

The Role of Metacognition

Given the abundance of negative consequences of rumination, researchers have sought to explain why individuals engage in such unhelpful cognitive processes. Theories of metacognition emphasize the cognitive mechanisms involved in the knowledge, interpretation, and regulation of thinking itself. The self-regulatory executive function (S-REF) theory (Wells & Matthews, 1996) posits that, in individuals who are vulnerable to psychopathology, ruminative thought is a function of underlying beliefs about the reasons for and consequences of rumination. The S-REF theory identifies knowledge and regulation as the two major components of metacognition.

According to the S-REF theory, metacognitive knowledge is defined as an individual’s beliefs about the course and consequences of thought. Metacognitive regulation involves planning, resource allocation, monitoring, and correcting of cognitive events. Despite rumination’s many negative consequences, individuals may continue to ruminate because a ruminative pattern is held in place by positive metacognitive beliefs (Papageorgiou & Wells, 2004). The S-REF theory conceptualizes psychopathology as stemming from a general dysfunction in the metacognitive system. This dysfunction, called the Cognitive-Attentional Syndrome (CAS), is characterized by perseverative thinking and attentional biases (e.g., threat-
monitoring, avoidance) that contribute to maladaptive coping strategies and failure to effectively regulate emotion (Wells, 2000, 2009).

In their metacognitive theory of depression, Papageorgiou and Wells (2003, 2004) propose that positive metacognitive beliefs construe rumination as a helpful strategy, particularly for maintaining focus on goals and reducing discrepancy between one’s current state and ideal or “ought” states (e.g., “I need to ruminate about my problems to find answers to my problems’’). However, when rumination is ineffective and self-discrepancy persists, it may lead to continued rumination, increased depressed mood, and interference with effective problem solving. As a result, negative metacognitive beliefs may emerge. According to Papageorgiou and Wells (2003, 2004), these negative beliefs are usually related to the uncontrollability and harmfulness of ruminative thinking (e.g., “Rumination about my problems is uncontrollable’’) and to the social consequences of rumination (e.g., “People will reject me if I ruminate’’). These negative metacognitions are thought to contribute to depressive mood states for a number of reasons, particularly because they leave individuals feeling stuck, isolated, and hopeless in their maladaptive patterns of thinking.

Empirical tests of the metacognitive theory of depression have yielded mixed results. Several studies have found that positive beliefs about rumination are predictive of increases in rumination, which further predict depressive symptoms and negative beliefs about rumination (Huntley & Fisher, 2016; Solem et al., 2015). Roelofs and colleagues (2007) found that although both negative and positive metacognitive beliefs about rumination were linked to increased depressive mood in a clinical sample, the expected pattern of the metacognitive theory of depression was not replicated. They suggested that
the precise relationships between negative metacognitions, rumination, and depressive symptoms may vary depending on the sample tested and the precise measures used (Roelofs et al., 2007).

The underlying tenet of the S-REF theory, which posits that specific negative and positive metacognitive beliefs contribute to an increasingly ruminative, maladaptive response style, has been tested within other psychological disorders. For example, dysfunctional metacognitions related to post-event processing, or negative, perseverative thinking back on a social event in the past, has been shown to be predictive of increases in social anxiety symptoms (Gavric et al., 2017). Spada, Caselli, and Wells (2013) employed metacognitive theory to alcohol abuse and found that metacognitions can maintain patterns of alcohol abuse and increase negative affect and the likelihood of relapse in individual who have stopped drinking. Metacognitive theory has also been applied to anger control problems; one study showed that rumination and metacognitive beliefs predicted subsequent anger and that metacognitive beliefs and subsequent rumination levels mediated the relationship between a triggering event and anger three days later (Caselli et al., 2017).

Distorted metacognitive beliefs appear to be common in individuals with eating disorders. Dysfunctional metacognitions (e.g., ‘constantly ruminating helps me control my thoughts’ and ‘worrying so much about my weight means I must be stupid’) are often observed in clinical work in eating disorders (Cooper et al., 2007). Rawal, Park, and Williams (2010) found that in a non-clinical undergraduate sample, level of eating disorder concerns was significantly correlated with dysfunctional beliefs about rumination. Cowdrey and colleagues (2012) observed that some patients with eating disorders reported feeling better during a mealtime rumination exercise compared a distraction or mindfulness exercise because it served
as a form of experiential avoidance, allowing them to distract from focusing on their bodies or their distress about the meal.

Specific negative and positive metacognitions have been studied in relation to eating disorders. Konstantellou and Reynolds (2010) found that metacognitions such as positive beliefs about worry and need to control thoughts were associated with problematic eating attitudes in a sample of undergraduates. Positive beliefs about rumination may be common in individuals who struggle with disordered eating because they may believe rumination is a pertinent strategy for maintaining focus on important food and weight-related goals and controlling one’s thoughts and behavior (Rawal et al., 2010). Positive beliefs about rumination cause ruminative patterns to persist and increase (Papageorgiou & Wells, 2003, 2004). Thus, positive beliefs about rumination may affect eating disorder symptoms indirectly, through the effects of rumination.

Similarly, negative beliefs about rumination may also be involved in the link between rumination and eating disorders. Konstantellou and Reynolds (2010) found that negative metacognitive beliefs surrounding the uncontrollability and danger of thoughts were associated with problematic eating attitudes. Similarly, individuals with AN have been found to have more negative metacognitions, such as believing their thoughts are abnormal or uncontrollable, than dieters and non-dieting controls (Woolrich, Cooper, & Turner, 2007). These beliefs may serve to strengthen the cycle of rumination if they also believe that ruminative thought processes are helpful in controlling thoughts and behaviors (Rawal, Park, & Williams, 2010). However, it may also exacerbate the negative consequences of rumination because these negative beliefs exacerbate the negative effects of rumination (Papageorgiou & Wells, 2003; Solem et al., 2016). To our
knowledge, moderation and mediation models have not been tested to examine the nuances of the relationships between metacognition, rumination, and disordered eating symptoms, particularly bulimic symptoms.

**The Current Research**

Despite the growing understanding of how rumination and metacognitive variables relate to disordered eating symptoms, there have been few empirical examinations of how they relate specifically to binge eating and compensatory behaviors. Further, to our knowledge there have been no studies of how these variables relate in real time, in individuals’ day-to-day lives. Daily diary studies may help capture fluctuations in eating behavior and cognitive variables that cannot be measured using methods that require recall over longer periods of time and can prevent biases that result from this type of recall (Bolger, Davis, & Rafaeli, 2003).

The current research examines the metacognitive model of rumination and bulimic symptoms. Specifically, Study 1 tests the associations between metacognitive beliefs, rumination, and disordered eating in a sample of undergraduates. Study 2 examines the associations of daily rumination and positive beliefs about rumination with daily bulimic symptoms. A majority of research examining these variables has been cross-sectional (e.g., Rawal, Park, & Williams, 2010) and few studies have used daily diary methods to demonstrate the associations between rumination and disordered eating symptoms. Moreover, this study will expand upon prior daily diary research to examine the metacognitive model of disordered eating in a non-clinical sample of adults.

**Study 1**

Study 1 served as an initial test of whether the variables of interest demonstrate the expected relationships in a cross-sectional study in a college sample. Most of the research on
metacognitive models of disordered eating has examined its relationship to symptoms of anorexia or disordered eating attitudes, such as drive for thinness (Cooper et al., 2007; Davenport et al., 2015; McDermott & Rushford, 2011). To our knowledge, this was the first study of its kind to test the associations between rumination, metacognitive beliefs, and bulimic symptoms.

Based on prior research that has linked rumination and disordered eating and demonstrated higher levels of metacognitive beliefs in eating disorder patients, it was hypothesized that undergraduate women who endorsed bulimic symptoms would show significantly higher levels of rumination and metacognitions than undergraduate women who did not endorse bulimic symptoms.

Further, extending upon prior research that negative metacognitions can exacerbate the consequences of repetitive negative thought processes, it was hypothesized that the interaction between rumination and negative beliefs about rumination would account for significant variance in bulimic symptoms, over and above that accounted for by the first two variables. Therefore, individuals who frequently ruminate and endorse stronger negative beliefs about rumination would be those at the highest risk for bulimic pathology.

Finally, based on findings that positive beliefs about rumination increase ruminative tendencies, it was predicted that positive beliefs about rumination will be significantly, positively correlated with bulimic symptoms and that tendency to engage in rumination would mediate this relationship.

**Method**

**Participants**

Participants were 386 undergraduate women ages 18 to 45 ($M = 19.08$, $SD = 1.83$) from a large, Northeastern university. Inclusion criteria consisted of identifying as
female, being at least 18 years of age, and being enrolled in a University undergraduate psychology course that participated in the research pool. In terms of race/ethnicity, 43.4% of the sample identified as White/Caucasian, 13.7% identified as Black/African American, 22.0% identified as Asian/Pacific Islander, 14.7% identified as Hispanic/Latina. Another 6.0% identified as biracial, selected “Other,” or chose not to identify their race/ethnicity. A majority of participants (82.2%) identified as heterosexual, 3.6% identified as gay/lesbian, 10.9% identified as bisexual, and 3.1% selected “Other” or chose not to identify their sexual orientation.

Most of the participants were non-smokers, with only 2.8% of participants endorsing regular use of tobacco products. The mean number of days participants reported exercising each week was 2.53 ($SD = 2.09$) and number of days of exercise ranged from 0 to 7. The mean number of alcoholic drinks participants reported consuming each week was 2 ($SD = 2.91$) and number of weekly alcoholic drinks consumed ranged from 0 to 16. The mean BMI among participants was 25.18 ($SD = 5.02$) and BMI ranged from 15.92 to 41.32.

**Procedure**

Potential participants were recruited from undergraduate psychology classes using the online research pool. Study postings offered an opportunity to participate in research to earn course credit. Eligible participants were over the age of 18 and identified as female. Participants attended an in-lab appointment where they were given more detailed information about the study and those who were still interested provided informed consent. They completed a questionnaire (measures listed below) containing items assessing demographic information, disordered eating symptoms, rumination, metacognition, negative and positive affect, and depression. Participants received class credit for their participation. All procedures were approved by the University Office of Regulatory Research Compliance – Institutional Review Board.
Measures

**Demographic Information.** Each participant responded to single items assessing for demographic information, including age, gender identity, race, year in school, sexual orientation, use of tobacco products, frequency of alcohol use and frequency of exercise.

**Eating Disorders Examination - Questionnaire.** As a global measure of eating pathology, the Eating Disorders Examination – Questionnaire (EDE-Q; Fairburn & Beglin, 1994) was used. The EDE-Q is a self-report questionnaire that assesses attitudes and behaviors characteristic of eating disorders over the previous 28 days. In addition to a Global score, the measure also consists of four subscale scores: Restraint, Eating Concern, Shape Concern, and Weight Concern. The measure yields frequencies of specific disordered eating behaviors (e.g., binge eating, compensatory behaviors), which are assessed in terms of the number of episodes of each behaviors occurring during the past four weeks. Items are rated on a 7-point scale and higher scores indicate more severe eating pathology. The current study only used frequency count items, therefore Global scale and subscale internal consistency is not reported.

