



Variation in the physiological costs and benefits of rumination and distraction: The moderating effect of habitual thought suppression



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ABSTRACT

Whereas traditional theories of emotion regulation have differentiated between categorically adaptive and maladaptive strategies, contemporary research has emphasized the role of context in strategy efficacy. The current study sought to determine whether the effects of rumination, which is typically considered to be a maladaptive strategy, and the effects of distraction, which is typically considered to be an adaptive strategy, are moderated by trait thought suppression. In a sample of 50 participants, habitual thought suppression was measured and participants underwent either a rumination induction or distraction induction while respiratory sinus arrhythmia (RSA), a physiological index of flexible response to stimuli, was monitored. Results demonstrated that among trait thought suppressors, induced rumination resulted in increased RSA, suggesting enhanced regulatory flexibility, while induced distraction resulted in decreased RSA, suggesting less flexibility. Among individuals who are not prone to thought suppression, the converse was observed. These results provide support for the context-dependent theory of emotion regulation, and indicate that the efficacy of rumination and distraction may be moderated by proneness to thought suppression.

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The regulation of emotion is fundamental to both goal-directed behavior and hedonic well-being. Traditional theories of emotion regulation have differentiated between putatively adaptive strategies, such as acceptance and reappraisal, and maladaptive strategies, such as rumination (for review, see [Aldao, 2013](#)). Recently, alternative theoretical conceptualizations have underscored the importance of context in determining a strategy's adaptive potential ([Aldao, 2013](#)). This approach has led to research indicating that adaptive outcomes are linked not to the use of a single ideal strategy, but rather to the ability to flexibly employ strategies in concert with contextual demands ([Bonanno & Burton, 2013](#)). According to this reasoning, strategies typically deemed maladaptive may actually have more varied consequences across different types of situations ([Bonanno, Papa, Lalande, Westphal, & Coifman, 2004](#); [Tamir, Chiu, & Gross, 2007](#); [Tamir, Mitchell, & Gross, 2008](#)) and for different people ([Cheng, 2001](#); [Tamir, 2005](#); [Wegner & Bargh, 1998](#)).

Rumination, for example, is generally assumed to be a maladaptive strategy ([Gotlib & Joormann, 2010](#)) and, indeed, chronic

rumination has been implicated in the development of psychopathology ([Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008](#)). In the context of depression, rumination reduces motivation and instrumental problem solving ([Lyubomirsky, Tucker, Caldwell, & Berg, 1999](#); [Nolen-Hoeksema et al., 2008](#)). The negative consequences of rumination are clearest, however, when this behavior is enacted repetitively. Short-term use of rumination may enhance motivation and goal-directed behavior ([Watkins, 2008](#)). Temporary, intensely self-directed focus may also enhance emotional and physiological regulation ([Wegner & Bargh, 1998](#)).

By contrast, another strategy, distraction, is typically viewed as an effective mode of emotion regulation which, when employed early in the emotion-generation process, helps reduce negative behavioral and physiological responsivity ([Gross, 2002](#)). Distraction is associated with early reduction of the late positive potential ERP component, indicating that it is effective in the rapid attenuation of stimulus processing ([Thiruchselvam, Blechert, Sheppes, Rydstrom, & Gross, 2011](#)). Similarly, multiple studies have found that distraction decreases amygdala activation, which has been implicated in the processing of negative emotion ([Kanske, Heissler, Schönfelder, Bongers, & Wessa, 2010](#); [McRae et al., 2010](#)). There are contexts, however, in which distraction appears to be maladaptive. For example, distraction may impede the encoding of information, thereby impairing memory

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(Sheppes, Scheibe, Suri, & Gross, 2011), especially when distraction is employed late in an emotional situation (Sheppes & Meiran, 2008). Distraction may also impede cognitive performance and productivity (Healey, Campbell, & Hasher, 2008) and, in circumstances of high cognitive load, may allow unwanted thoughts to become especially salient (Wegner, 1994).

