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Understanding the relationship between emotional and behavioral dysregulation: Emotional cascades

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Abstract

Recent research suggests that many dysregulated behaviors, such as binge-eating and non-suicidal self-injury, often occur during times of emotional distress. These behaviors also appear to decrease negative affect. Why is it, however, that individuals engage in these behaviors to reduce emotional distress rather than taking a shower or talking to a friend? This study proposes the role of emotional cascades, an emotional phenomenon that occurs when an individual intensely ruminates on negative affect, thus increasing the magnitude of that negative affect to the point that an individual engages in a dysregulated behavior in order to distract from that rumination. The purpose of these studies was to examine the relationship between rumination and dysregulated behaviors, and in doing so determine if there is some support for the emotional cascade model of behavioral dysregulation. Using two different studies we were able to demonstrate that rumination is associated with some dysregulated behaviors, both cross-sectionally using structural equation modeling, and temporally using a two time-point method.

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Keywords: Rumination; Emotion regulation; Impulsivity; Binging; Purging; Reassurance seeking

Introduction

Do we really have control over our emotions, or do our emotions have control over us? Perhaps a synthesis of the two suppositions is more accurate than either alone. Emotion regulation is defined as the extrinsic and intrinsic processes responsible for monitoring, evaluating, and modifying emotional reactions, especially their intensive and temporal features, to accomplish one's goal (Thompson, 1994)—in short, emotion regulation is how you manage and alter your emotions so that they are consistent with your objectives. Gross (1998) has proposed a model of emotion regulation that indicates that both cognitive and behavioral strategies may be used to regulate emotions, either before or after an emotion occurs. Both cognitive and behavioral emotion regulation strategies have received attention separately, but there have been few studies examining both forms together—especially in the case of maladaptive emotion regulation. For example, cognitive emotion regulation strategies such as rumination (Nolen-Hoeksema & Morrow, 1991) and thought suppression (Wegner, Schneider, Carter, & White,

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1987) have been linked to a number of negative psychological outcomes. Recent evidence is also beginning to indicate that certain behaviors such as non-suicidal self-injury (NSSI) (Chapman et al., 2006), binge-eating (Wegner et al., 2002), and other impulsive behaviors (Whiteside & Lynam, 2001) may all be a result of emotion dysregulation, and they may serve as emotion regulatory functions as well.

One important question remains, however: why does emotion dysregulation appear to result in behavioral dysregulation? The connection may lie in the use of rumination and catastrophizing as cognitive emotion regulation strategies, both of which may actually increase the intensity of negative emotions (resulting in emotion dysregulation). Additionally, the use of rumination and catastrophizing may not only increase negative affect, but may also cause an individual to engage in maladaptive behaviors (behavioral dysregulation) in order to down-regulate these intense emotions (because of the distracting properties of those behaviors). In essence, the way we regulate our emotions may actually cause us to lose control of them, and of our behavior.

First, a discussion of behaviors used to regulate affect is warranted. A particularly vivid example is NSSI, the deliberate infliction of injury upon oneself without suicidal intent. Although there are different reasons for engaging in NSSI, one of the most frequent reasons is to escape or regulate negative affect (Brown, Comtois, & Linehan, 2002; Chapman, 2006; Nock & Prinstein, 2004; see Klonsky, 2007 for a review of the functions of NSSI). Binge-eating is another behavior that may have emotion regulation properties, and it has been suggested that an individual who engages in binge-eating uses this behavior to avoid negative emotions by narrowing attention away from negative self-awareness and focusing on the concrete physical stimuli associated with eating (Heatherton & Baumeister, 1991; also see Agras & Telch, 1998; Telch & Agras, 1996). Finally, reassurance seeking (Joiner, Metalsky, Katz, & Beach, 1999), a tendency to elicit reassurance from others to alleviate feelings of self-doubt, and alcohol use (Cooper, Frone, Russell, & Mudar, 1995) are also behaviors that appear to regulate negative affect.

These behaviors, and others, appear related in that they are often considered “impulsive,” and they appear during the experience of negative affect. Whiteside and Lynam (2001) have proposed that there are four reasons for engaging in impulsive behaviors: sensation seeking, lack of premeditation, lack of perseverance, and urgency. Urgency, the most relevant factor for this paper, is feeling the need to act when faced with emotional distress. Trait urgency has been found to be a factor involved in bulimia (Claes, Vandereycken, & Vertommen, 2005), alcohol abuse (Whiteside & Lynam, 2003) and borderline personality disorder (Whiteside, Lynam, Miller, & Reynolds, 2005). While not a behavioral emotion regulation strategy per se, urgency may be part of what causes certain individuals to engage in behavioral dysregulation. Individuals who exhibit high levels of urgency may be more likely to engage in maladaptive behaviors such as reckless driving (Nesbit, Conger, & Conger, 2007), dysregulated eating (Anestis, Selby, Fink, & Joiner, 2007), and substance abuse (Anestis, Selby, & Joiner, 2007) as a result of emotion dysregulation. Although urgency is considered a personality feature with persistent qualities, it is also possible that individuals may fluctuate in levels of their propensity to engage in impulsive behavior when faced with negative affect.

Just as behaviors may be used to regulate emotion, cognitive processes may also be used to regulate emotions. Perhaps the best-characterized cognitive emotion regulation strategy is rumination (Nolen-Hoeksema, 1991), or the tendency to repetitively think about the causes, situational factors, and consequences of one's emotional experience. In other words, rumination is the repetitive focus of attention on emotionally relevant stimuli. Research indicates that rumination tends to increase the magnitude of various negative emotions (Donaldson & Lam, 2004; Rusting & Nolen-Hoeksema, 1998), and an interaction between rumination and negative cognition has been shown to predict increases in negative affect (Ciesla & Roberts, 2007). Other studies have indicated that increases in emotional arousal and intensity focus attention on emotion (Cornsweet, 1969; Easterbrook, 1959; Fredrickson & Branigan, 2005; Salovey, 1992)—in other words, intense emotion may result in increased rumination. Thus, although rumination may initially be an attempt to problem solve, continuous rumination may actually aggravate negative affect.

Thought suppression and catastrophizing are additional cognitive processes that appear to increase, rather than decrease, negative emotions. Thought suppression refers to deliberate attempts to reduce the frequency or intensity of unpleasant cognitions, and this phenomenon has been linked to a variety of negative psychological consequences (e.g., Purdon, 1999; Wegner et al., 1987). Meta-analyses suggest that deliberate attempts to suppress specific thoughts may have a paradoxical “rebound” effect where the frequency of the unwanted thought increases following efforts to suppress it (Abramowitz, Tolin, & Street, 2001; Wenzlaff &

Wegner, 2000). Thus, thought suppression and rumination may be related in that an individual may use thought suppression in an attempt to stop ruminating on negative affect, but in doing so ruminate more. Catastrophizing (Garfneski, Kraaij, & Spinhoven, 2001) is the tendency to continuously think about how bad a situation is and the negative effects that the current situation has on the future. Catastrophizing appears to be future-oriented rumination in which thoughts are focused on the consequences of a situation (consistent with Nolen-Hoeksema's (1991) definition of rumination). Using catastrophizing as an emotion regulation strategy has been found to increase emotional distress (Sullivan, Bishop, & Pivik, 1995).

All three cognitive emotion strategies discussed (rumination, thought suppression, and catastrophizing) appear to have a common theme: they all focus attention on negative emotional stimuli. Furthermore, evidence has shown that ruminative processes tend to amplify the effect of negative affect (Donaldson & Lam, 2004; Lavender & Watkins, 2004; Rusting & Nolen-Hoeksema, 1998; Thomsen, 2006). Emotion dysregulation may then be a result of the intense use of rumination, catastrophizing, and thought suppression when upset. Yet the tendency to ruminate on negative emotional thoughts increases levels of negative affect, and in turn the increase in negative affect increases levels of rumination. The evidence presented indicates that rumination at intense levels may result in an extremely high level of negative affect, where minimal negative emotional stimuli are followed by a flood of racing negative emotional thoughts, which in turn increase levels of negative affect in a vicious, repetitive cycle—an emotional cascade. Then, in order to “break-up” this positive feedback loop, an individual may engage in a behavior that distracts him/her from emotional thoughts. These behaviors may inhibit this cycle by allowing an individual to focus on the alternate physical and emotional stimuli associated with the behavior, such as taste or chewing in binge-eating, the physical pain and sight of blood in NSSI, or the positive words of another individual in the case of excessive reassurance seeking. The results of engaging in one of these behaviors are effective in altering affect, though the effects may only last for a short time—which explains why many of these behaviors may become habitual. Following the behavior the individual may not experience another rumination cycle until later, or they may begin another cycle resulting from shame or guilt for engaging in the behavior.