**Bulimia Test – Revised.** To assess for the severity of bulimic symptoms, the Bulimia Test (BULIT-R; Thelen, Farmer, Wonderlich, & Smith, 1991) was used. The BULIT-R is a 28-item self-report questionnaire that measures the attitudes and behaviors common in bulimia nervosa. All items (e.g., “After I binge eat I turn to one of several strict methods to try to keep from gaining weight”) are presented in a 5-point Likert with item ratings differing based on the question (e.g., 1 (Never) to 5 (Most or All of the Time)). Higher scores indicate more severe bulimic symptoms and attitudes. In addition to assessing for bulimia nervosa, the BULIT-R is considered an excellent measure of binge eating disorder (VanderWal, Stein, & Blashill, 2011). The scale has demonstrated strong psychometric properties in college women (Brelsford,
Hummel, & Barrios, 1992). In the current study, Cronbach’s alpha was 0.93, demonstrating excellent internal consistency.

**Ruminative Response Scale.** The Ruminative Response Scale (RRS) subscale of the Response Styles Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991) was used to assess participants’ tendency to engage in a ruminative style of thinking. The scale consists of 22 items (e.g., “Think about a recent situation, wishing it had gone better”) rated on a 7-point scale based on how frequently the respondent engages in the behavior, ranging from 0 (*none of the time*) to 6 (*all of the time*). Higher scores indicate higher tendency to engage in rumination in response to low mood. The RRS is proposed to have three subscales – brooding (e.g., “Think, ‘What am I doing to deserve this?”’), reflection (e.g., “Think about recent events to try to understand why you are depressed), and depressions-related (e.g., “Think about how alone you feel”; Treynor, Gonzalez, & Nolen-Hoeksema, 2003). The brooding subscale has been shown to have adequate psychometric properties, including internal consistency ($\alpha = 0.77$), test-retest reliability ($r = 0.62$; Treynor et al., 2003). In the current sample, internal consistency was excellent for the brooding subscale ($\alpha = .94$) and for the reflection subscale ($\alpha = .94$).

**Positive Metacognitive Beliefs Scale.** To assess positive metacognitions, the Positive Beliefs about Rumination Scale (PBRS; Papageorgiou & Wells, 2001a) was used. The PBRS is a nine-item scale that assesses beliefs about the benefits of rumination (e.g., “I need to ruminate about the bad things that have happened in the past to make sense of them”). Items are rated on a 4-point scale ranging from 1 (*do not agree*) to 4 (*agree very much*). Higher scores indicate stronger positive beliefs about rumination. The PBRS has good support for its reliability and validity (Cane, Olinger, Gotlib, & Kuiper, 1986). In the current study, Cronbach’s alpha was 0.94, demonstrating excellent internal consistency.
Negative Metacognitive Beliefs Scale. To assess negative metacognitions, the Negative Beliefs about Rumination Scale (NBRS; Papageorgiou & Wells, 2001b) was used. The NBRS is a 13-item questionnaire that evaluates negative metacognitive beliefs about the uncontrollability and harm associated with rumination (e.g., “Ruminating about my problems is uncontrollable”). The scale measures beliefs about the interpersonal and social consequences of rumination (e.g., “Rumination means I’m a bad person”). Respondents rate the extent to which they agree with each item on a scale ranging from 1 (do not agree) to 4 (agree very much). Higher scores indicate stronger beliefs about the harmful effects of rumination. The internal consistency in the current sample was excellent (α = .90).

Depression Anxiety Stress Scales. The Depression Anxiety Stress Scale (DASS-21; Henry & Crawford, 2005) was used to measure symptoms of psychological distress. The full scale consists of 21 items (e.g., “I felt down-hearted and blue”) rated on a four-point scale ranging from 0 (never) to 3 (almost always). There are three subscales – depression, anxiety, and stress, or the 21 items can be used as a composite. Higher scores indicate higher levels of psychological distress. Psychometric properties have been well established in non-clinical samples (Crawford & Henry, 2003; Ng et al., 2007). Internal consistency estimates were adequate for full scale DASS-21 (α = .93) and subscales (depression α = .90, anxiety α = .82, and stress α = .83) in the current sample.

Positive and Negative Affect Scales. The Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) was used to measure tendency to experience subjective distress and negative emotions. The time instructions of the scale can be modified to measure different variations of experiences of negative affect (e.g., momentary, daily, weekly, general/trait; Watson, Clark, & Tellegen, 1988). In the current study, participants were instructed
to respond based on their negative affect over the past two weeks. The scale consists of a list of 10 negative emotions (e.g., irritable, anxious), which respondents rate based on the degree to which they have experienced each emotion over the specified timeline on a scale ranging from 1 (Very slightly/not at all) to 5 (Extremely). Higher scores indicate stronger negative or positive affect. Internal consistency was good for both scales in the current sample (NA $\alpha = .89$; PA $\alpha = .89$).

**Analytic Approach**

The raw data from the online surveys were uploaded and analyzed using the Statistical Packages for Social Sciences (SPSS) for Windows version 21. To examine Hypothesis 1, participants were classified by the presence or absence of bulimic symptoms, according to the symptom count items in the EDE-Q. The bulimic symptom group included participants who endorsed overeating with a sense of loss of control over amount consumed and/or presence of compensatory behaviors (including self-induced vomiting, laxative use, and compulsive over-exercise; $N = 182$). The comparison group consisted of participants who did not endorse any symptoms of binge eating or compensatory behaviors ($N = 204$). Group classification was strongly correlated with magnitude of bulimic symptoms measured by the BULIT-R ($r = .73$, $p < .001$). Independent samples t-tests were conducted to compare ruminative tendency and metacognitive beliefs among individuals with and without symptoms of bulimia.

With regards to Hypotheses 2 and 3, the correlation matrix was examined to determine how strongly each variable was correlated with bulimic symptoms and to examine what measure of rumination was most strongly correlated with bulimic symptoms. Potential covariates were identified by examining the relationship between demographic variables, depression, rumination, metacognitive variables, and bulimic symptoms.
The primary analyses for Study 1 consisted of a series of multiple regression analyses to test moderation and mediation models. For Hypothesis 2, hierarchical linear regression analyses were runs to determine whether the independent variables (rumination and negative metacognitive beliefs) significantly predicted bulimic symptoms, and whether their interaction accounts for significant additional variance in bulimic symptoms. All dependent variables were mean-centered to address multicollinearity.

To investigate Hypothesis 3, multiple linear regression was used to test for mediation. First, the relationship between positive beliefs about rumination and bulimic symptoms was examined. Second, the correlation between positive beliefs about rumination and ruminative tendency was tested for significance. Next, the relationship between rumination and bulimic symptoms was tested while controlling for positive beliefs about rumination. Finally, the relationship between positive metacognitive beliefs and bulimic symptoms was tested while controlling for rumination. The indirect effect was testing using bootstrapping (Hayes, 2009; Preacher & Hayes, 2008). Again, all dependent variables were mean-centered to address multicollinearity. Regression analyses using moderation and mediation were tested using Hayes Process Macros for SPSS 21 (Hayes, 2017).

Results

Preliminary Analyses

Correlations among each of the variables can be found in Table 1, all of the variables and potential covariates were significantly correlated to bulimic symptoms. As such, depression and BMI were included as covariates in subsequent analyses. The brooding subscale of the RRS was more strongly related to bulimic symptoms, but the reflection subscale was also significantly
correlated with scores on the BULIT-R. Therefore, a composite of brooding and reflection was used as a general measure of rumination in the remaining analyses.

A total of 143 (37.0%) participants endorsed binge eating (overeating with a sense of loss of control) at least once within the past four weeks. In terms of compensatory behaviors, 22 (5.7%) participants reported self-induced vomiting, 23 (5.9%) reported laxative use, and 163 (42.1%) reported compulsive exercise.

Assumptions

The assumptions of independent samples t-test and multiple linear regression were tested for both regression models. The data were initially screened to check for normality and identify any potential outliers or data points that would have interfered with the inferential statistical analyses. All variables were approximately normally distributed with no significant skewness or kurtosis statistics. Levene’s Test for Equality of Variances was non-significant for all t-tests.

Scatterplots demonstrated linear relationships between bulimic symptoms and independent variables, including rumination, negative metacognitive beliefs, and positive metacognitive beliefs. There was no evidence of multicollinearity, as tolerance was above 0.2 and variance inflation factor (VIF) was under 10.0. The Durbin-Watson statistics were close to 2.0, which suggests independence of the residuals. Plotting the standardized expected values against the standardized residuals demonstrated homoscedasticity. The P-P plot for the model showed a slight bend for the moderation model, indicating a possible violation of the assumption of normally distributed residuals. Therefore, caution should be taken when interpreting the results, however the curve was small and unlikely to have had a significant impact on the findings. Cook’s Distance values were all less than 1.0, indicating that no multivariate outliers existed in the data that could have placed undue influence on the model.
Group Comparisons

Independent samples t-tests were conducted to compare ruminative tendency and metacognitive beliefs among individuals with and without symptoms of bulimia (see Table 2). There was a significant difference in the scores for all independent variables between participants endorsing bulimic symptoms and the control group, even after adjusting for multiple tests ($p < .001$). These results suggest that individuals who engage in binge eating and/or compensatory strategies such as purging demonstrated higher levels of rumination, as well as greater positive and negative beliefs about rumination.

Regression Analyses

Moderation Model. Results of regression analyses showed that the overall model -- including predictors ruminative tendency, negative beliefs about rumination, and their interaction, and covariates including depression and BMI significantly predicted bulimic symptoms ($F(5, 379) = 17.17$, $p < .001$). However, within the model none of the predictors or their interaction significantly accounted for variance in bulimic symptoms above and beyond that accounted for by the covariates. Without the covariates in the model, rumination and negative metacognitive beliefs were significantly related to bulimic symptoms (see Table 3). However, the interaction term was not significant ($b = .004$, $SE = .004$, $p = .31$), indicating that negative metacognitive beliefs did not significantly moderate the relationship between rumination and bulimic symptoms.

Mediation Models. The results from the two mediation models of rumination tendency, metacognitive beliefs (negative and positive) and bulimic symptoms are shown in Figures 2 and 2. The link between metacognitive beliefs and bulimic symptoms, mediated by rumination tendency, was explored. The indirect effects were tested using a percentile bootstrap estimation
approach with 10000 samples (Shrout & Bolger, 2002), implemented with the PROCESS macro Version 3 (Hayes, 2017).

In the first model, results indicated that, controlling for depression and BMI, positive metacognitive beliefs was a significant predictor of tendency to ruminate ($b = .36, t (385) = 7.88$, $p < .001, 95\% \text{ C.I.} [0.27, 0.45]$). Further, individuals who engaged in more frequent rumination endorsed significantly higher levels of bulimic symptoms ($b = .34, t (385) = 2.28, p = .023, 95\% \text{ C.I.} [0.05, 0.64]$). A bias-corrected bootstrap confidence interval for the indirect effect based on 10,000 bootstrap samples did not include 0 (.007 to .250). The direct effect was no longer significant ($b = .27, t (385) = 1.83, p = .069, 95\% \text{ C.I.} [-0.02, 0.55]$), suggesting a significant indirect effect. Approximately 52.3\% of the variance in bulimic symptoms was accounted for by the predictors ($R^2 = .523$).