Apart from the contextual effects, the relatively adaptive or maladaptive consequences of a particular strategy may also be moderated by personality. For example, individuals who chronically attempt to suppress unwanted thoughts (Wenzlaff & Luxton, 2003) tend to deploy avoidant strategies, such as distraction (Wegner, 1994). However, since this trait has been linked to a range of psychological disorders (Luciano et al., 2006), their use of distraction may not serve adaptive purposes. Complementarily, since habitual thought suppressors are by definition unlikely to repeatedly engage unwanted material, it is plausible that for these individuals induced rumination may serve an adaptive function.

To test these ideas in the current study, we asked participants showing high or low tendencies toward thought suppression to engage in either a rumination induction task or a distraction task. To monitor the consequences of these tasks, we monitored respiratory sinus arrhythmia (RSA), which is a measure of variations in heart rate that accompany the respiratory cycle and a physiological index of parasympathetic activation relates to emotion regulation and capacity for flexible adaptation to stress (Hofmann et al., 2005). Phasic increases in RSA have been related to successful regulation and cognitive engagement (Thayer, Hansen, Saus-Rose, & Johnsen, 2009) and, thus indicate positive consequences of regulation. For example, Butler, Wilhelm, and Gross (2006) found that individuals who were instructed to regulate their emotions following the viewing of a disturbing film experienced increases in RSA while those who not instructed to self-regulate did not. Decreases in RSA have been related to autonomic dysregulation (Friedman & Thayer, 1998) and thus indicate negative consequences of regulation. Smith et al. (2011) observed decreased heart rate variability among married women who discussed with their husbands each other's faults; these researchers suggested that such stressful interactions may disrupt self-regulatory capacities.

In the current study we compared two hypotheses based on opposing theories of emotion regulation. The first hypothesis, which was based on the traditional theory of uniform efficacy, posited that induced rumination would result in decreased RSA across all participants, and distraction would result in increased RSA across all participants. The second hypothesis, which was based on the theoretical formulation of regulatory flexibility, posited that rumination would result in increased RSA and distraction would result in decreased RSA among those individuals prone to thought suppression. If induced rumination constitutes an exercise in coping flexibility for habitual thought suppressors, it's likely that increased parasympathetic activity and autonomic regulation would be observed. Furthermore, since these individuals habitually employ distraction, it's possible that use of this default strategy would result in decreased parasympathetic activity.

1. Method

1.1. Participants

Female participants between the ages of 18 and 60 were recruited via online advertisements posted on a public forum based in New York City. Recruitment was specific to women since previous research has shown significant gender differences in tonic as well as phasic cardiovascular physiology (Grossman, Wilhelm, & Spoerle, 2004). The advertisements briefly described a "thought pattern study" that involved several questionnaires, a basic

computer task, and noninvasive measurements of heart rate and respiration. Study sessions were approximately 45 min in length, and participants were paid \$10.

1.2. Materials

The instruments used in the current study were The White Bear Suppression Inventory and Mindware HRV Analysis Software.

1.2.1. Suppression

The White Bear Suppression Inventory (WBSI) is a 15-item measure that assesses an individual's tendency to suppress negative or unwanted thoughts (Wegner & Zanakos, 1994). The measure uses a 5-point Likert type scale and asks participants to rate the extent to which they agree with items such as, "My thoughts frequently return to one idea" and, "Sometimes I really wish I could stop thinking." In the original validation sample, the WBSI was shown to have high internal consistency ($\alpha = .89$) (Wegner & Zanakos, 1994).

1.2.2. Respiratory sinus arrhythmia

Mindware Acquisition hardware was used to collect heart rate and respiration data, and Mindware software was used to calculate a figure of mean phasic RSA across the task (Mindware Technologies Ltd., Gahanna, OH). RSA computation was based on fast Fourier transformations, and was estimated using the high-frequency component of heart rate variability in the respiratory frequency band (.12–.40 Hz), reflecting parasympathetic influences on the heart that vary with respiration.

1.3. Procedure

Participants completed a series of questionnaires including a demographics form and measure of trait suppression. Following completion, a research assistant helped participants affix three electrocardiogram electrodes, one below each clavicle and one at the left base of the ribcage, in order to monitor heart rate. In addition, an elastic belt was placed an inch above the navel to measure respiration rate (Berntson et al., 1997). Participants were randomly assigned to an induction condition, and then were asked to sit in front of a computer for an 8-min task. Prior to the induction, 2 min of baseline heart rate and respiration were recorded. Lyubomirsky and Nolen-Hoeksema (1993) designed the rumination and distraction tasks; both tasks involve the viewing of 45 slides for 10 s each. The rumination induction task included emotion-, symptom- and self-focused directives such as, "Think about the possible explanations for your physical sensations" and, "Think about whether you have accomplished a lot so far." The distraction task, which served as the control condition, included neutral, image-based directives such as, "Think about the shape of a large black umbrella" and, "Think about the baggage claim area at the airport." Following the task, a two-minute recovery period was recorded. After the induction, participants were debriefed and compensated.