This proposed model is consistent with previous theories of behavioral dysregulation put forth by Heatherton and Baumeister (1991), Chapman et al. (2006), and Linehan (1993), and empirical research that has established rumination as an important risk factor for both bulimic symptoms (Nolen-Hoeksema & Harrell, 2002) and substance abuse (Nolen-Hoeksema, Stice, Wade, & Bohon, 2007). It is also consistent with the findings of Tice, Bratslavsky, and Baumeister (2001), who found that induced emotional distress increases engagement in various impulsive behaviors, and furthermore these effects disappeared when individuals were led to believe that these behaviors would have no effect on their mood. Additional support for this model comes from the findings of Bushman, Baumeister, and Phillips (2001) and Bushman (2002), who found that people believe that aggressive behaviors have emotion regulatory functions in that they help vent anger and decrease negative affect. Furthermore, Bushman, Bonacci, Pederson, Vasquez, and Miller (2005) demonstrated that ruminating about a provocation increases the likelihood that even a minor triggering event will increase displaced aggression. This evidence that rumination increases aggressive behavior, even after a relatively minor inciting event, provides some support for the model of an emotional cascade, where these aggressive behaviors serve as an attempt at distraction from rumination on negative affect.

The current effort has been designed to examine the influence of rumination on behavioral dysregulation using two studies. In Study 1, structural equation modeling (SEM) will be used to test a model in which the latent variable of “Rumination” will be used to predict the latent variable of “Behavioral Dysregulation.” In Study 2, a two time-point method will be used to examine if changes in the levels of rumination predict changes in the levels of behavioral dysregulation. This will be done using regression analyses with the standardized residuals of the predictor and outcome variables.

Study 1

Method

Participants

Participants were 200 introductory psychology students at the Florida State University. All participants signed informed consent forms, and the study was approved by the Florida State University IRB. The

demographics of this sample consisted of 31.5% male, 68.5% female, 68% Caucasian, 15% African American, 2.5% Asian, 9.5% Hispanic, and 5% other. The average age of the participants was 18.6 (SD = 2.36). According to Kline (2005, p. 15), a sample of 200 participants is considered a “medium”-sized sample, which is adequate for structural equation models of moderate complexity.

Measures

Rumination variables. *Cognitive Emotion Regulation Questionnaire (CERQ)—Rumination and Catastrophizing Subscales* (Garfnfski et al., 2001): This scale assesses the use of several cognitive emotion regulation strategies that an individual may use when experiencing negative affect. There are a number of subscales on the CERQ, though only the rumination and catastrophizing subscales will be used as indicators of rumination (due to the other scales not being ruminative processes, but rather strategies to increase positive affect, such as positive reappraisal, or attributional styles, such as blaming others). The Rumination subscale measures an individual's tendency to focus attention on the feelings and thoughts associated with a negative event, and it consists of questions such as, “I am preoccupied with what I think and feel about what I have experienced.” The Catastrophizing subscale measures the tendency of an individual to focus attention on the negative consequences that an event has caused, as well as the future negative implications of that event. The catastrophizing subscale consists of questions such as, “I keep thinking about how terrible it is what I have experienced.” Each question is rated on a 5-point Likert scale. The Rumination and Catastrophizing subscales of the CERQ have been shown to have a correlation of .65 (Garfnfski et al., 2001), which suggests that they both provide a measure of common ruminative tendencies. Previous studies have demonstrated that each of the subscales of the CERQ has adequate internal consistency with α between .68 and .83. Test–retest values range from .41 to .59 for the subscales. In this sample, the Cronbach's α 's for the Rumination and Catastrophizing subscales were .64 and .77, respectively.

Anger Rumination Scale (ARS; Sukhodolsky et al., 2001): The ARS measures the tendency to think about anger-provoking situations, to recall anger episodes from the past, and to think about the causes and consequences of anger episodes. The scale consists of 19 items rated on a 4-point Likert-type scale. The ARS is composed of four subscales: Angry Afterthoughts, Thoughts of Revenge, Angry Memories, and Understanding of Causes. The Angry Afterthoughts subscale pertains to the tendency to ruminate on anger after an anger experience, and consists of such items as: “Whenever I experience anger, I keep thinking about it for a while.” The Thoughts of Revenge subscale assesses the tendency of an individual to focus on thoughts and feelings of revenge and consists of items such as: “I have long living fantasies of revenge after the conflict is over,” and “When someone makes me angry I can't stop thinking about how to get back at this person.” The Angry Memories subscale assesses the tendency to recall memories of previous anger episodes and consists of such items as: “I think about certain events from a long time ago and they still make me angry.” The Understanding of Causes subscale pertains to the tendency to try to understand one's anger experiences, and consists of such items as: “I analyze events that make me angry,” and “I think about the reasons people treat me badly.” The authors report a 1 month test–retest reliability of .77 and an internal consistency of $\alpha = .93$ for the scale as a whole. In this study the total score for all ARS subscales was used to measure an overall tendency to ruminate on anger, and the Cronbach's α for the ARS in this study was $\alpha = .91$.

Behavioral dysregulation variables. *Drinking Motives Questionnaire (DMQ; Cooper, Russell, Skinner, & Windle, 1992):* is a self-report measure that consists of three dimensions—coping motives, enhancement motives, and social motives—each of which measures a particular motivation for consuming alcohol. In this study only the Drinking to Cope (DMQCope) subscale was used as a measure of behavioral dysregulation because this subscale measures the tendency of an individual to drink alcohol in response to negative affect. Drinking alcohol may serve as a distraction from rumination in that an individual can shift attention from negative affect to the physical and mental sensations that alcohol produces. Each dimension of drinking is measured with five questions and the individual test items utilize a Likert-style format ranging from 1 (almost never/never) to 4 (almost always). The Cronbach's α for the DMQCope subscale in this sample was .85.

The Depressive Interpersonal Relationships Inventory—Reassurance Seeking subscale (DIRI-RS; Joiner, Alfano, & Metalsky, 1992): is a four-item scale (using a 7-point Likert scale) that measures the degree to which

individuals seek reassurance from others. This scale was chosen as a measure of behavioral dysregulation because individuals who excessively seek out others for reassurance may do so in an effort to distract themselves from ruminative processes. Positive feedback from others may provide individuals with enough positive affect to distract them and decrease a ruminative cycle. In this sample, the Cronbach's α for the DIRI-RS was .88.

The Eating Disorder Inventory (EDI; Garner, Olmstead, & Polivy, 1983): The EDI is a self-report questionnaire consisting of 64 items used to assess pathological eating cognitions and behaviors. The measure has eight subscales: Drive for Thinness, Bulimia, Interpersonal Distrust, Interoceptive Awareness, Perfectionism, Maturity Fears, Body Dissatisfaction, and Ineffectiveness. The Bulimia subscale was one of the behavioral dysregulation outcome variables in this study because research suggests that binge-eating is often a response to negative emotional stimuli (Heatherton & Baumeister, 1991; Wegner et al., 2002). Binge-eating may serve as a distraction from rumination because it provides an individual with physical and taste sensations that an individual can shift attention to, and away from negative affect. Individual items use a Likert scale (1 = strongly agree, 6 = strongly disagree) and the internal validity of the measure has been widely reported. Additionally, discriminant validity for Bulimia Nervosa and Anorexia Nervosa diagnoses has been reported (Garner et al., 1983). Items on the Bulimia subscale examine the degree to which individuals experience a loss of control while eating large quantities of food and then subsequently purge (e.g. "I have gone on eating binges where I have felt that I could not stop."). The Cronbach's α for the EDI-Bulimia subscale in this sample was .84.

