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## Do Negative Appraisals of Unwanted Thoughts Predict Negative Outcomes? A Test of the Effect of Negative Appraisals across Thought Types

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### Abstract

Cognitive-behavioral and metacognitive theories propose that negative interpretations of normal intrusive or repetitive negative thoughts lead to symptoms of anxiety and depression. However, most research has been correlational and has examined only obsessional thoughts, despite similarities between theoretical models of obsessions and models of worry and rumination. In the present study, healthy participants were randomly assigned to receive negative, normalizing, or no feedback about their worried, ruminative, and obsessional thoughts to test the hypothesis that negative thought appraisals predict increased negative outcomes across thought types. Additional analyses determined whether preexisting beliefs about thoughts predicted outcomes, either alone or in interaction with experimental condition. Preexisting beliefs interacted with experimental condition to predict affective responses, with negative feedback having the expected effect only for individuals with preexisting negative beliefs about thoughts. Overall, results are consistent with a transdiagnostic model in which preexisting negative beliefs about thoughts act as a cognitive vulnerability in the face of specific, relevant environmental stressors.

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## Introduction

Anxiety and mood disorders are among the most prevalent mental disorders in the US, with approximately 21% to 29% of adults meeting diagnostic criteria during their lifetime (Kessler, Berglund, Demler, Merikangas, & Walters, 2005). Cognitive-behavioral theories, which emphasize the role of thought processes in causing feelings and behaviors, have been highly influential in the understanding and treatment of these disorders. More recently, metacognitive theories have led to new advances through a related but narrower focus on individuals' beliefs about, and appraisals of, their own thoughts (Wells, 1997; 2000; Wells & Matthews, 1994). Although cognitive-behavioral and metacognitive theories of different anxiety and mood disorders have developed largely independently, all share the common assertion that negative mental health consequences result from misinterpretations of internal or external experiences (Beck, 1964; Ellis, 1962; Lazarus, 1982; Power & Dalgleish, 2008; Wells, 1997).

Intrusive or repetitive negative thought represents one internal experience that is hypothesized to result in anxiety or mood symptoms when misinterpreted as uncontrollable, dangerous, or harmful (Papageorgiou & Wells, 2001; Rachman, 1997; Wells, 1995). Generalized anxiety disorder (GAD), major depressive disorder (MDD), and obsessive-compulsive disorder (OCD) each include some form of intrusive or repetitive negative thought as a key feature in the etiology and experience of the disorder. Worry, the central feature of GAD, is future-focused and is characterized by a predominance of verbal thought and an abstract processing style (Borkovec, Robinson, Pruzinsky, & DePree, 1983). The rumination commonly found in MDD is similarly verbal and abstract, but tends to focus on the past or present rather than the future (Ehring & Watkins, 2008; Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). In contrast, the obsessions characteristic of OCD include a preponderance of imagery rather than verbal thought (Langlois, Freeston, & Ladouceur, 2000a, 2000b; Wells & Morrison, 1994) and their content tends to include more than the daily life concerns that are the focus of worry and rumination. Despite some differences, the three thought types share important similarities: all are typically unwanted, and all are associated with negative emotions and loss of mental control (Ehring & Watkins, 2008; Langlois et al., 2000b; Papageorgiou, 2006).

Importantly, because each thought type is common in nonclinical populations (Nolen-Hoeksema, Morrow, & Fredrickson, 1993; Ruscio, 2002; Ruscio, Stein, Chiu, & Kessler, 2010), theorists have long sought to explain why only a subset of individuals who experience these thoughts develop clinically significant anxiety or depression symptoms (Langlois et al., 2000b; Papageorgiou, 2006). Cognitive-behavioral and metacognitive theories of GAD, MDD, and OCD propose that the pathway from normal intrusive or repetitive negative thoughts to symptom