1.3.1. Data analysis

In order to test the hypotheses, mean respiratory sinus arrhythmia was calculated by averaging minute-by-minute RSA across the 8-min induction task. A multiple regression was performed in which mean RSA was regressed on induction group, suppression scores, and a suppression score by induction condition interaction variable.

2. Results

There were no significant differences between induction groups in terms of age, race, or level of education (See Table 1), and the distributions of data for the suppression and RSA variables were normal (See Table 2). In addition, there were no differences in mean suppression or baseline RSA scores between induction groups (See Table 3) or racial categories.

To test the relationships described in the introduction, we regressed RSA on induction group, continuous suppression scores, and the suppression score by induction condition interaction. Together the predictors accounted for 18% of the variance in task RSA, $F(3,46) = 3.36$, $p = .027$. Both induction group ($t(46) = 2.24$, $p = .03$) and the suppression by group interaction variable ($t(46) = 2.53$, $p = .02$) were significant predictors of RSA while continuous suppression scores alone were not (See Table 4).

The plotted two-way interaction shows that, in the rumination condition, mean RSA was higher for those individuals with high trait suppression scores. As expected, the converse was observed in the distraction condition (See Fig. 1).

Table 1
Demographics.

	Overall sample, N = 50	Rumination group, N = 25	Distraction group, N = 25
Age	M = 28.4, SD = 9.0	M = 28.84, SD = 11.16	M = 27.92, SD = 7.75
Race			
Caucasian	40%, N = 20	44%, N = 11	36%, N = 9
Latina	6%, N = 3	8%, N = 2	4%, N = 1
African-American	30%, N = 15	32%, N = 8	28%, N = 7
Asian-American	18%, N = 9	12%, N = 3	24%, N = 6
Other	6%, N = 3	4%, N = 1	8%, N = 2
Years of education			
High school	46%, N = 23	60%, N = 15	32%, N = 8
College degree	38%, N = 19	32%, N = 8	44%, N = 11
Graduate degree	6%, N = 8	8%, N = 2	24%, N = 6

Table 2
Descriptive statistics.

	M	SD	Minimum	Maximum	Cronbach's α
WBSI scores	52.28	12.05	22.00	73.00	.90
Baseline RSA	6.22	1.26	3.30	8.57	–
Task RSA	6.13	1.15	2.54	8.68	–
Recovery RSA	6.15	1.15	3.01	8.69	–
Heart rate	76.44	12.07	55.06	12.07	–

N = 50.

Table 3
Descriptive statistics by induction group.

	Rumination condition		Distraction condition		t	p
	M	SD	M	SD		
WBSI scores	52.88	10.93	51.68	13.28	.35	.73
Baseline RSA	6.30	1.21	6.13	1.33	.48	.64
Task RSA	6.27	0.99	5.99	1.30	.88	.39
Recovery RSA	6.40	1.07	5.90	1.18	1.56	.13

Table 4
Condition and suppression as predictors of task RSA.

	B	SE (B)	β	t	p	Partial r	Part r
Induction group	3.13	1.40	1.38	2.24	.03	.31	.30
WBSI score	0.08	0.04	.875	1.92	.06	.27	.26
Induction group * WBSI score	–0.07	0.03	–1.86	–2.53	.02	–.35	–.34

Note: dependent variable is task RSA.

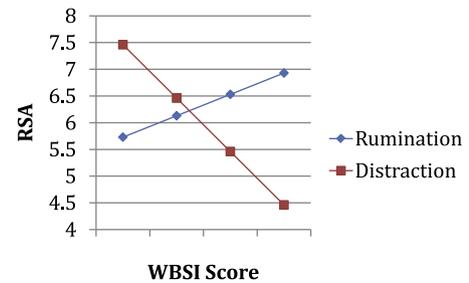


Fig. 1. Interaction of induction condition (rumination versus distraction) and White Bear Suppression Inventory (WBSI) scores on respiratory sinus arrhythmia (RSA).