The Urgency, (lack of) Premeditation, (lack of) Perseverance, and Sensation Seeking Impulsive Behavior Scale (UPPS; Whiteside & Lynam, 2001): This is a 45-item self-response scale that features four subcategories: Urgency, Sensation Seeking, (lack of) Premeditation, and (lack of) Perseverance. The Urgency subscale consists of 12 items measuring the degree to which individuals act impulsively in the face of negative affect (e.g., "I often make matters worse because I act without thinking when I am upset."), each of which uses a Likert-type scale ranging from 1 "Not true of me" to 5 "Very true of me." This scale was used as a measure of behavioral dysregulation because when an individual is caught in a cycle of rumination they may engage in activities such as reckless driving or impulsive shopping, both of which provide alternative stimuli for an individual to focus on rather than on negative affect. The Cronbach's α for the Urgency subscale in this sample was .87.

Control variables. Beck Depression Inventory II (BDI-II; Beck, Steer, & Garbin, 1988): The BDI is a self-report measure that consists of 21 items used to assess depressive symptoms. Participants use a Likert-type scale (0–3) to report the degree to which the different items describe their affective state over the course of the past 2 weeks. The reliability and stability of the BDI have been reviewed extensively (Beck, Steer, et al., 1988; Beck, Steer, & Brown, 1996). The Cronbach's α for the BDI in this sample was .89. This scale was chosen as a covariate in order to show that individuals who engage in behavioral dysregulation are not doing so only because they are depressed.

Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988): The BAI is a self-report measure that consists of 21 items. Each item uses a Likert scale (0–3) with which the participant indicates to what degree particular symptoms of anxiety have applied to them over the course of the past 2 weeks. The measure shows impressive test–retest reliability and extensive information regarding the validity of the measure has been published by the authors. The Cronbach's α for the BAI in this sample was .90. This scale was chosen as a covariate in order to show that individuals who engage in behavioral dysregulation are not doing so only because they are feeling anxious.

CERQ—Adaptive Emotion Regulation Strategies. (Garfnieski et al., 2001): The CERQ, mentioned above regarding scales on rumination and catastrophizing, also contains four scales on adaptive regulation strategies. In the analyses, these four subscales were used to create a latent variable of adaptive emotion dysregulation, which was then used as a control variable in the SEM analyses. The Refocus on planning subscale refers to thinking about the steps to take and how to handle a negative situation, and consists of questions such as, "I think about how to change the situation." The Positive Refocusing subscale measures an individual's tendency to think about separate pleasant or joyful issues rather than the negative event, and consists of questions such as, "I think about something nice instead of what has happened." The

Table 1
Correlations, means, standard deviations for observed variables in Study 1

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Anger rumination	1												
2. CQ rumination	.336**	1											
3. CQ catastrophizing	.386**	.466**	1										
4. Urgency	.452**	.379**	.495**	1									
5. Reassurance seeking	.320**	.340**	.266**	.232**	1								
6. EDI-Bulimia	.251**	.212**	.327**	.409**	.253**	1							
7. Drinking to Cope	.174*	.255**	.287**	.347**	.114	.433**	1						
8. BAI	.318**	.303**	.229**	.336**	.317**	.265**	.148*	1					
9. BDI	.394**	.246**	.295**	.475**	.265**	.315**	.171*	.453**	1				
10. Refocus on planning	-.111	.194**	-.085	-.170*	-.098	-.178*	-.134	-.200**	-.217**	1			
11. Positive reappraisal	-.137	.024	-.151	-.247**	-.105	-.201**	-.214**	-.285**	-.285**	.692**	1		
12. Putting in perspective	-.142*	-.023	-.191**	-.156*	-.210**	-.100**	-.130	-.217**	-.235**	.352**	.382**	1	
13. Positive refocus	.020	.015	-.032	-.041	-.023	-.017	-.067	-.235**	-.176*	.443**	.305**	.662**	1
Mean	35.97	12.64	10.10	31.79	12.17	3.74	9.50	11.34	7.38	14.26	14.62	10.83	14.25
St. Dev.	10.22	3.32	3.72	9.16	5.58	.76	4.12	9.64	6.54	3.48	3.52	3.52	3.52
α	.91	.64	.77	.87	.88	.84	.85	.9	.89	.77	.79	.74	.82

Note: * $p < .05$, ** $p < .001$; BAI: Beck Anxiety Inventory; BDI: Beck Depression Inventory.

Positive Reappraisal subscale measures an individual's tendency to think about the positive aspects of a situation, or how they can grow from what they have experienced. It consists of questions like, "I think that the situation has its positive sides." The Putting into Perspective subscale measures an individual's tendency to examine a negative situation in context, and to play down the situation in comparison to other situations. It consists of items such as, "I think that it hasn't been too bad compared to other things." Previous studies have demonstrated that each of the subscales of the CERQ has adequate internal consistency with α between .68 and .83. Test-retest values range from .41 to .59 for the subscales. In this sample the Cronbach's α 's for the scales are listed in Table 1, and they ranged from .64 to .82. A final positive subscale, acceptance, was not used in the creation of the adaptive emotion regulation latent variable because of the wording of its items having a potential "hopeless" nature to them (e.g. "I think that I cannot change anything about it"), which calls into question whether it validly assesses an adaptive emotion regulation strategy. The acceptance subscale also had moderate positive correlations with the rumination, anger rumination and catastrophizing subscales (.39, .19, and .29, respectively—all were significant at the $p < .01$ level), which further indicates that it should not be grouped with the other adaptive emotion regulation strategies.

Procedure

All participants were presented with an informed consent sheet, the contents of which were explained by a trained research assistant. This assistant also answered any questions that the participants had before signing the informed consent sheet. The participants were then given a battery of questionnaires, including the measures used in this study. Upon completion of these questionnaires, the participants were debriefed and given course credit for their participation. The data from these questionnaires were then entered into an SPSS file by trained research assistants. This file was then checked by the primary investigator and cleaned as needed. There were no participants who were missing large portions of data, so no participants were excluded. Any missing data points that were found were replaced with the series mean for that question.

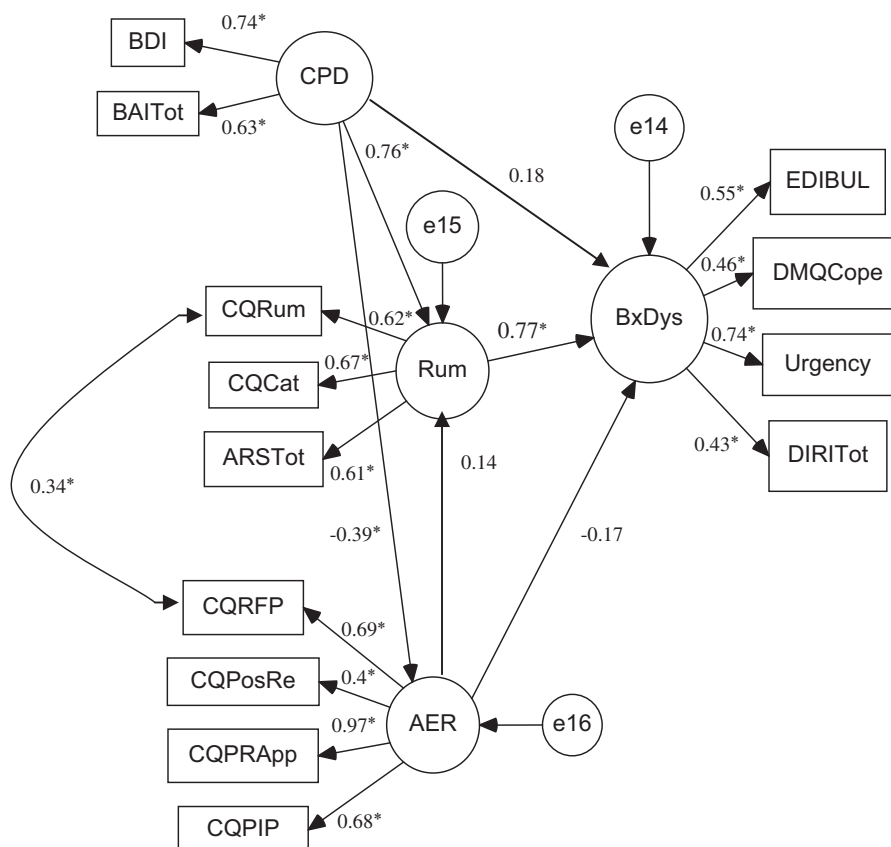


Fig. 1. Hypothesized model of the relationship between rumination and behavioral dysregulation.