development begins when the thoughts are followed by negative appraisals, or interpretations of the thoughts as dangerous or threatening. Negative appraisals of particular thought occurrences are proposed to stem from the individual's global beliefs about the corresponding thought type. Individuals differ in their global tendency to believe that intrusive negative thoughts are dangerous or threatening and an individual holding more global negative beliefs about thoughts is more likely to make a negative appraisal and to experience distressing emotions in response to a particular thought occurrence (Purdon, 2001; Steketee et al., 1997). Across thought types and disorders, negative appraisals, rather than the thoughts themselves, are believed to cause symptoms of anxiety and depression (Papageorgiou & Wells, 2003; Salkovskis, 1985; Wells, 1995).

Past tests of these theories have largely supported the proposed associations between negative interpretations of thoughts and anxiety and depression symptoms. Global negative beliefs and specific negative appraisals of worried, obsessional, and ruminative thoughts have been associated with negative affect; cognitive and behavioral avoidance; and symptoms of anxiety, depression, and OCD (e.g., Freeston, Ladouceur, Thibodeau, & Gagnon, 1991, 1992; Langois et al., 2000a; Purdon, 2001; Starr & Moulds, 2006; Steketee et al., 2003; Watkins, 2004). Furthermore, in the only longitudinal study performed to date, negative appraisals of obsessional thoughts experienced in the first month after the birth of a child were found to partially mediate the relationship between pre-birth global negative beliefs about thoughts and OCD symptoms three months postpartum (Abramowitz, Nelson, Rygwall, & Khandker, 2007). Overall, these findings are consistent with the premise that negative interpretations of thoughts play an important role in the pathway from normal thoughts to symptom development. However, as a test of existing theoretical models, this research is limited in several important respects.

First, most studies have used cross-sectional correlational designs, with only a few exceptions that have induced OCD-relevant thought appraisals in nonclinical samples. One such study found that experimentally induced appraisals of responsibility and thought-action fusion (the assumption of incorrect causal relationships between thoughts and external events) led to increased discomfort and efforts to resist thoughts (Rassin, Merckelbach, Muris, & Spaan, 1999). A separate set of studies experimentally manipulated appraisals concerning the personal meaning and morality of intrusive thoughts (Teachman & Clerkin, 2007; Teachman, Woody, & Magee, 2006). In this study, reactions explicitly reported by participants (e.g., state self-esteem) were predicted by preexisting beliefs about obsessional thoughts, but not by the experimental manipulation. In contrast, implicit self-evaluation (as measured by the Implicit Associations Test; Greenwald, McGhee, & Schwartz, 1998) was predicted by the interaction of experimentally induced appraisals and preexisting beliefs, with more negative preexisting beliefs about thoughts predicting a stronger response to feedback about the personal meaning and morality of thoughts. In related research, a psychoeducational intervention correcting negative appraisals and maladaptive avoidance behavior was found to reduce anxiety symptoms among undergraduate students with subclinical OCD (Zucker, Craske, Blackmore, & Nitz, 2006). Similarly, cognitive bias modification has been found to reduce anxiety-related cognitive biases and symptoms by training participants in new ways of processing information in order to change interpretations and other cognitive biases (see Beadel, Smythe, & Teachman, 2014; Hertel & Mathews, 2011; MacLeod & Mathews, 2012). Taken together, these experiments suggest that appraisals of obsessional thoughts influence behavioral and emotional experience, even in nonclinical samples. It remains an open question whether this apparent role of appraisals extends to worry and rumination, which have been understudied relative to obsessions.