In the second model, results indicated that, controlling for depression and BMI, negative metacognitive beliefs was a significant predictor of rumination tendency ($b = .11, t(385) = 7.22$, $p < .001, 95\% \text{ C.I.} [0.08, 0.15]$), but ruminative tendency was not a significant predictor of bulimic symptoms in step 2 ($b = .22, t(385) = 1.50, p = .13, 95\% \text{ C.I.} [-0.12, 0.31]$). These results are not consistent with mediation. Approximately 51\% of the variance in bulimic symptoms was accounted for by the predictors ($R^2 = .51$).

**Discussion**

The goal of the present study was to examine how metacognitive beliefs about rumination and tendency to engage in rumination relate to bulimic symptoms in a non-clinical sample of undergraduate women. Consistent with prior research, all independent variables were found to be significantly correlated to bulimic symptoms. First, a series of independent samples t-tests tested whether participants who endorsed binge eating and/or compensatory behaviors
showed higher levels of rumination and metacognitive beliefs. Results demonstrated significant mean differences in rumination and negative and positive metacognitions between those endorsing bulimic symptoms and controls. This supports prior research that has demonstrated higher levels of rumination and metacognitions in individuals with eating pathology (Konstantellou & Reynolds, 2010; Naumann et al., 2015; Papageorgious & Wells, 2003).

The first regression model showed that negative metacognitions did not significantly moderate the relationship between rumination and bulimic symptoms. This finding was contrary to the hypothesis that rumination would predict bulimic symptoms more strongly in those who endorsed higher levels of negative beliefs about rumination, as believing that rumination is harmful and uncontrollable would exacerbate the negative effects of rumination.

The second and third models tested whether rumination mediated the relationship between metacognitive beliefs (negative and positive) and bulimic symptoms. Rumination did not mediate the relationship between negative beliefs about rumination and bulimic symptoms. However, consistent with predictions, rumination was found to mediate the relationship between positive beliefs about rumination and bulimic symptoms. This suggests that positive metacognitive beliefs may be linked to bulimic symptoms indirectly, through ruminative tendency. However, it is important to note that these data were cross-sectional and therefore temporal or causal relationships cannot be inferred.

**Study 2**

The purpose of the second study was to further examine and understand the relationship between rumination, metacognitions, and bulimic symptoms using a more naturalistic data-collection method than cross-sectional research can provide. Specifically, the study aimed to test
the effects of between-person metacognitive beliefs and within-person daily associations between rumination and bulimic symptoms in undergraduate women.

It was hypothesized that rumination would predict bulimic symptoms. Specifically, it was predicted that higher levels of rumination, negative affect, and negative beliefs about rumination would be associated with greater bulimic symptomology at the day level. Next, it was predicted that the cross-level interaction between within-person (Level 1) tendency to ruminate and between-person (Level 2) negative metacognitive beliefs would be associated with more bulimic symptoms. Finally, I predicted that positive metacognitive beliefs would be both directly related to daily bulimic symptoms and indirectly related, through the mediating role of rumination.

Method

Participants

Participants were undergraduate women (N = 58) who ranged in age from 18 to 22 years (M = 19.24, SD = .98) recruited from undergraduate psychology courses. Interested participants were sent an email containing a link to an online pre-screen questionnaire consisting of a measure of disordered eating and demographic information. Those who reported elevated scores on the EAT-26 or endorsed positive behavioral items on the bulimia subscale were invited to participate in the full study. Individuals who do not endorse disordered eating attitudes or symptoms, did not identify as female, or were not yet 18 years of age, were excluded from the study (N = 31; 34.83%).

The sample was predominately Caucasian (56.9%). An additional 17.2% identified their race/ethnicity as Asian/Pacific Islander, 10.3% identified as black/African American, 6.8% identified as Hispanic/Latina, 5.1% identified as biracial, and 3.4% selected “Other” or chose not to identify their race/ethnicity. A majority of participants (89.7%) identified as heterosexual,
1.7% identified as gay/lesbian, 5.2% identified as bisexual, and 3.4% selected “Other” or chose not to identify their sexual orientation. The mean number of days participants reported exercising each week was 2.82 (SD = 2.11, range 0 – 7). The mean number of alcoholic drinks participants reported consuming each week was 2.10 (SD = 2.77, range 0 - 15). The mean BMI among participants was 24.21 (SD = 4.49, range 17.64 – 41.15).

Seven participants’ data were removed from analyses due to lack of reported bulimic symptoms (i.e., score of 0 for bulimic subscale of the EAT-26) over all 14 days of the daily diary portion of the study. Thus, the remaining 51 participants were included in subsequent analyses.

**Procedures**

Participants who met eligibility criteria in the prescreen measures were invited to participate in the current daily diary study. Respondents who elected to participate attended an in-lab appointment where they were provided more detailed information about the study and gave informed consent, completed an online survey of baseline measures, and were given further instruction about daily diary procedures. The daily diary portion of the study began the day following the in-lab appointment.

Participants received an email every evening containing a link to a survey and instructions. Data were collected through a secure website that was accessible through any device with internet access (e.g., computer, smartphone, tablet). Participants were instructed to complete the daily diary study between the hours of 8:00PM and 2:00AM (as close to bedtime as possible) the same evening, but no later than 9:00am. If participants did not complete two consecutive daily diary surveys, a text reminder was sent. Respondents who completed 10 of the 14 daily
surveys earned full class credit and were entered in a raffle to win additional compensation of up to $50 in gift card money.

Psychology course credit was scaled such that participants received more credit if they completed more of the daily diary surveys. Following participants’ completion of the 2-week daily diary protocol, they received an email containing debriefing information, including contact information if they have any questions or concerns regarding their participation in the study. All procedures were approved by the University Office of Regulatory Research Compliance – Institutional Review Board.

**Measures**

**Baseline Measures.** *Demographic Information.* Each participant responded to single items assessing their age, gender identity, race, year in school, height, weight, sexual orientation, and frequency of tobacco and alcohol use.

*Eating Attitudes Test-26.* The Eating Attitudes Test-26 (EAT-26; Garner, Olmsted, Bohr, & Garfinkel, 1982) is a widely-used, standardized measure of attitudes toward food and eating (e.g., “I feel that food controls my life”). It was developed in the 1970s as a 40-item measure to detect anorexia nervosa. Later study established its utility in screening for bulimia nervosa and other types of disordered eating. It continues to be used as a screening tool and measure of pathological eating attitudes and behavior despite evolving diagnostic criteria.

The EAT-26 contains three subscales: Dieting, Bulimia/Food Preoccupation, and Oral Control. The measure is most often used as a screening tool to identify individuals at risk for eating disorders, including anorexia nervosa and bulimia. Respondents indicate how frequently they engage in each item on a scale ranging from *Never* to *Always*. Per traditional scoring of the EAT-26, a score of “0” is assigned to responses ranging from *Never* to *Sometimes* and responses
of Often, Usually, and Always are assigned 1, 2, and 3, respectively. In our pre-screen, a conservative cut-off of 10 was used to determine presence of disordered eating attitudes/behaviors, although the typical threshold score indicating risk for eating pathology is 20 (Garner et al., 1982). Additionally, if a potential participant endorsed any of the behavioral items related to binge eating or self-induced vomiting, they were deemed eligible to participate. In the current sample pre-screen, Cronbach’s α was .87, indicating good internal consistency.

*Ruminative Response Scale.* At baseline, within the initial in-lab questionnaire, the Ruminative Response Scale (RRS), a subscale of the Response Style Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991) was used to assess participants’ tendency to engage in a ruminative style of thinking. The scale consists of 22 items (e.g., “Think about a recent situation, wishing it had gone better”) rated on a 7-point scale based on how frequently the respondent engages in the behavior ranging from 0 (*None of the time*) to 6 (*All of the time*). The RRS is proposed to have two subscales – brooding and reflection (Treynor, Gonzalez, & Nolen-Hoeksema, 2003) and has been shown to have adequate psychometric properties (Treynor et al., 2003). In the initial baseline questionnaire overall RRS and the brooding subscale showed good internal consistency (Cronbach’s α = .90; brooding subscale α = .85).

*Positive Beliefs about Rumination Scale.* To assess positive metacognitions, the Positive Beliefs about Rumination Scale (PBRS; Papageorgiou & Wells, 2001b) was used. The PBRS is a nine-item scale that assesses beliefs about the benefits of rumination (e.g., “I need to ruminate about the bad things that have happened in the past to make sense of them”). Items on both scales are rated on a 4-point scale ranging from 1 (do not
agree) to 4 (agree very much). The PBRS has good support for its reliability and validity (Cane, Olinger, Gotlib, & Kuiper, 1986). In the current study, Cronbach’s alpha was .93, indicating excellent internal consistency.

**Negative Beliefs about Rumination Scale.** To assess negative metacognitions, the Negative Beliefs about Rumination Scale (NBRS; Papageorgiou & Wells, 2001a) was used. The NBRS is a 13-item questionnaire that evaluates negative metacognitive beliefs about the uncontrollability and harm associated with rumination (e.g., “Ruminating about my problems is uncontrollable”). The scale measures beliefs about the interpersonal and social consequences of rumination (e.g., “Rumination means I’m a bad person”). Respondents rate the extent to which they agree with each item on a scale ranging from 1 (Do not agree) to 4 (Agree very much). Higher scores indicate stronger beliefs about the harmful effects of rumination. The internal consistency in the current sample was excellent (α = .92).

**Depression Anxiety Stress Scales.** The Depression Anxiety Stress Scales (DASS-21; Henry & Crawford, 2003) was used to measure symptoms of psychological distress. The scale consists of 21 items (e.g., “I felt down-hearted and blue”) rated on a four-point scale (0 = Never; 3 = Almost always). There are three subscales – depression, anxiety, and stress, or the 21 items can be used as a composite. The current study primarily used the depression subscale. Psychometric properties have been well established in non-clinical samples (Crawford & Henry, 2003; Ng et al., 2007). Internal consistency estimates were excellent for full scale DASS-21 (α = .92) and subscales depression (α = .88), anxiety (α = .76), and stress (α = .84) in the undergraduate sample. Full scale DASS-21 scores were strongly correlated with average daily diary negative affect scores (r = .71), indicating convergent validity.
Daily Diary Measures. Ruminative Response Scale. To measure daily rumination, the Brooding subscale of the Ruminative Response Scale (RRS; Nolen-Hoeksema & Morrow, 1991; Treynor, Gonzalez, & Nolen-Hoeksema, 2003) was used, which measures melancholic pondering about negative mood, whereas reflection measures tendency to contemplate and reflect about negative mood. This subscale was chosen because it is more strongly associated with psychopathology that the reflection subscale (Treynor et al., 2003). The scale consists of 22 items (e.g., “Think about a recent situation, wishing it had gone better”) rated on a 7-point scale based on how frequently the respondent engages in the behavior, ranging from 0 (None of the time) to 6 (All of the time). The instructions of the measure were revised so that participants responded based on their frequency of rumination during the past 24 hours or since the previous day’s diary (e.g., Genet & Siemer, 2012). Within the daily diaries, Cronbach’s alphas ranged from $\alpha = .89$ (day 1) to $\alpha = .96$ (day 11).