Note: * $p < .05$; Rum: Rumination; BxDys: Behavioral Dysregulation; CPD: Current Psychological Distress; AER: Adaptive Emotion Regulation; CQRum: Rumination (CERQ); CQCat: Catastrophizing (CERQ); ARSTot: Anger Rumination Scale Total; DMQCope: Drinking to Cope (DMQ); EDIBUL: Bulimia (EDI); DIRI: Reassurance Seeking (DIRI-RS); Urgency (UPPS); CQPIP: Putting into Perspective (CERQ); CQPRApp: Positive Reappraisal (CERQ); CQPosRe: Positive Refocus (CERQ); CQRFP: Refocus on Planning (CERQ); BDI: Beck Depression Inventory total; and BAITot: Beck Anxiety Inventory total.

Data analytic strategy

The data for Study One were analyzed using SEM techniques. SEM evaluates the plausibility of a model proposed about the relationships among a set of variables, usually including both observed (or measured) variables and unobserved (or latent) variables (Covert, Penner, & MacCallum, 1990), as well as modeling error variance. This statistical method has advantages over other techniques used to analyze theoretical relationships because it relies on several indicators, rather than a single measurement instrument, to assess a construct of interest, and it allows one to simultaneously assess measurement models (or factor loadings) of latent variables and relationships (or correlations) between the latent variables. This reduces measurement error and increases construct validity. SEM analyses were conducted with the statistical program AMOS (Arbuckle & Wothke, 1999).

The hypothesized model that was tested is displayed in Fig. 1. In this model there is a causal path leading from rumination to behavioral dysregulation. Rumination also serves as a partial mediator between current psychological distress (symptoms of depression and anxiety) and deficits in adaptive emotion regulation strategies and behavioral dysregulation. The Behavioral Dysregulation latent variable was created using the observed variables of the DMQCope, EDI-Bulimia, DIRI-RS (reassurance seeking), and Urgency subscales. Although these behaviors do not necessarily occur together, it was hypothesized that each of these scales measures a common tendency to engage in a maladaptive behavior when faced with negative affect, and as will be seen, results provide some support for this approach.

Three latent variables were hypothesized to have causal pathways to the Behavioral Dysregulation latent variable: Rumination, Adaptive Emotion Regulation, and Current Psychological Distress. The Rumination

latent variable was composed of the rumination and catastrophizing scales of the CERQ and the total score for the ARS. All three of these scales appear to measure a tendency to focus on emotion-relevant thoughts when faced with negative affect. The Adaptive Emotion Regulation latent variable consisted of the refocus on positive, refocus on planning, positive reappraisal, and putting into perspective scales of the CERQ. These variables appear to measure an adaptive way to regulate negative emotions, or a way that would at least weaken the strength of negative affect. In this model, Rumination and deficits in Adaptive Emotion Regulation are hypothesized to predict Behavioral Dysregulation, and furthermore, it was predicted that the effects of deficits in Adaptive Emotion Regulation would be mediated by Rumination (e.g. these deficits in Adaptive Emotion Regulation result in more rumination, which leads to more behavioral dysregulation). The Adaptive Emotion Regulation latent variable was chosen as a control variable in this structural model, rather than a modifying variable, because rumination may take up so much attention that even someone who tries to shift his or her attention using a positive regulation strategy may continue to intensely ruminate—having the same result (behavioral dysregulation) as a ruminating individual who did not attempt to use a positive emotion regulation strategy. In short, rumination may be such a powerful process that even attempts to use positive strategies may not inhibit it when an emotional cascade is taking place, at least not without great effort to use that positive strategy.¹

An additional latent variable of “Current Psychological Distress” was created using the BDI and BAI as observed variables. This was viewed as an initial emotional stimulus variable, which affects Behavioral Dysregulation through the paths of rumination and deficits in adaptive emotion regulation. It also served as a control variable to demonstrate that the effects of rumination are not primarily a result of current, general psychological distress or depression. It was hypothesized that the effects of Current Psychological Distress would be partially mediated by Rumination and deficits in Adaptive Emotion Regulation. Rumination was considered to be a mediator between Current Psychological Distress and Behavioral Dysregulation because symptoms of depression and anxiety (or life stress contributing to these symptoms) may serve as the stimuli that initiate an emotional cascade and subsequent dysregulated behavior.

Residual predictors were placed on the Behavioral Dysregulation, Rumination, and Adaptive Emotion Regulation latent variables. This is because other variables not measured in this study most likely influence the behavioral dysregulation, rumination, and adaptive emotion regulation variables in addition to current psychological distress. There was also a hypothesized correlation between the error terms of the Rumination (CERQ) and the Refocus on Planning subscale (CERQ) indicators. This is because rumination appears to have a problem-solving component. [Treyner, Gonzalez, and Nolen-Hoeksema \(2003\)](#) have suggested that there are actually two components to rumination: reflection and brooding. Reflection is a tendency to try to understand why one is in a negative emotional state; whereas brooding is an immersion in negative affect. Studies have demonstrated that reflection may be less harmful than brooding ([Treyner et al., 2003](#)), but it still worsens mood. The hypothesized correlation between the error terms of the Rumination (CERQ) subscale and the Refocus on Planning (CERQ) subscale was also supported by a moderate positive correlation between the two subscales (.195, significant at the $p < .01$ level).

In order to evaluate the overall model, the maximum likelihood chi-square statistic (χ^2) was used (with non-significance indicating that the model fit the data perfectly). Due to the χ^2 's sensitivity to large sample sizes, other fit indices were used including the comparative fit index (CFI), the root-mean square error of approximation (RMSEA), and the standardized root-mean residual (SRMR). Standard cutoff criteria for good fit were used to judge the model as a whole, and consisted of CFI values greater than .95, RMSEA values of less than .06, and SRMR values of less than .06 ([Hu & Bentler, 1999](#)). To test individual parameter estimates, a cutoff criterion value for significance was set at $p = .05$. To compare non-nested alternative models, the AIC for each alternative model was compared, with the model having the lowest AIC being the one with the best fit.

¹In order to test the hypothesis that an interaction between rumination and adaptive emotion regulation would be a better predictor of behavioral dysregulation than rumination, additional analyses were conducted for Studies 1 and 2 using the interaction as a predictor for behavioral dysregulation. The results of these analyses indicated that the interaction term did not significantly predict the behavioral dysregulation variables for either study. This suggests that an interaction between high rumination and low positive emotion regulation strategies does not necessarily predict behavioral dysregulation beyond having high rumination.

Results

Preliminary analyses

The correlations, means, standard deviations, and α 's for the variables used in Study 1 are presented in Table 1. Because SEM can be sensitive to non-normal variable distributions, univariate analyses of normality were conducted. An assessment of univariate normality revealed that none of the variables were significantly skewed, but that two variables, BDI and EDI-Bulimia, were significantly leptokurtic. Square-root transformations improved the normality of these variables, and they remained in all subsequent analyses. Because gender differences have been reported on variables such as rumination and catastrophizing (Martin & Dahlen, 2005), a series of ANOVAs were run (using a Bonferroni-adjusted α of .004) to examine if gender differences existed with any of the variables in this sample. The ANOVA analyses indicated that there was no significant gender effect on any of the variables used in the analyses.²

Measurement model analyses

Due to the fact that the Behavioral Dysregulation latent variable was comprised of four behavioral tendencies that are not necessarily correlated, a preliminary measurement analysis was conducted to ensure that these variables would fit well together as a latent variable. Measurement analysis indicated that all four variables loaded onto the Behavioral Dysregulation latent variable well, $\chi^2(2, N = 200) = 2.93, p > .05$. All four variables had significant loadings onto the latent variable, with bulimic behaviors highest loading ($sr = .577$), and reassurance seeking having the lowest ($sr = .324$). The finding that one latent variable with all four of these independent behaviors provided a good fit to the data suggests that all of these behaviors may have similar underlying causes, consistent with the current conceptualization.