Second, most research on negative appraisals has been disorder-specific (e.g., Lang, Moulds, & Holmes, 2009; Would, Holmes, Postma, Dalgleish, & Mackintosh, 2012), despite parallels in etiological theories across disorders and an increasing shift in the literature toward identifying common mechanisms that operate across diagnostic categories. Intrusive or repetitive negative thought is particularly well-suited to transdiagnostic study, having been identified as a central feature of several anxiety and mood disorders (Ehring & Watkins, 2008; Harvey, Watkins, Mansell, & Shafran, 2004). Transdiagnostic study of the pathway from intrusive or repetitive negative thought to symptom development may have a number of advantages. If the effect of negative appraisals on outcomes is similar across thought types, it would suggest not only that metacognitive processes cut across GAD, MDD, and OCD (Harvey et al., 2004), but that their functional significance and mechanisms of action may be similar across the three disorders. This could, in turn, facilitate the transfer of scientific and treatment advances between disorders, leading to new applications of available interventions, to improvements in treatment efficiency, or to the

development of more potent interventions for the many individuals who suffer from more than one of these disorders (Ruscio, Seitchik, Gentes, Jones, & Hallion, 2011). For example, if appraisals of intrusive or repetitive negative thoughts are found to operate similarly across disorders, an intervention that has successfully been used to modify negative appraisals of obsessions (Zucker et al., 2006) could fruitfully be extended to worry and rumination.

To address these gaps in the literature, the present study manipulated appraisals of normal intrusive or repetitive negative thoughts by providing negative, normalizing, or no feedback about the severity of these thoughts to healthy participants. We had two objectives. The first was to test the emotional impact of experimentally induced negative appraisals of worried, ruminative, and obsessional thoughts. Across all three thought types, those receiving negative feedback about their thoughts were expected to report greater negative affect and less positive affect relative to those receiving normalizing feedback and no feedback. The second objective was to test whether participants' preexisting negative beliefs about thoughts interacted with experimentally induced appraisals in predicting affective outcomes. Based on previous research (Rassin et al., 1999; Teachman & Clerkin, 2007), we expected higher levels of preexisting negative beliefs to predict greater negative affect and less positive affect among those assigned to receive negative feedback, with those assigned to receive normalizing or no feedback showing a weaker or no relationship between preexisting beliefs and affect. Because the normalizing and no feedback groups were not the primary focus of the present study, specific hypotheses were not made about the relationship between preexisting beliefs and affect in these groups. However, past research suggests that preexisting beliefs may show no relationship to affect among individuals receiving normalizing feedback (Zucker et al., 2006), while the no feedback group may be expected to show a relationship between preexisting beliefs and affect that is similar to but weaker than that seen in the negative feedback group (i.e., higher levels of preexisting negative beliefs predict greater negative affect and less positive affect), simply as a result of being reminded of their unwanted thoughts (Purdon, 2001; Steketee et al., 1997). Negative and positive affect were selected as outcomes for the present study because they are highly relevant across the anxiety and mood disorders, and may be quite sensitive to the effects of appraisal feedback (Watson, Clark, & Tellegen, 1988), increasing the possibility of detecting interaction effects.

## Method

### Participants

The sample consisted of 98 undergraduate students at a private northeastern university. Participants were primarily female (56%;  $n = 55$ ) with a mean age of 19.76 ( $SD = 2.05$ ). The sample was 49% Caucasian, 33% Asian/Pacific Islander, 12% Black, and 6% other race-ethnicity. Twelve percent of the sample identified as Hispanic. Because we were interested in experimentally manipulating appraisals in a healthy sample, and in order to protect those who might experience excessive distress as a result of receiving negative feedback about their thoughts, individuals were screened online to determine eligibility to participate in the study. This screening included self-report of past and current mental health diagnoses, as well as self-report measures of symptoms of GAD (GAD-Q; Roemer, Borkovec, Posa, & Borkovec, 1995), OCD (Obsessive-Compulsive Inventory – Revised; Foa et al., 2002), and depression (Diagnostic Inventory for Depression; Zimmerman, Sheeran, & Young, 2004). Individuals who self-reported a current or lifetime diagnosis of GAD, OCD, or depression ( $n = 1$ ), or who scored above the clinical cutoff suggestive of probable diagnosis on self-report symptom measures ( $n = 2$ ) were excluded from participating in the study.