Bulimic Symptoms. The Eating Attitudes Test – 26 (EAT-26; Garner, Olmsted, Bohr, & Garfinkel, 1982) was used to measure daily disordered eating symptoms. In the daily measures, the wording of the instructions for the EAT-26 explicitly focused on the past 24 hours or since completion of the previous night’s survey. In the current study continuous scoring (0 = Never/Not at all to 5 = Always/Throughout the whole day) was used in order to capture adequate daily variation in eating disorder symptoms.

The Bulimia/Food Preoccupation subscale was used in the current study. This subscale measures cognitive and behavioral symptoms associated with bulimia nervosa, such as binge eating, compensatory behaviors, and urges to engage in such behaviors (e.g., “I have the impulse to vomit after meals”). In the current study, the scale showed
good internal consistency. Within the daily diaries, Cronbach’s alphas ranged from 0.73 (day 14) to 0.87 (day 8) for the Bulimia subscale and ranged from 0.92 (day 4) to 0.95 (day 13) for the overall EAT-26. Averages of all daily diary scores were highly correlated with another measure of bulimic symptoms used in the in-lab baseline questionnaire, the BULIT-R, ($r = 0.78, p < 0.001$), indicating good convergent validity.

*Positive and Negative Affect Scales:* The negative affect scale of the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988) was used to measure tendency to experience subjective distress and negative emotions. The time instructions of the scale can be modified to measure different variations of experiences of negative affect (e.g., momentary, daily, weekly, general/trait; Watson, Clark, & Tellegen, 1988). In the current study, participants were instructed to respond based on their negative affect over the past 24 hours. The scale consists of a list of 10 negative emotions (e.g., irritable, anxious), which respondents rate based on the degree to which they have experienced each emotion over the specified timeline on a scale ranging from 1 (*Very slightly/not at all*) to 5 (*Extremely*). There is empirical evidence that the negative affect scale of the PANAS shows good psychometric properties within ecological momentary assessment or daily diary designs, and that variability at the state and trait level has been shown to be approximately equal (Merz & Roesch, 2011). Within daily diaries, Cronbach’s alphas ranged from .88 (day 1) to .95 (day 12). Daily negative affect was highly correlated with trait negative affect measured at baseline with correlation coefficients ranging from $r = .58$ (day 12) to $r = .79$ (day 1).

**Analytic Approach**

The raw data from the online surveys were uploaded and analyzed using the Statistical Packages for Social Sciences (SPSS) for Windows version 21. Due to the two-level, hierarchical
structure of the data, multilevel regression modeling procedures were used. In this study, daily observations (Level 1 data) were nested within participants (Level 2 data). Hierarchical, multilevel regression analyses allow for the data to violate assumptions that underlie other analytic approaches. For example, repeated measures provided by the same individuals over a two-week period are not independent of one another. Multilevel modeling accounts for these dependencies by estimating variance associated with group (i.e., individual) differences in average responses (intercepts) and group differences in associations (slopes) between predictors and the dependent variable. Furthermore, multilevel regression analyses do not require balanced data, meaning they are robust against issues of missing or incomplete data, which are common in repeated measures methods.

Daily (Level 1) predictors, ruminative brooding and negative affect, were centered on each individual’s mean (person-centered, i.e., each participant’s mean, aggregated across all 14 days, was subtracted from each day’s score). This strategy reduces collinearity and provides an assessment of the within-person relationship between level 1 predictors and the dependent variable that are less contaminated by between-person variability. Baseline or Level 2 predictors, negative and positive metacognitive beliefs, were centered around the grand mean for that variable. Rather than using the repeated command in SPSS, random slopes were specified (e.g., Tabachnick & Fidell, 2018).

For the mediation analyses of interest, hierarchical linear regression analyses were used. In the current study, positive metacognitive beliefs was conceptualized as a between-person (Level 2) variable and not measured daily. Therefore, for the mediation
analyses of interest, average scores over the daily diary measures for bulimic symptoms and rumination were used and a standard regression model with mediation was tested using Hayes Process Macros for SPSS 21 (Hayes, 2017). All dependent variables were mean-centered to address multicollinearity.

**Results**

**Descriptive Statistics and Survey Compliance**

A total of 728 diaries were collected. Of these diaries, 720 were completed within the instructed time (8:00 PM – 9:00AM). After the seven participants who did not report any bulimic symptoms throughout the 14 daily diaries were removed from analyses, a total of 632 diaries remained to be analyzed. All individuals completed at least one diary day. The mean number of days completed was 12.42 (89%; SD = 1.70; range 8-14). Approximately 88.3% of participants completed 10 or more daily diary surveys and 31.4% completed all 14. I examined how completion rates were associated with demographic and study variables. Completion rate was not correlated with any of the study variables, including depression, anxiety, disordered eating symptoms, rumination, metacognitive beliefs, and BMI. There were also no significant associations between compliance and demographic variables. Notably, there were differences in completion rate by day, with significantly fewer participants (65%) completing the daily diary survey on day 14 and 100% completing day 3.

Among all participants throughout the 14 days, at least one episode of binge eating was endorsed in approximately 19.5% of daily diaries. At least one episode of self-induced vomiting was endorsed in 5.9% of daily diaries. Laxative abuse was endorsed in 1.4% of daily diaries. Compulsive exercise for the purpose of weight loss was endorsed in 32% of daily diaries. Within participants, the number of episodes of binge eating during the 14 days ranged from 0 to 13. The
frequency of episodes of self-induced vomiting ranged from 0 to 8. The frequencies of laxative use and compulsive exercise ranged from 0 to 2 and 0 to 12, respectively. Means and standard deviations of baseline (and average daily, when applicable) bulimic symptoms, rumination, negative affect, and negative and positive beliefs about rumination are presented in Table 4.

**Analyses – Multilevel Models**

**Assumptions.** There were very few missing data at the item level for days completed. Mean imputation was used to manage missing data at the item level. Distributions for rumination and bulimic symptoms were positively skewed, as expected in a non-clinical sample of undergraduate women, however skewness values for all variables were less than the cutoff value for extreme skewness (>2). Distributions for all other variables were acceptable. The assumptions of linear regression (for the mediation models) were all met. Cook’s distances were observed and none were greater than 1.0, suggesting there were no extreme outliers that would have unduly influenced the models. The Durbin-Watson statistics were close to 2.0, which suggests independence of the residuals. Plotting the standardized expected values against the standardized residuals demonstrated homoscedasticity. The P-P plot for the model suggested normality of the residuals. Results demonstrated no evidence of problematic levels of multicollinearity.

**Multilevel Models.** First, unconditional models were run for each within-person (Level 1) variable, to provide an estimate the grand mean of each variable and partition the total variance of each variable into Level 1 (daily) variance and Level 2 (person-level) variance. In this step, intraclass correlations were also calculated to provide an estimate of the proportion of variance that can be explained by the clustering, or by differences
between subjects. A large intraclass correlation suggests that observations within subjects are not independent and that the multilevel approach is appropriate (Hox, Moerbeek, & Van de Schoot, 2010). The intra-class correlation for bulimic symptoms was 0.71, indicating that 71% of the variability in bulimic symptoms was associated with individual differences (differences among participants). Therefore, multilevel modeling is advisable because the data violate the assumption of independence.

To evaluate the hypotheses, a series of models was tested, and models were compared. For each model, predictors were added separately to examine the changes in the coefficients and model fit. To determine significance of the predictors, effects of each additional predictor on coefficients and goodness of fit statistics were observed. To evaluate model fit, the -2 Log Likelihood were compared for each model. In the hypothesized model, individuals were declared random effects to account for variability among daily diary scores within individuals. Also, predictor variables rumination and negative beliefs were included as random effects, reflecting the hypothesis that individuals would differ in the association between these variables and bulimic symptoms.

The model was tested with three different covariance structures, including unstructured, autoregressive, and diagonal. The diagonal covariance structure proved to best fit the data. For random effects, there was significant variability in bulimic symptoms among daily diary surveys within participants ($p > .001$). There was also significant residual (unexplained) variance over days after taking into account all effects in this hierarchical model ($p < .001$).

Negative beliefs about rumination was initially entered as a random effect, reflecting the hypothesis that there would be individual differences in the relationship between negative
metacognitive beliefs and bulimic symptoms. However, this model failed to converge. Therefore, the full model included negative beliefs about rumination as a fixed effect.

The model including negative affect was significantly better than the intercept-only model $\chi^2 (3, N = 632) = 152.77; p < .001$. Adding rumination to the negative affect-only model also significantly improved model fit, $\chi^2 (1, N = 632) = 26.57; p < .001$. Model 4 included the addition of negative beliefs about rumination to the model, which also significantly improved model fit $\chi^2 (1, N = 632) = 9.48; p < .001$. The inclusion of the interaction between negative metacognitive beliefs and rumination did not improve model fit. Therefore, the final and most parsimonious model was the model that included rumination, negative affect, and negative beliefs about rumination predicting bulimic symptoms. In all models, the residual estimate was also statistically significant, indicating that there is significant unexplained variance. This suggests that there is room to improve the model.

For fixed effects, daily rumination, negative affect, and between-person negative beliefs about rumination significantly predicted bulimic symptoms. The parameter estimates demonstrate that bulimic symptoms were greater when reported rumination levels were higher. For each one-unit increase in daily rumination frequency, self-reported bulimic symptoms increased by about 1.4 on a scale of 0 to 30. Bulimic symptoms were also higher for participants who endorsed greater negative beliefs about rumination at baseline. For every one-unit increase in negative metacognitive beliefs, bulimic symptoms increased by about 0.16. Similarly, each one-unit increase in negative affect predicted a .93 increase in bulimic symptoms.

**Analyses – Regression Analyses**
Assumptions. Regression analysis was used to investigate the hypothesis that tendency to ruminate mediates the effect of positive metacognitive beliefs on bulimic symptoms. The results from the two mediation models including rumination tendency, metacognitive beliefs (negative and positive) and bulimic symptoms are shown in Figures 3 and 4. The indirect effects were tested using a percentile bootstrap estimation approach with 10000 samples (Shrout & Bolger, 2002), implemented with the PROCESS macro Version 3 (Hayes, 2017).