3. Discussion

As anticipated, the relationship between respiratory sinus arrhythmia and suppression scores varied by induction group. Respiratory sinus arrhythmia (RSA) is considered a physiological analogue to coping flexibility; increases in RSA indicate flexible response to challenges (Thayer & Lane, 2000). Research has demonstrated that heart rate variability relates to a number of cortical-subcortical pathways that correspond to top-down appraisal of stimuli. These appraisals are instrumental in thwarting default responses (such as fight-or-flight) and promoting flexible cognitive and physiological control, thereby facilitating adaptive responses to stimuli (Thayer, Åhs, Fredrikson, Sollers, & Wager, 2012). Results of the present study showed that, for individuals who are prone to thought suppression, induced distraction resulted in reductions in RSA which may suggest negative consequences, whereas inducing rumination showed increases in RSA. By contrast, for those individuals with low trait thought suppression, inducing distraction was related to increased RSA, suggesting increased flexibility, while rumination resulted in lower RSA.

While it is widely assumed that emotion regulation strategies are categorically adaptive or maladaptive, the present findings indicate that the efficacy of two such strategies, rumination and distraction, may actually be dependent upon person-situation interactionist factors. More specifically, rumination is detrimental when it is enacted repetitively over long periods of time (Nolen-Hoeksema et al., 2008). Conversely, ruminative self-focus may serve adaptive consequences, including enhanced cognitive processing and anticipatory planning (Watkins, 2008), especially when this self-focus is concrete and short-term (Watkins & Moulds, 2005). It is possible that these benefits are especially pronounced for habitual thought suppressors, who may typically avoid self-focus, and whose emotion regulation strategies may be characterized by a lack of flexibility to context. Among these individuals, induced rumination may have facilitated cognitive processing of self-referential thoughts that would otherwise be avoided.

While distraction is typically considered to be a more adaptive strategy than rumination (Lyubomirsky, Kasri, & Zehm, 2003), our results demonstrated that induced distraction resulted in

decreased RSA among habitual thought suppressors thereby indicating a less flexible response to the task. Distraction is integral to the process of thought suppression, and serves an avoidant function (Wegner, 1994). These avoidant mechanisms have been implicated in a range of psychopathological symptoms (Luciano et al., 2006), indicating that distraction serves a maladaptive function for this population. The data support this conclusion, as induced distraction resulted in decreased parasympathetic activity for habitual thought suppressors. The study's hypotheses are further supported by the inverse effects observed among those participants who were not habitual thought suppressors: distraction resulted in higher RSA, while rumination resulted in lower in RSA.

There are several limitations to the current study. There was no post-induction manipulation check to ascertain whether participants indeed ruminated or had been distracted. Furthermore, RSA alone was used as an index of flexible regulation. This index was selected because of the sensitivity of physiological measurement, and its freedom from reporting bias in individuals who may struggle with self-reporting emotional processes, yet this data could have been enhanced by an additional self-report measure of perceived emotion regulation. Future studies should consider the inclusion of a manipulation check as well as a measure of state emotion.

Despite these limitations, the novel approach we adopted in the current study yielded potentially important findings about variation in the consequences of rumination and distraction. Our results add to a growing body of research that supports the complexity and situation-dependence of emotion regulation strategies, and the role of flexibility (Bonanno & Burton, 2013; Kashdan & Rottenberg, 2010). Specifically, our results demonstrate that, for individuals prone to suppression, a rumination induction may increase parasympathetic activation, and distraction induction may decrease such activation. For individuals who are prone to cognitive avoidance or thought suppression, effortful and directed rumination may constitute an effective strategy of emotion regulation, while distraction may be avoidant and detrimental. These findings have implications for the effectiveness of cognition-based treatment modalities, which have traditionally aimed to decrease rumination (Watkins et al., 2007). As the beneficial effects of this strategy may manifest on both emotional and physiological levels, exercises akin to rumination, such as sustained engagement with aversive thought, should be considered for cognition-based treatment protocols used with these individuals.

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