### Design

The study used a 3x3 mixed factorial design. The between-subjects factor was experimental condition (Negative, Normalizing, No Feedback). The primary condition of interest (Negative Feedback) was compared with two conditions that controlled for the receipt of specific feedback about thoughts (Normalizing Feedback) as well as for the effects of testing, including the recollection of intrusive or repetitive negative thoughts (No Feedback). Results from pilot testing showed that the Negative Feedback manipulation was successful in inducing negative appraisals

of thoughts, relative to the Normalizing and No Feedback manipulations. The within-subjects factor was thought type (worried, ruminative, obsessional). Order of thought types was counterbalanced within each condition.

A power analysis was conducted using GPower to estimate the sample size necessary to detect an interaction between experimental condition and preexisting beliefs. Effect sizes from previous research were in the moderate range ( $d = 0.32$ ; Teachman & Clerkin, 2007) and were submitted to the power analysis, which indicated that a power level of 0.80 (with  $\alpha = .05$  level) would be achieved with a total sample size of 96 (32 per condition). Results from this power analysis also indicated that a sample size of 32 per condition would be sufficient for detection of main effects at a power level of 0.80 (Cohen, 1988).

## Measures

### Pre-manipulation measures.

Before receiving any instructions related to the experimental manipulation, participants completed the Metacognitions Questionnaire (MCQ; Cartwright-Hatton & Wells, 1997). The MCQ assesses five domains of beliefs about worry and intrusive thoughts. Items are rated on a Likert scale from 1 (*do not agree*) to 4 (*agree very much*) and are summed within subscales. We used only the two negative beliefs subscales in the present study: Negative Beliefs about the Controllability of Thoughts and Corresponding Danger (16 items; e.g., "If I let my thoughts get out of control, they will end up controlling me") and Negative Beliefs Involving Superstition, Punishment, and Responsibility (13 items; e.g., "If I do not stop my thoughts, they could come true"). Because the two negative beliefs subscales were conceptually related and highly correlated ( $r = .58$ ), they were standardized and combined into a single preexisting negative beliefs composite for analysis ( $\alpha = .92$ ).

Participants were asked to provide information about one recently experienced worried, ruminative, and obsessional thought. First, participants were presented with definitions and examples of worried, ruminative, and obsessional thoughts that are commonly reported by college students and have been used in previous research studies with this population (e.g., McLaughlin, Borkovec, & Sibrava, 2007; Teachman et al., 2006; see Appendix). Definitions appeared on the computer screen and were read aloud by the experimenter. Participants were asked to recall one thought of each type that they had recently experienced and to describe the content of each thought in one to two sentences. All participants were able to recall a recently experienced thought of each type and the content of each worried, ruminative, and obsessional thought reported by participants was examined by both the first author and an independent rater to ensure that each thought was appropriately categorized based on the definitions provided to participants (see Preliminary Analyses).

Participants were then asked to provide additional information about each thought using the general descriptors subscale of the Cognitive Intrusions Questionnaire (CIQ; Freeston et al., 1992), which assesses frequency ("How often does this thought enter your mind?"); duration ("How long does the thought usually last?"); triggers ("Are you aware of triggers that set off the thought?"); distress ("How much does this thought bother you?"); and persistence ("How difficult is it for you to remove this thought from your mind?"). Each CIQ item was rated on a 1-9 Likert scale.

To ensure that all participants endorsed at least some bothersome thoughts (so that the manipulation was believable), a series of very commonly reported thoughts of each type were added to the CIQ (e.g., "When on a high ledge, I have had the thought of jumping;" "On occasion, I have had doubts about my ability to succeed in life"). Items were taken from a measure of social desirability (Crowne & Marlowe, 1960) and were reviewed by a small group of researchers and clinicians with expertise in the area of intrusive or repetitive negative thought who assessed the relevance of the items and suggested additional items for inclusion. Participants rated each of these Common Bothersome Thought items on a Likert scale ranging from 1 (*not at all true*) to 9 (*extremely true*) before nominating their three recently experienced thoughts.