In the first model, simple mediation test results indicated that positive metacognitive beliefs was a significant predictor of ruminative brooding ($b = .43, t(51) = 3.40, p = .005, 95\%$ C.I. [0.17, 0.69]), and that brooding tendency was a significant predictor of bulimic symptoms, ($b = .39, t(51) = 2.62, p = .01, 95\%$ C.I. [0.09, 0.68]). A bias-corrected bootstrap confidence interval for the indirect effect based on 10,000 bootstrap samples did not include 0 (.04 to .45). The direct effect was no longer significant ($b = .15, t (51) = 1.08, p = .28, 95\%$ C.I. [-0.14, 0.45]). These results are consistent with mediation. Approximately 19.7\% of the variance in bulimic symptoms was accounted for by the predictors ($R^2 = .197$).

Finally, to test whether rumination was also a significant mediator of the relationship between negative metacognitive beliefs and bulimic symptoms, a second simple mediation test was performed. Negative metacognitive beliefs was a significant predictor of ruminative brooding ($b = .03, t (51) = 3.24, p = .002, 95\%$ C.I. [0.01, 0.04]) and brooding tendency was a significant predictor of bulimic symptoms, ($b = .33, t (51) = 2.35, p = .02, 95\%$ C.I. [0.05, 0.62]). A bias-corrected bootstrap confidence interval for the indirect effect based on 10,000 bootstrap samples did not include 0 (0.002 to 0.04). The direct effect was still significant ($b = .02, t (51) = 2.04, p = .05, 95\%$ C.I. [0.0003, 0.04]). These results are consistent with partial mediation.
Approximately 25.5% of the variance in bulimic symptoms was accounted for by the predictors ($R^2 = .255$).

**Discussion**

The goal of Study 2 was to further examine and understand the relationship between rumination, metacognitions, and bulimic symptoms using a more naturalistic data-collection method than cross-sectional research can provide. Consistent with hypotheses, multiple regression analyses demonstrated that average level of rumination during the daily diaries significantly mediated the relationship between baseline negative and positive beliefs about rumination and the dependent variable, average daily bulimic symptoms. This suggests that positive metacognitive beliefs may be linked to bulimic symptoms indirectly, through ruminative tendency. However, it is important to note that temporal or causal relationships cannot be inferred with these data.

A daily diary design was also employed to examine how these variables predict daily levels of bulimic symptoms. Several multilevel linear models were tested and compared to determine which variables provided the best fit in prediction of daily, within-person bulimic symptoms. The best fit model included within-person rumination, within-person negative affect, and between-person negative beliefs about rumination predicting bulimic symptoms. Including the interaction between rumination and negative metacognitive beliefs did not significantly improve model fit. This suggests that negative beliefs about rumination was not more strongly predictive of bulimic symptoms on days when individuals engaged in more frequent rumination. However, our model does demonstrate that on days when individuals engaged in more frequent rumination and experienced more negative emotions, they were also more likely to endorse
bulimic symptoms. Additionally, individuals with stronger negative beliefs about the harmful effects of rumination showed greater daily bulimic symptoms.

These results support prior findings that have demonstrated the link between daily rumination and eating pathology (e.g., Kubiak et al., 2008). They extend upon prior research by demonstrating that some of the expected patterns of the metacognitive model were demonstrated in an undergraduate, adult sample with primarily subclinical levels of eating pathology. Additionally, they further suggest that individuals who hold stronger negative beliefs about the harmful impact of rumination may experience greater negative consequences of rumination.

**General Discussion**

The present studies aimed at examining the relationship between rumination, metacognitive variables, and bulimic symptoms in a non-clinical sample of adult women. Study 1 provided further support that individuals who engage in disordered eating tend to endorse more frequent rumination and hold stronger metacognitive beliefs about the benefits and consequences of rumination. Further, findings suggest that positive beliefs about rumination may be linked to bulimic symptoms through the mediating role of rumination. Study 2 also showed that rumination mediated the relationship between baseline metacognitive beliefs (negative and positive) and bulimic symptoms. Contrary to hypotheses, the current study found that negative beliefs about rumination did not significantly moderate the relationship between rumination and disordered eating in both cross-sectional and daily diary samples.

The daily diary study extended upon the first study by including more naturalistic methods to measure rumination and negative affect and examine how within-person and between-person cognitive and metacognitive variables may be involved in bulimic symptoms. The model including daily, within-person rumination, negative affect, and between-person
negative beliefs about rumination was the best fit in prediction of daily levels of bulimic symptoms. This indicated that on days when individuals engaged in more rumination and experienced more negative affect, they were more likely to endorse bulimic symptoms (e.g., binge eating and/or purging). Further, greater negative beliefs about rumination and its consequences was predictive of increased bulimic symptoms.

There is a growing body of literature to support that rumination is a transdiagnostic process that is involved in numerous forms of psychopathology, including eating disorders (e.g., Nolen-Hoeksema & Watkins, 2010). The results from these studies support previous research suggesting that a ruminative response style predicts increases in bulimic symptomatology (Mason & Lewis, 2016; Nolen-Hoeksema et al., 2007). The significant main effects of daily, within-person rumination and negative affect suggests that, consistent with the escape theory (Heatherton & Baumeister, 1990) and emotional cascades theory (Selby, Anestis, & Joiner, 2008), rumination and heightened negative affect may precede impulsive or other problematic behaviors, such as binge eating, which functions to distract or disengage from the distress.

Overall, some of these findings provide support for the S-REF theory (Wells & Matthews, 1996), which contends that positive and negative metacognitive beliefs contribute to an increasingly ruminative, maladaptive response style (the Cognitive-Attentional Syndrome) which eventually can result in psychopathology, including disordered eating. These results also extend upon early findings on the role of rumination and metacognitive beliefs in other types of disordered eating (Konstantellou and Reynolds, 2010; Rawal, Park, & Williams, 2010).

The evidence that positive beliefs about rumination are higher in individuals who endorse bulimic symptoms are consistent with prior studies examining the S-REF theory. Individuals who hold more positive beliefs about the benefits of ruminating may engage
in more frequent rumination and be more prone to the negative effects of engaging in repetitive, negative patterns of thinking. Individuals with disordered eating may have more positive beliefs about how rumination helps them understand their eating difficulties or keeps them focused on eating and weight-related goals.

Similarly, negative beliefs about rumination were also found to be higher in individuals with bulimic symptoms, which aligns with past studies that have found more frequent negative metacognitive beliefs in individuals with eating pathology (Konstantallou & Reynolds, 2010; Woolrich, Cooper, & Turner, 2007). Research has shown that negative metacognitive beliefs can exacerbate the negative effects of rumination on mood and increase the perceived uncontrollability of rumination (Matsumoto & Mochizuki, 2018). Although the current study did not find support for the interaction of negative beliefs and rumination, it is plausible that individuals who engage in disordered eating behaviors, such as binge eating or purging, may perceive that they have less control over their thoughts because of their difficulty regulating their eating. Further, experiencing thoughts as uncontrollable or perceiving social rejection due to one’s rumination may cause additional distress that prompts escape behaviors, such as binge eating.

These findings have important clinical implications as they suggest that individuals engaging in problematic eating patterns such as binge eating and purging may benefit from assessment of their ruminative response style and any relevant beliefs they may hold about their cognitive processes. Interventions that help to decrease rumination, such as attention training (Smith & Rieger, 2009; Tchanturia, 2014) and mindfulness may have an important place in treatment of disordered eating. Indeed, building mindfulness skills appears to be effective in reducing binge eating and other symptoms of eating pathology (Cowdrey & Park, 2012;
Godfrey, Gallo, & Afari, 2014). The original response style theory (Nolen-Hoeksema, 1991) suggests that positive distractions (e.g., reading, taking a walk) are more adaptive methods of responding to negative mood that may help to prevent the downward mood cycle.

Further, the findings provide evidence to support the use of interventions from Metacognitive Therapy (Wells, 2008) in the treatment of disordered eating. The aims of metacognitive therapy are to reduce unhelpful, repetitive negative thought processes and the subsequent unhelpful coping and self-regulatory behaviors that accompany various mental health conditions. Specific strategies used in MCT are attention training, detached mindfulness, and behavioral experiments that test the validity of specific maladaptive metacognitions. A manual of metacognitive therapy for treatment of binge eating disorder and bulimia nervosa has been published (Cooper, Todd, & Wells, 2008), however to date there are no known studies examining the effects of this therapy in eating disorder populations.

Limitations

Results of these studies must be considered within the context of several limitations. First, all data were taken from self-report measurements, which can be susceptible to errors from social desirability, self-report biases, context effects, and poor recall – although the daily diary methods employed may have counteracted recall biases.

Another limitation of the current research was the sample. Although one strength of the study was its ethnic diversity, both studies used samples of undergraduate women who identified primarily as heterosexual. Therefore, these results cannot easily be generalized to the general population and may not be applicable to a clinical population. Further, the current sample had a
very low base rate of disordered eating symptoms, despite screening for baseline disordered eating attitudes and symptoms. This can be remediated in future research by using clinical samples to achieve greater power to detect effects.

The dependent variables in the current study were self-reported measures of eating attitudes, rather than strictly behavioral symptoms. Although this may be interpreted as a limitation, these attitudes may be viewed as a precursor of maladaptive eating behavior (Thompson & Stice, 2001) and disordered eating attitudes are often important indicators of severity as well as treatment targets (Exterkate, Vriesendorp, & de Jong, 2009; Fairburn et al., 1993).

Further, although the daily diary study improved upon cross-sectional methods by increasing ecological validity, it is not possible to determine temporal relationships between Level 1 daily diary variables. Although theoretical accounts of rumination, negative affect, and disordered eating have positioned negative affect and rumination as causal predictors of bulimic symptoms, it is also plausible that individuals ruminate more frequently and experience greater negative affect in response to engaging in bulimic symptoms. It seems likely that these variables are reciprocal, rather than unidirectional. Future research may address this limitation by using more frequent experiential sampling to reveal the temporal order of variables such as negative affect, rumination frequency, and bulimic symptoms.

Additionally, there was a slight deterioration in daily diary compliance over days, with a lower completion rate in the final days of the study. This was likely due to the requirement that participants complete only 10 daily diary surveys in order to receive full compensation. However, overall the study yielded adequate compliance rates and multilevel modeling is robust against missing data.
Future Directions

Numerous researchers have addressed the measurement difficulties involved in the study of rumination and other forms of repetitive negative thinking. The current study used a general measure of rumination in response to negative mood, however other measures of rumination may be more highly related to disordered eating. Content-specific forms of rumination may emerge as important etiological or maintaining factors for specific mental health conditions. For example, Cowdrey and Park (2011) developed a measure of disordered eating specific rumination. It is likely that eating disorder-specific rumination may be a more potent predictor of bulimic symptoms than general ruminative response style. Further, different metacognitions may be related to content-specific forms of rumination.

Although prior research distinguished rumination from worry, with rumination considered past-focused compared to the future focus of worry (Ehring & Watkins, 2008). McEvoy, Mahoney, and Moulds (2010) conceptualized worry, rumination, and post-event processing as part of the same phenomenon, called repetitive negative thinking. Repetitive negative thinking theories help explain the overlap between worry, rumination, and post-event processing and the link between rumination and such a wide variety of negative outcomes (Papageorgiou & Wells, 1999; Watkins et al., 2005).