Next, the latent variable of Adaptive Emotion Regulation was also examined. Although the four indicators chosen to create this latent variable appear similar, they are not necessarily related to each other. Preliminary measurement analysis indicated that this latent variable fit the data well, $\chi^2(2, N = 200) = 4.23, p > .05$. All four variables significantly loaded onto the latent variable, with positive reappraisal loading the highest ($sr = .97$), and refocusing on the positive having the lowest loading ($sr = .40$). The finding that this latent variable fit the data well indicates that these adaptive emotion regulation strategies may be common measures of an overall tendency to use adaptive emotion regulation strategies when dealing with negative emotions.

Structural model analyses

The hypothesized model is recursive, and thus it is identified. The factor loadings of each latent variable on its corresponding observed variables and the regression paths between latent variables are displayed in Fig. 1. SEM analysis of the proposed model (Fig. 1) indicated that this model exhibited good fit to the data, $\chi^2(58, N = 200) = 88.48, p < .05$, CFI = .958, RMSEA = .051, SRMR = .051, and AIC = 154.58. As can be seen in Fig. 1, all exogenous variables loaded highly onto their endogenous variable. Standardized regression weights for the structural model are presented in Fig. 1. The effects of Rumination significantly predicted Behavioral Dysregulation ($sr = .76, p < .001$), even after controlling for the effects of Current Psychological Distress (non-significant) and a deficit in Adaptive Emotion Regulation (non-significant). This is a large effect according to Cohen (1988). Current psychological distress significantly predicted Rumination ($sr = .76, p < .001$), and deficits in Adaptive Emotion Regulation ($sr = -.39, p < .001$). There was also a significant correlation between the error variances of Refocus on Planning (CERQ) and Rumination (CERQ) ($sr = .301, p < .001$).

Contrary to initial hypotheses, deficits in Adaptive Emotion Regulation did not significantly predict Rumination, and neither Current Psychological Distress nor deficits in Adaptive Emotion Regulation

²Even with a standard α of .05, neither the EDI-Bulimia scale nor the BDI were significant, an unexpected finding given their gender differences in rates of bulimic behaviors and depression. One possible explanation for the non-significant gender effects on the EDI is that the grand mean for this scale was relatively low (3.7), and there may have been a number of women in this study who exhibited no bulimic behaviors. This hypothesis is supported by the findings of Study 2, which had a significantly higher mean for the EDI-Bulimia scale at both Time 1 (16.3) and Time 2 (15.3).

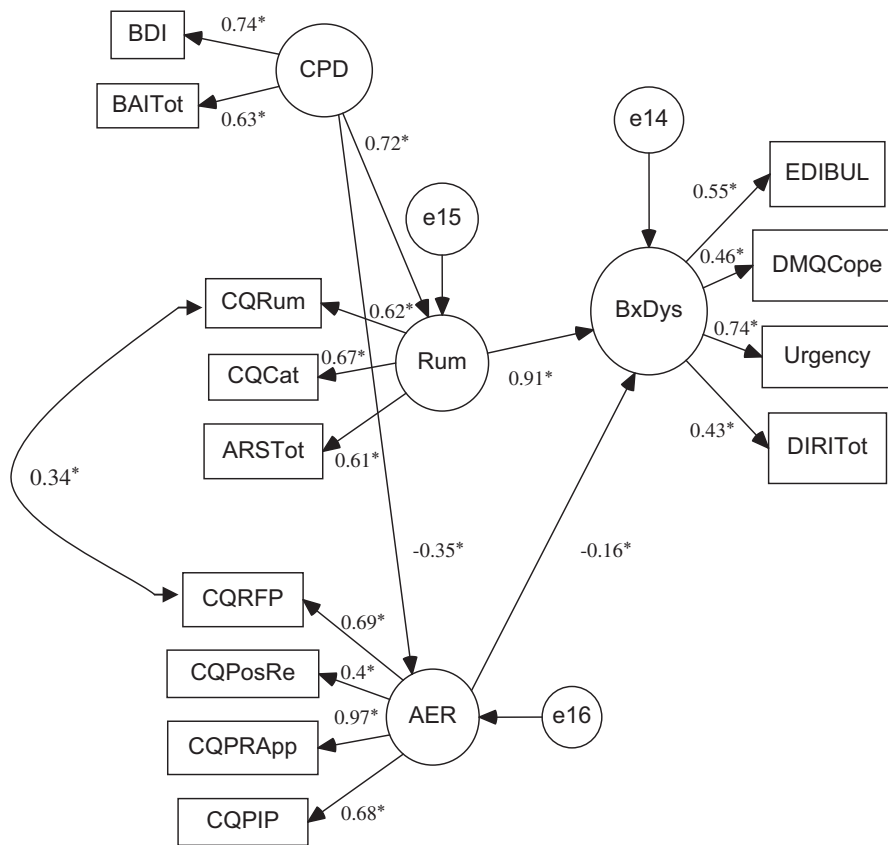


Fig. 2. Revised model of the relationship between rumination and behavioral dysregulation.

Note: * $p < .05$; Rum: Rumination; BxDys: Behavioral Dysregulation; CPD: Current Psychological Distress; AER: Adaptive Emotion Regulation; CQRum: Rumination (CERQ); CQCat: Catastrophizing (CERQ); ARSTot: Anger Rumination Scale Total; DMQCope: Drinking to Cope (DMQ); EDIBUL: Bulimia (EDI); DIRI: Reassurance Seeking (DIRI-RS); Urgency (UPPS); CQPIP: Putting into Perspective (CERQ); CQPRApp: Positive Reappraisal (CERQ); CQPosRe: Positive Refocus (CERQ); CQRFP: Refocus on Planning (CERQ); BDI: Beck Depression Inventory total; and BAITot: Beck Anxiety Inventory total.

significantly predicted Behavioral Dysregulation. Current Psychological Distress also had significant indirect effects on Behavioral Dysregulation ($.56, p < .05$). This indicates that although the direct path between Current Psychological Distress and Behavioral Dysregulation was non-significant, Current Psychological Distress had an indirect impact on Behavioral Dysregulation through Rumination and deficits in Adaptive Emotion Regulation. Additionally, a direct significance test of the mediational pathway of rumination mediating the effects of current psychological distress on behavioral dysregulation was conducted as suggested by Sobel (1982). This test was significant ($z = 2.83, p < .01$), suggesting that rumination mediated the relationship between current psychological distress and behavioral dysregulation.

Although the hypothesized model provided a good fit for the data, a second model was tested because neither Current Psychological Distress nor deficits in Adaptive Emotion Regulation predicted Behavioral Dysregulation, and deficits in Adaptive Emotion Regulation did not significantly predict Rumination. In this model (Fig. 2) the path with Rumination mediating the effects of deficits in Adaptive Emotion Regulation on Behavioral Dysregulation was removed, and the direct path between Current Psychological Distress and Behavioral Dysregulation was removed. This model also fit the data well, $\chi^2(60, N = 200) = 91.88, p < .001$, CFI = .956, RMSEA = .052, SRMR = .054, AIC = 153.88. Although this second model did not provide significantly better fit to the data ($\chi^2_{diff}(2, N = 200) = 3.4, p > .05$) than the first model, this model had 2 additional degrees of freedom than the first and is therefore more parsimonious than the first model. In this model, Rumination continued to significantly predict Behavioral Dysregulation ($sr = .90, p < .001$), and Adaptive Emotion Regulation also significantly predicted Behavioral Dysregulation ($sr = -.16, p < .05$). The other paths and factor loadings remained significant in this model, with the exception of the residual error term connected to the Behavioral Dysregulation latent variable.

In order to examine the specificity of the hypothesized model, an alternate model was tested with the effects of rumination being completely mediated by Current Psychological Distress and deficits in Adaptive Emotion Regulation. This model did not fit the data well, $\chi^2(60, N = 200) = 111.77, p < .001, CFI = .93, RMSEA = .066, SRMR = .063, \text{ and } AIC = 173.77$. The difference in AIC (used to compare non-hierarchical models) between the models ($\Delta AIC = +19.89$) indicate that the revised model (Fig. 2) provided better fit to the data than this alternate model (a model with a decrease in over 10 AIC units is usually considered significantly better fit (Burnham & Anderson, 2004)). This provides evidence that the effects of rumination on behavioral dysregulation are not better accounted for by other variables. A model with the effects of Rumination on Behavioral Dysregulation being partially mediated by Current Psychological Distress and deficits in Adaptive Emotion Regulation also did not provide better fit to the data than the revised model, $\chi^2(59, N = 200) = 100.37, p < .001, CFI = .94, RMSEA = .059, SRMR = .063, AIC = 164.37, \Delta AIC = +10.5$.