### Outcome measures.

Following the experimental manipulation, participants completed the PANAS (Watson et al., 1988) with state instructions that referenced each thought type (i.e., "Please indicate to what extent you feel this way right now, thinking about your thought \_\_\_\_"). Participants were asked to respond to each item on a Likert scale ranging

from 1 (*very slightly or not at all*) to 5 (*extremely*). The PANAS was selected as the primary outcome measure due to its ability to capture immediate fluctuations in affect evoked by the manipulation. Cronbach's alpha for the negative and positive affect scales was good to excellent for each of the three thought types ( $\alpha = .88 - .93$ ). Items were averaged into separate negative affect and positive affect scores for each thought type.

## Procedure

Participants were recruited from the Psychology Department's Research Participation Web site. All study procedures took place in a single laboratory session run by a female experimenter. Immediately prior to the experiment, participants were randomly assigned to receive feedback that the thoughts they reported on the CIQ were more severe than those reported by their peers (Negative Feedback;  $n = 34$ ) or average relative to their peers (Normalizing Feedback;  $n = 32$ ), or to receive no feedback about their thoughts (No Feedback;  $n = 32$ ).

Participants were told that the purpose of the study was to examine how people's thoughts and beliefs affect their feelings and emotions. After providing informed consent, participants were seated at a laptop computer. All questionnaires were administered electronically using Qualtrics Survey Software with "stop" screens built in to alert the participant when it was time to receive further instruction from the experimenter. Participants began the experiment by completing the MCQ, followed by the Common Bothersome Thought items. They were then presented with definitions and examples of worried, ruminative, and obsessional thoughts, which appeared on the computer screen and were read aloud by the experimenter. Participants provided information about one recently experienced thought of each type, completing the CIQ descriptors subscale for each thought. Participants were then asked to wait while the experimenter went back to the lab, ostensibly to download and score the questionnaires.

Upon returning, the experimenter provided the following feedback to the Negative Feedback group: *You're reporting more severe thoughts than we typically see on these questionnaires. What the scoring program has done is to create a standardized composite score of the thoughts you've reported based on the rarity of the thought content combined with the thought frequency and controllability. This creates a normal distribution where the mean standardized score is 50. You're scoring in the 89th percentile, meaning that overall, the thoughts you reported are more rare in content, more frequent, and more uncontrollable than 89% of college students based on norms from previous studies. I checked with the lab manager about whether these thoughts were too severe to continue and she thinks it will be fine for us to go on, so I'm going to have you fill out some additional questionnaires about these thoughts.*

The Normalizing Feedback group received the following feedback about their thoughts: *You're reporting average thoughts, which are similar to what we typically see on these questionnaires. What the scoring program has done is to create a standardized composite score of the thoughts you've reported based on the rarity of the thought content combined with the thought frequency and controllability. This creates a normal distribution where the mean standardized score is 50. You're scoring in the 51<sup>st</sup> percentile, meaning that overall, the thoughts you reported are average in rarity of content, frequency, and uncontrollability compared to college student norms. Our lab manager confirmed that it will be fine for us to continue with the experiment, so I'm going to have you fill out some additional questionnaires about these thoughts.*

Finally, the No Feedback group received the following information: *We're asking students to report thoughts in order to help us develop norms for these questionnaires. What the scoring program will do is to create a standardized composite score of the thoughts based on the rarity of the thought content combined with the thought frequency and controllability. This will create a normal distribution where the mean standardized score is 50. Your answers will help us to create the college student norms for these thoughts. Our lab manager confirmed that it will be fine for us to continue with the experiment, so I'm going to have you fill out some additional questionnaires about these thoughts.*

To enhance believability, feedback in the Negative Feedback and Normalizing Feedback conditions was accompanied by a printed score sheet that showed the participant's score for each individual thought, along with a standardized composite score for the three thoughts displayed on a normal distribution curve. Participants in the

No Feedback condition were shown a blank score sheet to demonstrate what the scoring program would do once developed.