Additionally, the present study focused on negative and positive beliefs about rumination, however there are many other forms of potentially problematic metacognitive beliefs that relate to disordered eating. For example, beliefs about the need to control thoughts has been linked to anorexia nervosa and eating and weight-related concerns (Konstantellou & Reynolds, 2010). Future research should examine how other
metacognitive variables, such as cognitive confidence and beliefs about other forms of repetitive negative thinking, may be related to bulimic symptoms (Olstad, Solem, Hjemdal, & Hagen, 2015).

Prior research has demonstrated that girls and women more frequently adopt a ruminative response style (Johnson & Whisman, 2013) and are more prone to eating disorders (Striegel-Moore et al., 2009), however men are not immune to rumination or its negative effects. Future research may examine how rumination and metacognitive beliefs may affect eating behavior in men. Finally, although experiential sampling methods were a strength of the present study, longitudinal studies may further facilitate our understanding of how these processes develop over time.

Conclusion

In summary, these results suggest an important role of rumination and metacognitive beliefs about rumination as dysfunctional cognitive processes involved in bulimic symptoms. Both studies suggest that holding positive beliefs about rumination is indirectly associated with bulimic symptoms through the mediating role of rumination, even after controlling for depression and BMI. These findings warrant further investigation, where the use of clinical samples, larger samples, or more long-term, longitudinal methods could further elucidate the cognitive and metacognitive processes that contribute to bulimic symptoms in daily life.
Table 1

*Bivariate Correlations among Independent Variables and Bulimic Symptoms (Study 1)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Rumination</td>
<td>1</td>
<td>.53**</td>
<td>.60**</td>
<td>.32**</td>
<td>.67**</td>
<td>.07</td>
</tr>
<tr>
<td>2. Positive beliefs</td>
<td></td>
<td>1</td>
<td>.36**</td>
<td>.26**</td>
<td>.41**</td>
<td>.14**</td>
</tr>
<tr>
<td>3. Negative beliefs</td>
<td></td>
<td></td>
<td>1</td>
<td>.37**</td>
<td>.59**</td>
<td>-.02</td>
</tr>
<tr>
<td>4. Bulimic symptoms</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>.35**</td>
<td>.14**</td>
</tr>
<tr>
<td>5. Depression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>.04</td>
</tr>
<tr>
<td>6. BMI</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>1</td>
</tr>
</tbody>
</table>

*Note. N = 386*

**p < .01
Table 2

*Independent Samples t-test Comparing Rumination and Metacognitive Variables (Study 1)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Bulimic symptoms</th>
<th>$N$</th>
<th>$M$</th>
<th>$SD$</th>
<th>$t$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rumination</td>
<td>Y</td>
<td>182</td>
<td>30.81</td>
<td>7.92</td>
<td>5.55</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>204</td>
<td>26.22</td>
<td>8.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive Beliefs</td>
<td>Y</td>
<td>182</td>
<td>20.59</td>
<td>7.24</td>
<td>4.77</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>204</td>
<td>17.21</td>
<td>6.69</td>
<td></td>
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<tr>
<td>Negative Beliefs</td>
<td>Y</td>
<td>182</td>
<td>33.52</td>
<td>10.16</td>
<td>7.29</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>204</td>
<td>25.77</td>
<td>10.65</td>
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</table>
Table 3

Regression Results Predicting Bulimic Symptoms (Study 1)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>$b$</th>
<th>95% CI [LL, UL]</th>
<th>beta</th>
<th>$R^2$</th>
<th>$\Delta R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>31.85</td>
<td>[23.0, 40.7]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>8.06**</td>
<td>[5.8, 10.3]</td>
<td>.34</td>
<td>.34</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>.45**</td>
<td>[0.11, 0.79]</td>
<td>.13</td>
<td>.13**</td>
<td>.13**</td>
</tr>
<tr>
<td>(Intercept)</td>
<td>35.05</td>
<td>[26.1, 44.0]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>3.70*</td>
<td>[0.61, 6.8]</td>
<td>.16</td>
<td>.16</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>.48**</td>
<td>[0.15, 0.81]</td>
<td>.13</td>
<td></td>
<td>.13**</td>
</tr>
<tr>
<td>Negative beliefs</td>
<td>.18**</td>
<td>[0.10, 0.26]</td>
<td>.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rumination</td>
<td>.14</td>
<td>[-0.15, 0.42]</td>
<td>.07</td>
<td>.17**</td>
<td>.04</td>
</tr>
<tr>
<td>(Intercept)</td>
<td>34.86</td>
<td>[25.9, 43.8]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression</td>
<td>3.55*</td>
<td>[0.44, 6.6]</td>
<td>.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>.47**</td>
<td>[0.14, 0.80]</td>
<td>.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative beliefs</td>
<td>.18**</td>
<td>[0.09, 0.27]</td>
<td>.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rumination</td>
<td>.15</td>
<td>[-0.13, 0.44]</td>
<td>.07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rumin * Neg Beliefs</td>
<td>.004</td>
<td>[-0.004, .05]</td>
<td>.17**</td>
<td></td>
<td>0.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.012</td>
</tr>
</tbody>
</table>

Note. $b$ represents the unstandardized regression weights. $\text{beta}$ indicates the standardized regression weights. LL and UL indicate the lower and upper limits of a confidence interval, respectively. * $p < .05$. ** $p < .001$. 

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Table 4

*Means and Standard Deviations for Independent Variables and Bulimic Symptoms (Study 2)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>M (Level 1 M)</th>
<th>SD (Level 1 SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulimic Symptoms</td>
<td>51 (632)</td>
<td>6.44 (5.93)</td>
<td>4.76 (5.33)</td>
</tr>
<tr>
<td>Negative Affect</td>
<td>51 (632)</td>
<td>24.95 (20.93)</td>
<td>7.20 (9.83)</td>
</tr>
<tr>
<td>Brooding</td>
<td>51 (632)</td>
<td>9.35 (12.40)</td>
<td>5.26 (4.97)</td>
</tr>
<tr>
<td>Positive Beliefs</td>
<td>51</td>
<td>20.97</td>
<td>6.85</td>
</tr>
<tr>
<td>Negative Beliefs</td>
<td>51</td>
<td>34.41</td>
<td>11.64</td>
</tr>
<tr>
<td>BMI</td>
<td>51</td>
<td>23.96</td>
<td>4.04</td>
</tr>
</tbody>
</table>
Table 5

Bivariate Correlations Among Independent Variables and Bulimic Symptoms (Study 2)

<table>
<thead>
<tr>
<th>Variable</th>
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<tbody>
<tr>
<td>1. Rumination (baseline)</td>
<td>1</td>
<td>.61**</td>
<td>.53**</td>
<td>.47*</td>
<td>.61**</td>
<td>-.03</td>
<td>.67**</td>
<td>.52**</td>
<td>.39**</td>
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<td>2. Positive beliefs (baseline)</td>
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<td>.50**</td>
<td>.30*</td>
<td>.30*</td>
<td>.13</td>
<td>.44**</td>
<td>.30*</td>
<td>.32*</td>
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<td>3. Negative beliefs (baseline)</td>
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<td>--</td>
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<td>.37**</td>
<td>-.11</td>
<td>.42**</td>
<td>.34*</td>
<td>.42**</td>
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<td>4. Bulimic symptoms (baseline)</td>
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<td>--</td>
<td>1</td>
<td>.32*</td>
<td>-.02</td>
<td>.35*</td>
<td>.27</td>
<td>78**</td>
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<td>5. Negative affect (baseline)</td>
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<td>--</td>
<td>--</td>
<td>--</td>
<td>1</td>
<td>.04</td>
<td>.69**</td>
<td>.78**</td>
<td>.36**</td>
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<td>6. BMI</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>1</td>
<td>-.15</td>
<td>.02</td>
<td>-.22</td>
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<td>7. Rumination (daily)</td>
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<td>--</td>
<td>--</td>
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<td>1</td>
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<td>.44**</td>
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<td>8. Negative affect (daily)</td>
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<td>--</td>
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Note. N = 51

**p < .001, *p < .05
Table 6

*Final Multilevel Model of Bulimic Symptoms (Study 2)*

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<thead>
<tr>
<th>Fixed Effects</th>
<th>Est (SE)</th>
<th>t</th>
<th>95% CI</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>LL</td>
<td>UL</td>
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<td>Intercept</td>
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<td>9.71***</td>
<td>.79</td>
<td>1.20</td>
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<td>Day</td>
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<td>.16</td>
<td>-.01</td>
<td>.01</td>
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<td>Daily negative affect</td>
<td>.23 (.07)</td>
<td>3.26**</td>
<td>.09</td>
<td>.38</td>
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<tr>
<td>Daily rumination</td>
<td>.15 (.07)</td>
<td>2.15*</td>
<td>.01</td>
<td>.30</td>
</tr>
<tr>
<td>Negative beliefs</td>
<td>.03 (.01)</td>
<td>3.23**</td>
<td>.01</td>
<td>.04</td>
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</table>

*Note.* *p* < .05, **p* < .005, ***p* < .001
Table 7

Comparison of Multilevel Models Predicting Daily Bulimic Symptoms (Study 2)

<table>
<thead>
<tr>
<th>Model</th>
<th>-2 Log Likelihood</th>
<th>df</th>
<th>$\chi^2$ Difference Test</th>
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<tr>
<td>Intercepts Only (Model 1)</td>
<td>3278.81</td>
<td>3</td>
<td></td>
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<tr>
<td>Model 2</td>
<td>3126.04</td>
<td>6</td>
<td>M1 – M2 = 152.77*</td>
</tr>
<tr>
<td>Model 3</td>
<td>3099.47</td>
<td>7</td>
<td>M1 – M3 = 179.34* / M2 – M3 = 26.57*</td>
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<tr>
<td>Full (Model 5)</td>
<td>3089.95</td>
<td>9</td>
<td>M1 – M5 = 188.86* / M4 – M5 = 0.04</td>
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<tr>
<td>Final (Model 4)</td>
<td>3089.99</td>
<td>8</td>
<td>M1 – M4 = 188.90* / M3 – M4 = 9.48*</td>
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</table>

Note. * $p < .05$

Model 2: Day, Negative Affect
Model 3: Day, Negative Affect, Rumination
Model 4: Day, Negative Affect, Rumination, Negative Beliefs
Model 5: Day, Negative Affect, Rumination, Negative Beliefs, Cross-Level Interaction
Figure 1.

Mediation model demonstrating that rumination mediates the effect of positive metacognitive beliefs on bulimic symptoms. The numbered paths reflect unstandardized regression coefficients (b). Indirect effect: b = .13, SE = 0.06, 95% C.I. [0.01, 0.25].

*p < 0.05. **p < 0.05.
Figure 2.

Mediation model demonstrating that rumination does not mediate the effect of negative metacognitive beliefs on bulimic symptoms. The numbered paths reflect unstandardized regression coefficients ($b$). Indirect effect: $b = .02$, SE = 0.2, 95% C.I. [-0.01, 0.06].

*p < 0.05. **p < 0.05.
Figure 3.