Discussion

Using SEM, the results of Study 1 suggest that there is a relationship between rumination and behavioral dysregulation, even when controlling for current symptoms of depression and anxiety, and for a deficit in adaptive emotion regulation strategies. One of the strengths of this study was that four behaviors (drinking to cope, reassurance seeking, binge-eating behaviors, and urgency), behaviors that might seem unrelated, fit together well enough to create a latent variable of dysregulated behavior. This finding lends some evidence to support the view that some dysregulated behaviors might be connected, particularly through rumination. Another interesting finding of this study was that a deficit in adaptive emotion regulation strategies, strategies that should reduce negative affect and increase positive affect, was also an important predictor of behavioral dysregulation. Finally, it is important to consider the large magnitude of the regression weight of Rumination on Behavioral Dysregulation. This indicates that there may be a strong relationship between rumination and dysregulated behaviors.

There were some limitations to this study, however. One potential limitation with this study is that there is a whole gamut of dysregulated behaviors, many of which are related to negative affect, that were not examined in this study. Rather, only four types of dysregulated behavior were used to create the latent variable of Behavioral Dysregulation. This limitation suggests that there may be problems with generalizability to other dysregulated behaviors, such as NSSI. It is important to remember, however, that these four seemingly unrelated behaviors did cluster together relatively well.

Another important limitation is that there may be a temporal discrepancy between current psychological distress symptoms, the more trait-like measures of emotion regulation (rumination, positive reappraisal, etc.), and general tendencies to behave in maladaptive ways. This is because the BDI and BAI measure the experience of depressive and anxiety symptoms over a 2 weeks period, while the emotion regulation and behavioral scales measure the ways an individual reacts to negative affect and behaves in general. This time scale discrepancy may not necessarily have affected the mediating role of rumination between current psychological distress and dysregulated behavior. This is because individuals who have a tendency to ruminate may experience increased levels of rumination during times of depressed mood and anxiety (possibly because they have more problems to ruminate on), which may also result in increased dysregulated behavior (e.g. higher levels of depressed affect may result in increased rumination, which may lead to an increased frequency of reassurance seeking).

A final limitation with this study is that it is a cross-sectional, correlational study that is unable to determine any causal effects of emotional cascades on behavioral dysregulation. Thus, in order to establish a temporal relationship between ruminative processes and behavioral dysregulation, although still not necessarily a causal one, Study 2 was designed to examine if changes in ruminative processes predicted changes in dysregulated behaviors.

Study 2

Method

Participants

Participants consisted of 65 participants (82.9% female). The participants in this study were given the same measures as those in Study 1 (with the exception of the ARS) at two separate times, 1 month apart. These

individuals were recruited through the Florida State University's mass screening system based on reported impulsivity problems, using high scores on screening questions from the Impulsive Behavior Scale (IBS; Rosotto, Yager, & Rorty, 1998) as the selection factor. The screening questions consisted of 10 questions from the IBS, which is a 25-item measure that asks participants to indicate how many times they have engaged in particular impulsive behaviors (e.g., self-mutilation, shoplifting, risky behaviors). The screening questions used for this study included questions such as, "Have you self-mutilated (e.g. cutting, pinching, burning yourself?)", "Have you driven recklessly?", and "Have you often enjoyed taking risks or engaging in somewhat dangerous activity?" Invitation to the study was based on an answer of 4 or higher (on a Likert scale of 1 = never, 5 = frequently) on at least three of the IBS screening questions because higher scores on these questions indicated that the individual may engage in more impulsive behaviors. The ethnic composition of the sample was 77.1% white or Caucasian, 10.0% Hispanic or Latino, 5.7% African American, 2.9% Asian American, and 2.8% other. The age range for the sample was 17–53 (mean = 19.31, standard deviation = 4.23). All participants signed informed consent forms, and the study was approved by the Florida State University IRB.

Measures

The same measures as used in Study 1 were used in Study 2, with the exception of the ARS, which was not used in this study.

Rumination: This scale was created by adding all of the items on the rumination and catastrophizing subscales of the CERQ to create an overall measure of ruminative processes. Because previous studies indicate that there are moderate correlations between rumination and catastrophizing, and because these two measures loaded well onto the same latent variable in Study 1, the items composing these two subscales were combined and used as a measure of rumination.

Adaptive Emotion Regulation (AER): This scale was created by adding all of the items on the refocus on planning, refocus on positive, positive reappraisal, and putting into perspective subscales of the CERQ. In Study 1, these four scales fit the data well as one latent variable, and during both Times 1 and 2 of this study all of these items demonstrated good internal consistency (T1 = .836, T2 = .866).

Dysregulated Eating Behaviors (EDI-Bulimia): The Cronbach's α for the EDI-Bulimia scale was .81 for Time 1 and .87 for Time 2.

DMQCOPE: The Cronbach's α for the DMQCOPE scale was .87 for Time 1 and .86 for Time 2.

Excessive Reassurance Seeking (DIRI-RS): The Cronbach's α for the DIRI-RS was .87 for Time 1 and .91 for Time 2.

Urgency (UPPS): The Cronbach's α for the Urgency subscale was .91 for Time 1 and .89 for Time 2.

Current Depressive Symptoms (BDI-II): The Cronbach's α for the BDI-II was .85 for Time 1 and .89 for Time 2.

Current Anxiety Symptoms (BAI): The Cronbach's α for the BAI was .92 for Time 1 and .91 for Time 2.

Data analytic strategy

In order to examine the relationship between changes in rumination and changes in behavioral dysregulation, a series of regression analyses were conducted by creating and saving the unstandardized residuals using Time 1 for each of the variables to predict T2 of the corresponding variable. Residualized change scores represent the degree to which Time 1 scores predict Time 2 scores, and by using residualized scores in the regression analyses both the amount of change and initial score are taken into account. The regression analyses were conducted using the residualized change in rumination as the predictor, and residualized change scores for each of the behavioral variables as the outcome variables. In addition, the residualized change scores of the BDI, BAI, and AER total were entered into the regression analyses as covariates. This was done to demonstrate that changes in behavioral dysregulation were not merely a result of changes in current psychological distress or deficits in adaptive emotion regulation strategies. A final analysis was conducted by creating z -scores for each of the behavioral variables, and then all four of the behavioral variables were added together to create an overall measure of behavioral dysregulation for both Times 1 and 2. A regression analysis was then conducted with residualized rumination as a predictor of the residualized composite of behavioral dysregulation, after controlling for residualized depression and anxiety.

Table 2
Correlations, means, standard deviations and α of Time 1 variables used in Study 2

	1	2	3	4	5	6	7	8	9
1. Rumination T1	1								
2. BAI T1	.251*	1							
3. BDI T1	.469**	.495**	1						
4. DMQ Cope T1	.291*	.326**	.131	1					
5. DIRI T1	.396**	.274*	.293*	.085	1				
6. EDI-Bulimi T1	.421**	.301*	.401**	.289*	.125	1			
7. Urgency T1	.365**	.351**	.284*	.543**	.338**	.475**	1		
8. BxComposite T1	.540**	.462**	.390**	.702**	.541**	.680**	.853**	1	
9. AER T1	-.188	.02	-.286*	.068	-.01	-.111	-.058	-.018	1
Mean	20.88	15.03	9.25	10.65	10.66	16.28	30.71	0	51.37
St. Dev.	5.26	11.26	6.70	4.58	5.71	6.55	9.18	2.8	13.73
α	.711	.92	.85	.87	.91	.81	.91	N/A	.836

Note: * $p < .05$, ** $p < .001$; BAI: Beck Anxiety Inventory, BDI: Beck Depression Inventory, DMQCope: Drinking to Cope, DIRI: Reassurance Seeking, BxComposite: composite of z-scored behavior variables, Adaptive Emotion Regulation total.

Additional regression analyses were also conducted using the Time 1 variables to predict change from Time 1 to 2 in order to examine the effect that initial levels of the variables had on the changes.

Results

Means, standard deviations, and α for Time 1 predictors, dependents, and covariates, as well as their intercorrelations, can be found in Table 2. Means, standard deviations, and α for Time 2 predictors, dependents, and covariates, as well as their intercorrelations, can be found in Table 3 below. Intercorrelations for Times 1 and 2 variables can be found in Table 4 below.