Immediately after the manipulation, participants completed the PANAS three times, once for each thought. After completing all experimental measures, participants were asked whether they believed that the feedback they had received about their thoughts was true and accurate. Their affirmative or negative response was recorded to serve as a manipulation check. Participants were also asked to state what they believed to be the purpose of the study. Participants were then debriefed and desensitized. Participants in all groups were told about the false feedback and given a chance to ask questions and discuss concerns before leaving the lab. All participants expressed understanding and no participant expressed distress or concern about the experimental procedures.

## Results

### Preliminary Analyses

#### Accuracy of thought classification.

All participants were able to recall a recently experienced thought of each type and write approximately one to two sentences describing the thought content. The average length of description of the thought content ranged from 2-50 words and did not differ across thought types. Before testing study hypotheses, the content of each worried, ruminative, and obsessional thought reported by participants was examined by both the first author and an independent rater to ensure that each thought was appropriately categorized based on the definitions provided to participants. Interrater reliability was good to excellent for each thought type ( $\kappa = .98, .90,$  and  $.79$  for worried, ruminative, and obsessional thoughts, respectively). Disagreements between raters were discussed until a consensus was reached. One obsessional thought was determined to be a poor fit for the thought definitions and was excluded from analyses, resulting in a final sample of 98 worried thoughts, 98 ruminative thoughts, and 97 obsessional thoughts.

#### Demand effects and believability of feedback manipulation.

No participant in any group was aware of the true aim of the study (i.e., manipulating appraisals of thoughts), reducing the likelihood that results are attributable to demand characteristics. The majority of participants in all three groups believed the feedback they received about their thoughts. The proportion of participants who reported believing the manipulation did not differ by group, with 82% of participants (28/34) in the Negative Feedback group reporting that they had believed the feedback, compared to 91% in the Normalizing Feedback group (29/32) and 97% (31/32) in the No Feedback group,  $\chi^2(2, N = 98) = 4.54, p = .104$ . Because believability did not differ between conditions, and in order to maximize sample size, all participants were included in analyses. The inclusion of all participants was also intended to increase generalizability of the present results to real-world situations in which individuals may receive feedback related to the normality of their thoughts from peers or other sources varying in authority or believability, which may result in affective and behavioral change, even when the individual does not report being affected by the feedback (Gawronski & Bodenhausen, 2006).

#### Success of random assignment and evaluation of order effects.

We tested for differences between the Negative, Normalizing, and No Feedback groups prior to the manipulation to check the success of random assignment. The groups did not differ in preexisting beliefs about thoughts (MCQ),  $F(2, 95) = 0.26, p = .775$  (see Table 1 for descriptive statistics) or in ratings of frequency, duration, distress, or persistence (CIQ) related to any of the three thought types, all  $F(2, 95) < .094, all p > .908$ . There was no main effect of thought order and no interaction between thought order and experimental condition in predicting any outcome, all  $F < 1.99, all p > .104$ .

## Effect of Experimental Condition and Interaction with Preexisting Negative Beliefs<sup>1</sup>

Descriptive statistics for each thought type (worried, ruminative, and obsessional) and condition (Negative Feedback, Normalizing Feedback, No Feedback) are presented in Table 1. We expected that those receiving negative feedback would report greater negative affect and less positive affect relative to those receiving normalizing feedback and no feedback, across all three thought types. We further hypothesized that the effects of the feedback would be qualified by an interaction with preexisting negative beliefs about thoughts (measured by the MCQ). Specifically, we hypothesized that higher levels of preexisting negative beliefs would predict more negative and less positive affect among those randomly assigned to the Negative Feedback condition, relative to those assigned to the Normalizing or No Feedback conditions. These hypotheses were tested using hierarchical regression, according to guidelines outlined by Aikin and West (1991).