Mediation model demonstrating that rumination mediates the effect of positive metacognitive beliefs on bulimic symptoms. The numbered paths reflect unstandardized regression coefficients ($b$). Indirect effect: $b = .17$, SE = .09, 95% C.I. [0.04, 0.39].

*p < 0.05. **p < 0.05.
Figure 4.
Mediation model demonstrating that rumination partially mediates the effect of negative metacognitive beliefs on bulimic symptoms. The numbered paths reflect unstandardized regression coefficients ($b$). Indirect effect: $b = 0.01$, SE = 0.005, 95% C.I. [0.002, 0.02].

*p < 0.05. **p < 0.05.
References


Appendix A

**Ruminative Response Scale**

**Instructions.** People think and do many different things when they feel depressed. Please read each of the items below and indicate whether you almost never, sometimes, often, or almost always think or do each one when you feel down, sad, or depressed. Please indicate what you generally do, not what you think you should do from 1 (almost never) to 4 (almost always).

(1) Almost never - - - - - - - - (4) Almost always

1. Think about how alone you feel.
2. Think "I won't be able to do my job if I don't snap out of this."
3. Think about your feelings of fatigue and achiness.
4. Think about how hard it is to concentrate.
5. Think "What am I doing to deserve this?"
6. Think about how passive and unmotivated you feel.
7. Analyze recent events to try to understand why you are depressed.
8. Think about how you don't seem to feel anything anymore.
9. Think "Why can't I get going?"
10. Think "Why do I always react this way?"
11. Go away by yourself and think about why you feel this way.
12. Write down what you are thinking about and analyze it.
13. Think about a recent situation, wishing it had gone better.
14. Think "I won't be able to concentrate if I keep feeling this way."
15. Think "Why do I have problems other people don't have?"
16. Think "Why can't I handle things better?"
17. Think about how sad you feel.
18. Think about all your shortcomings, failings, faults, mistakes.
19. Think about how you don't feel up to doing anything.

20. Analyze your personality to try to understand why you are depressed.

21. Go someplace alone to think about your feelings.

22. Think about how angry you are with yourself.
Appendix B

**Positive and Negative Affect Scale**

**Instructions.** This scale consists of a number of words that describe different feelings and emotions. Read each item and then select the appropriate answer (number) in the space next to that word. Indicate to what extent you have felt this way over the past two weeks.

(1) Very slightly or not at all - - - - - - - (5) Extremely

1. Interested
2. Distressed
3. Excited
4. Upset
5. Strong
6. Guilty
7. Scared
8. Hostile
9. Enthusiastic
10. Proud
11. Irritable
12. Alert
13. Ashamed
14. Inspired
15. Nervous
16. Determined
17. Attentive
18. Jittery
19. Active

20. Afraid
Appendix C

**Depression Anxiety Stress Scale – 21**

**Instructions.** Please read each statement and circle a number 0, 1, 2, or 3 which indicates how much the statement applied to you over the **past 12 months.** There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

(0) Did not Apply to me at all  
(1) Applied to me to some degree, or some of the time  
(2) Applied to me to a considerable degree, or a good part of the time  
(3) Applied to me very much, or most of the time

1. I found it hard to wind down.
2. I was aware of dryness of my mouth.
3. I couldn’t seem to experience any positive feeling at all.
4. I experienced breathing difficulty (e.g., excessively rapid breathing, breathlessness in the absence of physical exertion).
5. I found it difficult to work up the initiative to do things.
6. I tended to over-react to situations
7. I experienced trembling (e.g., in the hands).
8. felt that I was using a lot of nervous energy.
9. I was worried about situations in which I might panic and make a fool of myself.
10. I felt that I had nothing to look forward to.
11. I found myself getting agitated
12. I found it difficult to relax.
13. I felt down-hearted and blue
14. I was intolerant of anything that kept me from getting on with what I was doing.
15. I felt I was close to panic.
16. I was unable to become enthusiastic about anything.
17. I felt I wasn’t worth much as a person.

18. I felt that I was rather touchy.

19. I was aware of the action of my heart in the absence of physical exertion (e.g., sense of a heart rate increase, heart missing a beat).

20. I felt scared without any good reason.

21. I felt that life was meaningless
Appendix D

**Eating Disorders Examination – Questionnaire**

Questions 1 to 12: Please mark the appropriate number on the right. Remember that the questions only refer to the past four weeks (28 days) only.

No days   1-5 days   6-12 days   13-15 days   16-22 days   23-27 days   Every day

1) Have you been deliberately trying to limit the amount of food you eat to influence your shape or weight (whether or not you have succeeded)?

2) Have you gone for long periods of time (8 waking hours or more) without eating anything at all in order to influence your shape or weight?

3) Have you tried to exclude from your diet any foods that you like in order to influence your shape or weight (whether or not you have succeeded)?

4) Have you tried to follow definite rules regarding your eating (for example, a calorie limit) in order to influence your shape or weight (whether or not you have succeeded)?

5) Have you had a definite desire to have an empty stomach with the aim of influencing your shape or weight?

6) Have you had a definite desire to have a totally flat stomach?

7) Has thinking about food, eating, or calories made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, reading)?

8) Has thinking about shape or weight made it very difficult to concentrate on things you are interested in (for example, working, following a conversation, reading)?

9) Have you had a definite fear of losing control over eating?

10) Have you had a definite fear that you might gain weight?

11) Have you felt fat?

12) Have you had a strong desire to lose weight?

13) Over the past 28 days, how many times have you eaten what other people would regard as an unusually large amount of food (given the circumstances)?

14) On how many of those times did you have a sense of having lost control over your eating (at the time that you were eating)?
15) Over the past 28 days, on how many **DAYS** have such episodes of overeating occurred (i.e., you have eaten an unusually large amount of food and have had a sense of loss of control at the time)?

16) Over the past 28 days, how many times have you made yourself sick (vomit) as a means of controlling your shape or weight?

17) Over the past 28 days, how many times have you taken laxatives as a means of controlling your weight or shape?

18) Over the past 28 days, how many times have you exercised in a "driven" or "compulsive" way as a means of controlling your weight, shape, or amount of fat, or to burn off calories?

19) Over the past 28 days, on how many days have you eaten in secret (i.e., furtively)? .....Do not count episodes of binge eating.

   - No days
   - 1-5 days
   - 6-12 days
   - 13-15 days
   - 16-22 days
   - 23-27 days
   - Every day

20) On what proportion of the times that you have eaten have you felt guilty (felt that you've done wrong) because of its effect on your shape and weight? .....Do not count episodes of binge eating.

   - None of the times
   - A few of the times
   - Less than half
   - Half of the times
   - More than half
   - Most of the time
   - Every time

21) Over the past 28 days, how concerned have you been about other people seeing you eat? .....Do not count episodes of binge eating.

   - Not at all
   - -
   - -
   - Moderately
   - -
   - -
   - Markedly

Questions 22 to 28: Please select the appropriate bubble on the right. Remember that the questions only refer to the past four weeks (28 days).

   - Not at all
   - -
   - -
   - Moderately
   - -
   - -
   - Markedly

22) Has your weight influenced how you think about (judge) yourself as a person?

23) Has your shape influenced how you think about (judge) yourself as a person?

24) How much would it have upset you if you had been asked to weight yourself once a week (no more, or less, often) for the next four weeks?
25) How dissatisfied have you been with your weight?

26) How dissatisfied have you been with your shape?

27) How uncomfortable have you felt seeing your body (for example, seeing your shape in the mirror, in a shop window reflection, while undressing or taking a bath or shower)?

28) How uncomfortable have you felt about others seeing your shape or figure (for example, in communal changing rooms, when swimming, or wearing tight clothes)?
Appendix E

Positive Beliefs about Rumination Scale

Instructions: Most people experience depressive thoughts at times. When depressive thinking is prolonged and repetitive, it is called rumination. This questionnaire is concerned with the beliefs that people have about rumination. Listed below are a number of these beliefs. Please read each belief carefully and indicate how much you generally agree with each one. Please circle the number that best describes your answer. Please respond to all of the items.

(1) Do not agree - - - - - - - (4) Agree very much

1. I need to ruminate about my problems to find the answers to my depression.

2. Ruminating about my depression helps me to understand past mistakes and failures.

3. I need to ruminate about my problems to find the causes of my depression.

4. Ruminating about my feelings helps me to recognize the triggers for my depression.

5. I need to ruminate about the bad things that have happened in the past to make sense of them.

6. In order to understand my feelings of depression I need to ruminate about my problems.

7. Ruminating about the past helps me to prevent future mistakes and failures.

8. Ruminating about the past helps me work out how things could have been done better.

9. Ruminating about my problems helps me to focus on the most important things.
Appendix F

**Bulimia Test – Revised**

1) I am satisfied with my eating patterns.
   - Disagree strongly
   - Disagree
   - Disagree a little
   - Neutral
   - Agree

2) Would you presently call yourself a "binge eater"?
   - No, probably not
   - Yes, possibly
   - Yes, probably
   - Yes
   - Yes, absolutely

3) Do you feel you have control over the amount of food you consume?
   - Most or all of the time
   - A lot of the time
   - Occasionally
   - Rarely
   - Never

4) I am satisfied with the shape and size of my body
   - Frequently or always
   - Sometimes
   - Occasionally
   - Rarely
   - Seldom or never

5) When I feel that my eating behavior is out of control, I try to take rather extreme measures to get back on course (strict dieting, fasting, laxatives, diuretics, self-induced vomiting, or vigorous exercise).
   - Always
   - Almost always
   - Frequently
   - Sometimes
   - Never or my eating behavior is never out of control

6) I use laxatives or suppositories to help control my weight.
   - Once a day or more
   - 3-6 times a week
   - Once or twice a week
   - 2-3 times a month
Once a month or less (or never)

7) I am obsessed about the size and shape of my body.
   Always
   Almost always
   Frequently
   Sometimes
   Seldom or never

8) There are times when I rapidly eat a very large amount of food.
   More than twice a week
   Twice a week
   Once a week
   2-3 times a month
   Once a month or less (or never)

9) How long have you been binge eating (eating uncontrollably to the point of stuffing yourself)?
   Not applicable; I don't binge eat
   Less than 3 months
   3 months - 1 year
   1-3 years
   3 or more years

10) Most people I know would be amazed if they knew how much food I can consume at one sitting.
    Without a doubt
    Very probably
    Probably
    Possibly
    No

11) I exercise in order to burn calories:
    More than 2 hours per day
    About 2 hours per day
    More than 1 but less than 2 hours per day
    One hour or less per day
    I exercise but not to burn calories OR I don't exercise

12) Compared with women your age, how preoccupied are you about your weight and body shape?
    A great deal more than average
    Much more than average
    More than average
    A little more than average
    Average OR less than average
13) I am afraid to eat anything for fear that I won’t be able to stop
   Always
   Almost always
   Frequently
   Sometimes
   Seldom or never

14) I feel tormented by the idea that I am fat or might gain weight.
   Always
   Almost always
   Frequently
   Sometimes
   Seldom or never