Time 1 measures of all variables were regressed onto their corresponding Time 2 variable, while the unstandardized residuals of these regression analyses were saved. The unstandardized residuals of the change from Time 1 to 2 were then used in the subsequent analyses. First, residualized scores for the BAI, BDI and AER were entered in step one of the regression, and the residualized rumination/catastrophizing composite variable was entered in step two of the equation. These dependent variables were then used to predict residualized scores on DMQCope, Reassurance Seeking (DIRI), binge-eating behavior (EDIBUL), Urgency, and a z-scored composite variable of all of these behaviors.

Residualized change scores in the rumination variable significantly predicted residualized change in urgency (Table 5; $\beta = .30$, $t = 2.6$, $p < .05$), reassurance seeking ($\beta = .29$, $t = 2.3$, $p < .05$, no control variables were significant),³ and binge-eating behavior ($\beta = .38$, $t = 3.1$, $p < .05$, no control variables were significant). The only residualized outcome variable that was not significantly predicted by residualized rumination was DMQCope ($\beta = -.029$, $t = -.221$, $p > .05$). Follow up analyses on the DMQCope indicated that rumination significantly predicted DMQCope scores at T1 (after controlling for T1 BAI and BDI scores and T1 AER ($\beta = .28$, $t = 2.27$, $p < .05$), but not at T2. Finally, changes in rumination significantly predicted changes in the behavioral composite variable (Table 6; $\beta = .37$, $t = 3.1$, $p < .05$), even after controlling for residualized BAI, BDI, and AER scores.

Not only did changes in rumination predict the behavioral variables (with the exception of drinking to cope), but it also predicted a sizable amount of variance in change. For reassurance seeking, rumination predicted an additional 7.4% of variance in change (in addition to the 6% accounted by the control variables); for binge-eating behaviors it predicted 13% (in addition to 1.2% accounted by the control variables); for urgency it predicted 8% (in addition to 15% accounted by the control variables); and for the behavioral

³Regressions for the urgency and behavioral composite variables were the only ones presented in tables (Tables 5 and 6, respectively). The other regressions were similar to these analyses, except that changes in BAI, BDI, and AER were not significant. Due to space considerations, these were not included as additional tables.

Table 3
Correlations, means, standard deviations and α of Time 2 variables used in Study 2

	1	2	3	4	5	6	7	8	9
1. Rumination T2	1								
2. BAI T2	.309**	1							
3. BDI T2	.335**	.602**	1						
4. DMQ Cope T2	.146	.133	.095	1					
5. DIRI T2	.442**	.216*	.329**	.183	1				
6. EDI-Bulimi T2	.317**	.260*	.348**	.371**	.266*	1			
7. Urgency T2	.481**	.341**	.230*	.536**	.417**	.524**	1		
8. BxComposite T2	.473**	.324**	.324**	.713**	.637**	.737**	.845**	1	
9. AER T2	-.067	-.027	-.249*	-.155	-.12	-.175	-.073	-.178	1
Mean	20.08	11.20	7.45	11.15	10.49	15.26	30.62	0	51.49
St. Dev.	5.31	9.61	6.80	4.54	5.69	6.88	9.09	2.93	12.91
α	.768	.91	.89	.86	.89	.87	.89	N/A	.866

Note: * $p < .05$, ** $p < .001$; BAI: Beck Anxiety Inventory, BDI: Beck Depression Inventory, DMQCope: Drinking to Cope, DIRI: Reassurance Seeking, BxComposite: composite of z-scored behavior variables, AER: Adaptive Emotion Regulation total.

Table 4
Intercorrelations between Times 1 and 2 variables

	Rumination T2	BAI T2	BDIT2	DMQCope T2	DIRI T2	EDI Bulimia T2	Urgency T2	Bx Composite T2	AER T2
Rumination T1	.491**	.178	.258*	.234	.377**	.207	.355**	.401**	-.30*
BAI T1	.119	.587**	.37**	.272*	.15	.277*	.268*	.335**	-.05
BDI T1	.238*	.487**	.691**	.197	.241*	.30*	.377**	.387**	-.383**
DMQ Cope T1	.304**	.103	.082	.731**	.176	.343*	.502**	.604**	.119
DIRI T1	.251*	.179	.301*	-.028	.754**	.145	.338**	.362**	-.127
EDI-Bulimi T1	.304**	.234*	.334*	.356*	.104	.808**	.445**	.598**	-.297*
Urgency T1	.323**	.234	.224	.414**	.363**	.498**	.727**	.695**	-.035
BxComposite T1	.389**	.324**	.324**	.713**	.494**	.636**	.675**	.809**	-.103
AER T1	-.063	-.085	-.314**	-.166	.01	-.003	-.149	-.108	.598**

Note: * $p < .05$, ** $p < .001$; BAI: Beck Anxiety Inventory, BDI: Beck Depression Inventory, DMQCope: Drinking to Cope, DIRI: Reassurance Seeking, BxComposite: composite of z-scored behavior variables, AER: Adaptive Emotion Regulation.

composite it predicted 12.6% (in addition to the 10% accounted for by the control variables). These are sizable effects, especially when considering how many other variables may be influencing the change in these behaviors and the fact that only 1 month passed between measurements.

Additional regression analyses were conducted using T1 variables to predict change (residualized scores) in the outcome variables. Initial levels of AER (T1) significantly predicted changes in drinking to cope ($\beta = -.34$, $t = -2.7$, $p < .05$, after controlling for changes in rumination, as well as changes in BDI and BAI). AER scores at T1 accounted for 10% of the variance (in addition to the 4% accounted for by the other variables) in changes in drinking to cope. This was the only T1 variable to significantly predict changes in any of the variables.

Discussion

Using a two time-point method (with a month between measurements), Study 2 demonstrated that there may be a temporal relationship between ruminative processes and reassurance seeking, binge-eating behaviors,

Table 5
Rumination predicting Urgency

Model		β	<i>F</i> for set	<i>R</i> ² change for set	<i>t</i>	Sig	Correlations zero order	Part	
1	Constant		3.77	.152	-.204	.838			
	Change in BAI	.334			3.14	.003	.260		.364
	Change in BDI	-.31			-2.35	.022	-.125		-.273
	Change in AER	-.08			-.681	.498	-.075		-.079
2	Constant		4.70	.081	-.217	.829			
	Change in BAI	.386			3.05	.003	.260		.339
	Change in BDI	-.387			-.30	.004	-.125		-.331
	Change in AER	-.074			-.644	.509	-.075		-.074
	Change in Rum	.300			2.57	.013	.263		.284

Dependent: Urgency. *Note:* BAI: Beck Anxiety Inventory, BDI: Beck Depression Inventory, AER: Adaptive Emotion Regulation total, Rum: Rumination.

Table 6
Rumination predicting a composite variable of Behavioral Dysregulation

Model		β	<i>F</i> for Set	<i>R</i> ² change for set	<i>t</i>	Sig	Correlations zero order	Part	
1	Constant		2.28	.101	-.041	.967			
	Change in BAI	.314			2.29	.025	.232		.278
	Change in BDI	-.145			-1.06	.294	-.018		-.129
	Change in AER	-.164			-.134	.184	-.153		-.163
2	Constant		4.39	.126	.001	.999			
	Change in BAI	.276			2.15	.036	.232		.244
	Change in BDI	-.233			-1.71	.093	-.018		-.194
	Change in AER	-.159			-1.39	.17	-.153		-.158
	Change in Rum	.369			3.126	.003	.364		.355

Dependent BxComposite. *Note:* BAI: Beck Anxiety Inventory, BDI: Beck Depression Inventory, AER: Adaptive Emotion Regulation total, BxComposite: composite of *z*-scored behavior variables, Rum: Rumination.

urgency, and a composite of these variables (also including drinking to cope). The only behavior that changes in rumination were not correlated with was drinking to cope. Additionally, initial levels of ruminative processes did not predict changes in behavioral dysregulation. This suggests that current levels of rumination do not necessarily predict later change in behavioral dysregulation, but rather that times of high rumination may quickly result in more frequent engagement in dysregulated behaviors.