*Table 1: Descriptive Statistics by Condition*

Measure	Negative Feedback ( <i>n</i> = 34)	Normalizing Feedback ( <i>n</i> = 32)	No Feedback ( <i>n</i> = 32)
Metacognitions Questionnaire			
Controllability/Danger	31.69 (9.04)	31.55 (9.49)	32.31 (10.18)
Superstition/Punishment/Responsibility	23.32 (6.79)	23.68 (5.82)	22.79 (5.74)
Obsession			
Negative Affect	1.76 (.76)	1.76 (.62)	2.14 (.73)
Positive Affect	2.01 (1.03)	1.72 (.59)	1.94 (.81)
Worry			
Negative Affect	1.76 (.78)	1.74 (.61)	2.26 (.66)
Positive Affect	2.54 (.88)	1.83 (.89)	2.08 (.78)
Rumination			
Negative Affect	1.84 (.77)	1.89 (.68)	2.06 (.81)
Positive Affect	2.33 (.99)	1.80 (.70)	1.87 (.72)

Note. Values represent *M* (*SD*).

We performed parallel analyses by thought type for each outcome (negative affect and positive affect) in order to test whether the pattern of results was the same across thought types. This resulted in a total of six regression analyses. Prior to analysis, the continuous predictor variable (preexisting negative beliefs) was standardized. Experimental condition was represented by two dummy-coded variables. The Negative Feedback group was coded "0" in both dummy-coded variables, while each comparison group was coded "1" in one dummy variable and "0" in the other, causing the Negative Feedback group to be treated as the reference condition when both dummy-coded variables are entered together into regression analyses (Aikin & West, 1991). Two interaction terms were created by multiplying preexisting negative beliefs by each of the two dummy-coded variables (Negative Feedback versus Normalizing Feedback and Negative Feedback versus No Feedback). In all analyses, the preexisting negative beliefs composite was entered on the first step to test for a main effect of beliefs in predicting outcomes. The two dummy-coded variables representing experimental condition were entered on the second step, in order to test for the effect of condition above and beyond the effect of preexisting negative beliefs. Finally, the two interaction terms were entered on the third step to test for differences in the effect of preexisting beliefs as a function of experimental condition.

<sup>1</sup> We performed sensitivity analyses including only the subset of participants in each experimental condition who reported believing the feedback. Although estimates changed slightly, the overall pattern of results was unchanged.

Preexisting negative beliefs accounted for a significant proportion of the variance in negative affect across all three thought types (7%-15%; see Table 2). Individuals with higher levels of preexisting negative beliefs reported more negative affect following the experimental manipulation, irrespective of experimental condition.



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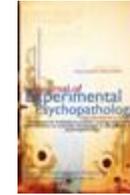


Table 2: Results from Hierarchical Regression Analyses Predicting Negative Affect

	Obsession					Worry					Rumination				
	B	SE	$\beta$	R <sup>2</sup>	$\Delta R^2$	B	SE	B	R <sup>2</sup>	$\Delta R^2$	B	SE	$\beta$	R <sup>2</sup>	$\Delta R^2$
Step 1				.12	.12**				.15	.15**				.07	.07*
Preexisting beliefs	.40	.13	.35**			.44	.13	.38**			.30	.13	.26*		
Step 2				.19	.07				.25	.11*				.09	.02
Condition (NEG v. NORM)	.05	.27	.02			-.01	.27	-.01			.01	.29	.00		
Condition (NEG v. NO)	.57	.27	.27			.71	.26	.33**			.33	.28	.16		
Step 3				.29	.10*				.32	.06*				.22	.13**
Preexisting beliefs* Condition															
(NEG v. NORM)	-.91	.31	-.41**			-.76	.31	-.34*			-1.07	.33	-.48**		
Preexisting beliefs * Condition															
(NEG v. NO)	-.20	.28	-.11			-.36	.29	-.20			-.61	.29	-.35**		

Note.  $N = 98$  for worried and ruminative thoughts.  $N = 97$  for obsessional thoughts. NEG = Negative Feedback; NORM = Normalizing Feedback; NO = No Feedback. Separate hierarchical regression analyses were conducted for each thought type. Condition was included in the model as a set of dummy codes contrasting Negative Feedback (0) with Normalizing Feedback (1) and No Feedback (1) conditions.