15) How often do you intentionally vomit after eating?
   2 or more times a week
   Once a week
   2-3 times a month
   Once a month
   Less than once a month or never

16) I eat a lot of food when I’m not even hungry.
   Very frequently
   Frequently
   Occasionally
   Sometimes
   Seldom or never

17) My eating patterns are different from the eating patterns of most people
   Always
   Almost always
   Frequently
   Sometimes
   Seldom or never

18) After I binge eat I turn to one of several strict methods to try to keep from gaining weight
   (vigorous exercise, strict dieting, fasting, self-induce vomiting, laxatives, or diuretics).
   Never or I don’t binge eat
   Rarely
   Occasionally
   A lot of the time
   Most or all of the time

19) I have tried to lose weight by fasting or going on strict diets
   Not in the past year
   Once in the past year
2-3 times in the past year
4-5 times in the past year
More than 5 times in the past year

20) I exercise vigorously and for long periods of time in order to burn calories
   Average or less than average
   A little more than average
   More than average
   Much more than average
   A great deal more than average

21) When engaged in an eating binge, I tend to eat foods that are high in carbohydrates (sweets and starches).
   Always
   Almost always
   Frequently
   Sometimes
   Seldom, or I don't binge eat

22) Compared to most people, my ability to control my eating behavior seems to be:
   Greater than others' ability
   About the same
   Less
   Much less
   I have absolutely no control

23) I would presently label myself a “compulsive eater” (one who engages in episodes of uncontrolled eating).
   Absolutely
   Yes
   Yes, probably
   Yes, possibly
   No, probably not

24) I hate the way my body looks after I eat too much
   Always
   Almost always
   Frequently
   Sometimes
   Seldom or never

25) When I am trying to keep from gaining weight, I feel that I have to resort to vigorous exercise, strict dieting, fasting, self-induced vomiting, laxatives, or diuretics.
Most or all of the time
A lot of the time
Occasionally
Rarely
Never

26) Do you believe that it is easier for you to vomit than it is for most people?
   Yes, it's no problem at all for me
   Yes, it's easier
   Yes, it's a little easier
   About the same
   No, it's less easy

27) I use diuretics (water pills) to help control my weight.
   Very frequently
   Frequently
   Sometimes
   Seldom
   Never

28) I feel that food controls my life.
   Always
   Almost always
   Frequently
   Sometimes
   Seldom or never

29) I try to control my weight by eating little or no food for a day or longer.
   Very frequently
   Frequently
   Sometimes
   Seldom
   Never

30) When consuming a large quantity of food, at what of speed do you usually eat?
   More rapidly than most people have ever eating in their lives
   A lot more rapidly than most people
   A little more rapidly than most people
   About the same rate as most people
   More slowly than most people (or not applicable)

31) I use laxatives or suppositories to help control my weight.
   Very frequently
   Frequently
   Sometimes
   Seldom
32) Right after I binge eat I feel:
   - So fat and bloated I can't stand it
   - Extremely fat
   - Fat
   - A little fat
   - OK about how my body looks or I never binge eat

33) Compared to other people of my sex, my ability to always feel in control of how much I eat is:
   - About the same or greater
   - A little less
   - Less
   - Much less
   - A great deal less

34) In the last 3 months, on the average how often did you binge eat (eat uncontrollably to the point of stuffing yourself)?
   - Once a month or less (or never)
   - 2-3 times a month
   - Once a week
   - Twice a week
   - More than twice a week

35) Most people I know would be surprised about how fat I look after I eat a lot of food.
   - Yes, definitely
   - Yes
   - Yes, probably
   - Yes, possibly
   - No, probably not or I never eat a lot of food

36) I use diuretics (water pills) to help control my weight.
   - 3 times a week or more
   - Once or twice a week
   - 2-3 times a month
   - Once a month
   - Never
Appendix G

Negative Beliefs about Ruminations Scale
Most people experience depressive thoughts at times. When depressive thinking is prolonged and repetitive it is called rumination. This questionnaire is concerned about the beliefs that people have about rumination. Listed below are a number of these beliefs. Please read each belief carefully and indicate how much you generally agree with each one. Please circle the number that best describes your answer. Please respond to all of the items.

(1) Do not agree - - - - - - - - (4) Agree very much

1. Ruminating makes me physically ill
2. When I ruminate I can't do anything else
3. Ruminating means I'm out of control
4. Everyone would desert me if they knew how much I ruminate about myself
5. People will reject me if I ruminate
6. Ruminating about my problems is uncontrollable
7. Ruminating about my depression could make me kill myself
8. Ruminating will turn me into a failure
9. I cannot stop myself from ruminating
10. Ruminating means I'm a bad person
11. It is impossible not to ruminate about the bad things that have happened in the past
12. Only weak people ruminate
13. Ruminating can make me harm myself
**Demographics**

How would you classify your race/ethnicity? (Please select all that apply)
- Caucasian / White
- Asian
- Pacific Islander
- African American / Black
- Hispanic
- Native American
- Latin@
- Arab
- Multiracial / Multiethnic
- Other/Do not wish to respond

What is your age?

With which gender do you identify?
- Male
- Female
- Other (please specify)
- Do not wish to respond

How would you describe your sexual orientation?
- Straight/Heterosexual
- Bisexual
- Gay/Homosexual
- Other (please specify)
- Do not wish to respond

What is your year in school?
- Freshman
- Sophomore
- Junior
- Senior
- Fifth year senior
- Graduate student
- Other
Appendix H

**Eating Attitudes Test – 26**

**Instructions:** Answer the following questions based on how frequently you engage in this attitude or behavior

1) I am terrified of being overweight.  
   - Never  - Rarely  - Sometimes  - Often  - Usually  - Always

2) I avoid eating when I am hungry.  
   - Never  - Rarely  - Sometimes  - Often  - Usually  - Always

3) I find myself preoccupied with food.  
   - Never  - Rarely  - Sometimes  - Often  - Usually  - Always

4) I have gone on eating binges where I feel like I may not be able to stop.  
   - Never  - Rarely  - Sometimes  - Often  - Usually  - Always

5) I cut my food into small pieces.  
   - Never  - Rarely  - Sometimes  - Often  - Usually  - Always

6) I am aware of the calorie content of the foods I eat.  
   - Never  - Rarely  - Sometimes  - Often  - Usually  - Always

7) I particularly avoid food with a high carbohydrate content (i.e. bread, rice, potatoes, etc.)  
   - Never  - Rarely  - Sometimes  - Often  - Usually  - Always

8) I feel that others would prefer if I ate more.  
   - Never  - Rarely  - Sometimes  - Often  - Usually  - Always

9) I vomit after I have eaten.  
   - Never  - Rarely  - Sometimes  - Often  - Usually  - Always

10) I feel extremely guilty after eating.  
    - Never  - Rarely  - Sometimes  - Often  - Usually  - Always

11) I am occupied with a desire to be thinner.  
    - Never  - Rarely  - Sometimes  - Often  - Usually  - Always

12) I think about burning up calories when I  
    - Never  - Rarely  - Sometimes  - Often  - Usually  - Always
exercise.

13) Other people think that I am too thin
14) I am preoccupied with the thought of having fat on my body.
15) I take longer than others to eat my meals.
16) I avoid foods with sugar in them.
17) I eat diet foods.
18) I feel that food controls my life.
19) I display self-control around food.
20) I feel that others pressure me to eat.
21) I give too much time and thought to food.
22) I feel uncomfortable after eating sweets.
23) I engage in dieting behavior.
24) I like my stomach to be empty.
25) I have the impulse to vomit after meals.
26) I enjoy trying new rich foods.
Appendix I

Daily Diary Survey

1. To continue your participation in the study, please enter your four letter code below:

2. Answer the following questions based on how much these happened to you OVER THE PAST 24 HOURS:

1) I am terrified of being overweight.  
   Never - Rarely - Sometimes - Often - Usually - Always

2) I avoid eating when I am hungry.  
   Never - Rarely - Sometimes - Often - Usually - Always

3) I find myself preoccupied with food.  
   Never - Rarely - Sometimes - Often - Usually - Always

4) I have gone on eating binges where I feel like I may not be able to stop.  
   Never - Rarely - Sometimes - Often - Usually - Always

5) I cut my food into small pieces.  
   Never - Rarely - Sometimes - Often - Usually - Always

6) I am aware of the calorie content of the foods I eat.  
   Never - Rarely - Sometimes - Often - Usually - Always

7) I particularly avoid food with a high carbohydrate content (i.e. bread, rice, potatoes, etc.)  
   Never - Rarely - Sometimes - Often - Usually - Always

8) I feel that others would prefer if I ate more.  
   Never - Rarely - Sometimes - Often - Usually - Always

9) I vomit after I have eaten.  
   Never - Rarely - Sometimes - Often - Usually - Always

10) I feel extremely guilty after eating.  
    Never - Rarely - Sometimes - Often - Usually - Always

11) I am occupied with a desire to be thinner.  
    Never - Rarely - Sometimes - Often - Usually - Always
12) I think about burning up calories when I exercise.  

13) Other people think that I am too thin.

14) I am preoccupied with the thought of having fat on my body.

15) I take longer than others to eat my meals.

16) I avoid foods with sugar in them.

17) I eat diet foods.

18) I feel that food controls my life.

19) I display self-control around food.

20) I feel that others pressure me to eat.

21) I give too much time and thought to food.

22) I feel uncomfortable after eating sweets.

23) I engage in dieting behavior.

24) I like my stomach to be empty.

25) I have the impulse to vomit after meals.

26) I enjoy trying new rich foods.
3. Please read each of the items below and indicate whether you almost never, sometimes, often, or almost always thought or did these things **IN THE PAST 24 HOURS**. Please indicate what you generally do, not what you think you should do from 1 (almost never) to 4 (almost always). Please indicate what you generally did, not what you think you should have done.

1. Think about a recent situation, wishing it had gone better. Never At times Frequently Almost Always (throughout the day)

2. Think "Why do I have problems other people don't have?" Never At times Frequently Almost Always (throughout the day)

3. Think "Why can't I handle things better?" Never At times Frequently Almost Always (throughout the day)

4. Think ‘‘What am I doing to deserve this?’’ Never At times Frequently Almost Always (throughout the day)

5. Think ‘‘Why do I always react this way?’’ Never At times Frequently Almost Always (throughout the day)

6. Think about all your shortcomings, failings, faults, mistakes Never At times Frequently Almost Always (throughout the day)

4. This scale consists of a number of words that describe different feelings and emotions. Read each item and then select the appropriate answer (number) in the space next to that word. Indicate to what extent you have felt this way over the past **24 hours**.

**Distressed**
- Very slightly/Not at all
- A little - Moderately - Quite a bit - Extremely

**Upset**
- Very slightly/Not at all
- A little - Moderately - Quite a bit - Extremely

**Guilty**
- Very slightly/Not at all
- A little - Moderately - Quite a bit - Extremely

**Scared**
- Very slightly/Not at all
- A little - Moderately - Quite a bit - Extremely

**Hostile**
- Very slightly/Not at all
- A little - Moderately - Quite a bit - Extremely
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