The finding that changes in rumination were not related to changes in drinking to cope was an interesting finding that did not support the hypotheses. Given that rumination at T1 was correlated with drinking to cope at T1 (as well as in Study 1), but that there was not a significant correlation between these variables at T2, suggests that the relationship between the two variables may have changed at T2. One possible explanation of this change in the relationship between the two variables may be that some individuals spent more time drinking and less time ruminating (via the effects of alcohol) at T2 than at T1. An examination of the scatter plots of the two variables at both T1 and T2 showed an increased number of individuals low in rumination and high in drinking to cope at T2 than T1, which may lend some support to this explanation.

One limitation with Study 2 included the passing of only a month between measurements, which may mean that the relationship between rumination and dysregulated behavior may not generalize to longer periods of time such as months or years. Another limitation is that trait measures of rumination and dysregulated behavior were used, rather than measures that gauged the levels of these constructs over the last few weeks—which may have been more appropriate to measure change in these constructs over a short period of time (e.g. 1 month). Because the instructions for completing the rumination question were the same at both Times 1 and 2, the finding that scores on this scale varied significantly over the short period of a month suggests that

rumination measures may have more state qualities than previously thought. Based on the events taking place in an individual's life, they may experience different levels of rumination. If they are experiencing stressful life events they may ruminate more, and if they are not experiencing stressful life events they may not be ruminating much. Rumination scales may be affected by this because as an individual answers the question, he or she may reflect on their current situation rather than a time that was more difficult or upsetting. A final limitation with Study 2 is the relatively small sample size, which may not have provided enough power to find a relationship between drinking to cope and rumination.

General discussion

The purpose of these studies was to examine the relationship between rumination and dysregulated behaviors, and in doing so determine if there is some support for the emotional cascade model. Using two different studies we were able to demonstrate that rumination is associated with some dysregulated behaviors, both cross-sectionally and temporally. The first study successfully used SEM to create a structural model in which rumination predicted higher frequencies of dysregulated behaviors, even after controlling for current psychological distress and a deficit of adaptive emotion regulation strategies. This study also provided support for a mediational relationship with the effects of current symptoms of anxiety and depression on dysregulated behavior being mediated by rumination and deficits in adaptive emotion regulation. The second study used a two time-point method, with a month in between measurement, to show that changes in rumination were temporally related to changes in dysregulated behaviors. The results of Study 2 found that changes in rumination significantly predicted changes in reassurance seeking, binge-eating behaviors, urgency, and a composite variable of dysregulated behaviors, even after controlling for changes in depression and anxiety symptoms, and for changes in deficits in adaptive emotion regulation. Furthermore, changes in rumination accounted for a sizable amount of variance in the changes of the behavioral variables over a period of only 1 month. Although these studies cannot establish a causal relationship between rumination and dysregulated behaviors, due to their correlational nature, these studies provide some support for an emotional cascade model in which emotional distress leads to intense rumination, which is in turn associated with dysregulated behaviors—which may subsequently result in distraction from negative affect and rumination.

The results of Study 1 are interesting in that not only did rumination have a significant relationship to behavioral dysregulation, but so did a deficit in adaptive emotion regulation strategies such as positive reappraisal, putting into perspective, refocusing on positive, and refocusing on planning. This significant relationship provides additional support for the emotional cascade model of dysregulated behaviors, in that individuals who engage in these behaviors may not only be increasing their negative affect (by ruminating) prior to engaging in the behavior, but additionally, they may have trouble using positive emotion regulation strategies to down-regulate negative affect. These deficits in adaptive emotion regulation strategies may be a result of not attempting to use them, or these strategies may be ineffective at inhibiting the ruminative process. The correlation between deficits in adaptive emotion regulation and behavioral dysregulation were not replicated in Study 2, however, which indicates that additional research may be needed to determine the role of adaptive emotion regulation strategies in maladaptive behaviors. One interesting finding of Study 2 was that initial scores on adaptive emotion regulation strategies significantly predicted changes in drinking to cope (and it accounted for 10% of the variance over the control variables). This suggests that low levels of adaptive emotion regulation may play a role in the onset of drinking to regulate negative affect.

The findings of Studies 1 and 2 also have potential clinical implications. For example, it may be important to assess rumination levels in individuals who are behaviorally dysregulated. It seems likely that individuals who engage in dysregulated behaviors will report experiencing high levels of rumination along with these behaviors, and providing psychoeducation about how rumination actually increases negative affect may help reduce the emotional intensity that is experienced along with these behaviors. It may also help for treatments of these behaviors to address additional ways to cope with emotional distress, specifically activities that provide distraction from ruminative tendencies. For example, engaging in activities such as cross-word puzzles or sudoku puzzles may be helpful because they require a good deal of concentration, thus leaving little attention left to be devoted to affective states. Additionally, given the finding of Study 1 that a deficit in adaptive emotion regulation strategies was also significantly related to behavioral dysregulation, it may be

important to teach patients who engage in dysregulated behaviors adaptive emotion regulation strategies as a way to help reduce ruminative processes.

The limitations of both Studies 1 and 2 have already been discussed in the discussion sections following each study, but there are also some limitations to the findings of both studies when considered together. The primary limitation is that both of these studies used correlational methods, and thus cannot establish a causal relationship between rumination and behavioral dysregulation. Thus, the question of whether rumination results in dysregulated behavior or times of dysregulated behavior result in increased rumination remains at issue, and rumination being the result of dysregulated behaviors may be a reasonable alternative explanation to the findings of these studies. One possibility is that both relationships may be accurate due to the concept of circular causality (Haken, 1977). Circular causality takes place when the output of a system feeds back into the system and results in additional output. In this case rumination may lead to a dysregulated behavior (such as a binge episode), but then subsequent rumination on the evaluations of that behavior (e.g. feelings of shame) may result in another emotional cascade and subsequent dysregulated behavior (such as purging). Potential evidence for circular causality comes from the study by Nolen-Hoeksema et al. (2007), who found that initial levels of rumination predicted increases in bulimic behaviors and alcohol use over the next few years, but furthermore found that initial levels of bulimic behaviors (but not alcohol use) predicted increased rumination over the next few years. Circular causality may also explain why some studies have found decreases in negative affect following a dysregulated behavior (Smyth et al., 2007), while other studies have not found this effect (Wegner et al., 2002).

Another limitation with these studies is that the participants in both Studies 1 and 2 were not from a clinical setting, meaning that the results of these studies may not generalize to individuals in clinical settings. Given the findings of previous studies that have linked rumination to alcohol use and binge-eating in clinical samples (Nolen-Hoeksema et al., 2007), however, it seems likely that these results will generalize to clinical populations. Another potential limitation is these results may only hold for the behaviors used to create the behavioral dysregulation latent variable, and rumination may not be linked to other forms of dysregulated behavior. Given the finding that four independent dysregulated behaviors fit the data adequately as one latent variable indicates that there may be a common underlying cause to dysregulated behaviors, and that rumination may be related to this cause.

The results of these studies provide important directions for future research. One important direction of future research is the use of Ecological Momentary Assessment (EMA) methodology in examining the relationship between emotional cascades and behavioral dysregulation in a naturalistic setting. EMA studies use programmable devices, such as palm-pilots, to monitor the emotional and behavioral tendencies of an individual in their daily life. Using this methodology it may be possible to clarify the temporal relationship between rumination and behavioral dysregulation, specifically to determine if high levels of state rumination precede various dysregulated behaviors. This methodology may also be able to determine if rumination on specific emotions leads to specific behaviors. EMA methodology cannot establish a causal relationship, however, so other methodologies will be needed to examine the emotional cascade model. For example, a carefully controlled study using a rumination induction and electrophysiological methods, paired with proxies for dysregulated behaviors (such as eating a snack for binge-eating or pain tolerance test for NSSI), may help establish if dysregulated behaviors reduce emotional arousal.

In conclusion, the findings of this study provide preliminary support for an emotional cascade model of dysregulated behavior. In this model high levels of rumination may cause extremely intense states of negative affect, which result in dysregulated behaviors that distract from rumination, and thus reduce that state of negative affect. This study specifically linked rumination to drinking to cope, binge-eating behaviors, reassurance seeking, and urgency, and it is likely that rumination is linked to a variety of other deregulated behaviors. Future research should continue to examine the emotional cascade model, and as well as examine how this model can inform psychological assessment and treatment.

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