\* $p < .05$ . \*\* $p < .01$ .

*Table 3: Results from Hierarchical Regression Analyses Predicting Positive Affect*

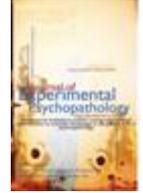
	Obsession					Worry					Rumination				
	B	SE	$\beta$	R <sup>2</sup>	$\Delta R^2$	B	SE	B	R <sup>2</sup>	$\Delta R^2$	B	SE	$\beta$	R <sup>2</sup>	$\Delta R^2$
Step 1				.00	.00				.01	.01				.04	.04
Preexisting beliefs	.00	.13	.00			.10	.13	-.09			-.21	.13	-.19		
Step 2				.01	.01				.09	.08				.10	.06
Condition (NEG v. NORM)	-.28	.29	-.13			-.66	.27	-.32			-.52	.28	-.25		
Condition (NEG v. NO)	-.12	.28	-.06			-.42	.27	-.21			-.50	.27	-.24		
Step 3				.03	.02				.11	.02				.16	.06
(NEG v. NORM)	.33	.35	.15			.31	.34	.15			.71	.34	.33		
(NEG v. NO)	.27	.32	.16			.33	.31	.20			.53	.30	.31		

Note. N = 98 for worried and ruminative thoughts. N = 97 for obsessional thoughts. NEG = Negative Feedback; NORM = Normalizing Feedback; NO = No Feedback. Separate hierarchical regression analyses were conducted for each thought type. Condition was included in the model as a set of dummy codes contrasting Negative Feedback (0) with Normalizing Feedback (1) and No Feedback (1) conditions. No coefficients were significant at  $p < .05$ .



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There was no consistent main effect of experimental condition. Instead, experimental condition interacted with preexisting beliefs to predict negative affect. The interaction between preexisting negative beliefs and experimental condition accounted for an additional 6% to 13% of the variance in negative affect associated with worried, ruminative, and obsessional thoughts. Across all three thought types, the relationship between preexisting negative beliefs and post-feedback negative affect differed for individuals in the Negative Feedback compared to the Normalizing Feedback condition (see Figure 1). To further examine the nature of this interaction, simple slopes were computed for the relationship between preexisting beliefs and negative affect within the Negative Feedback and Normalizing Feedback conditions. For all three thought types, higher levels of preexisting negative beliefs were associated with greater negative affect among individuals randomly assigned to the Negative Feedback condition, all  $t(32) > 3.35$ , all  $p < .003$ . In contrast, preexisting negative beliefs were not associated with negative affect among individuals randomly assigned to the Normalizing Feedback condition, all  $t(30) < 1.06$ , all  $p < .303$ .

For rumination, there was a second significant interaction, such that the relationship between preexisting negative beliefs and negative affect also differed for individuals in the Negative Feedback compared to the No Feedback condition. Simple slopes were computed for the relationship between preexisting negative beliefs and post-manipulation negative affect among individuals in these two conditions. Whereas higher levels of preexisting negative beliefs predicted greater negative affect in the Negative Feedback condition,  $t(32) = 4.51$ ,  $p < .001$ , preexisting beliefs were unrelated to negative affect in the No Feedback condition,  $t(30) = .934$ ,  $p = .360$ .

Neither preexisting negative beliefs nor their interaction with experimental condition predicted positive affect for any thought type (see Table 3).

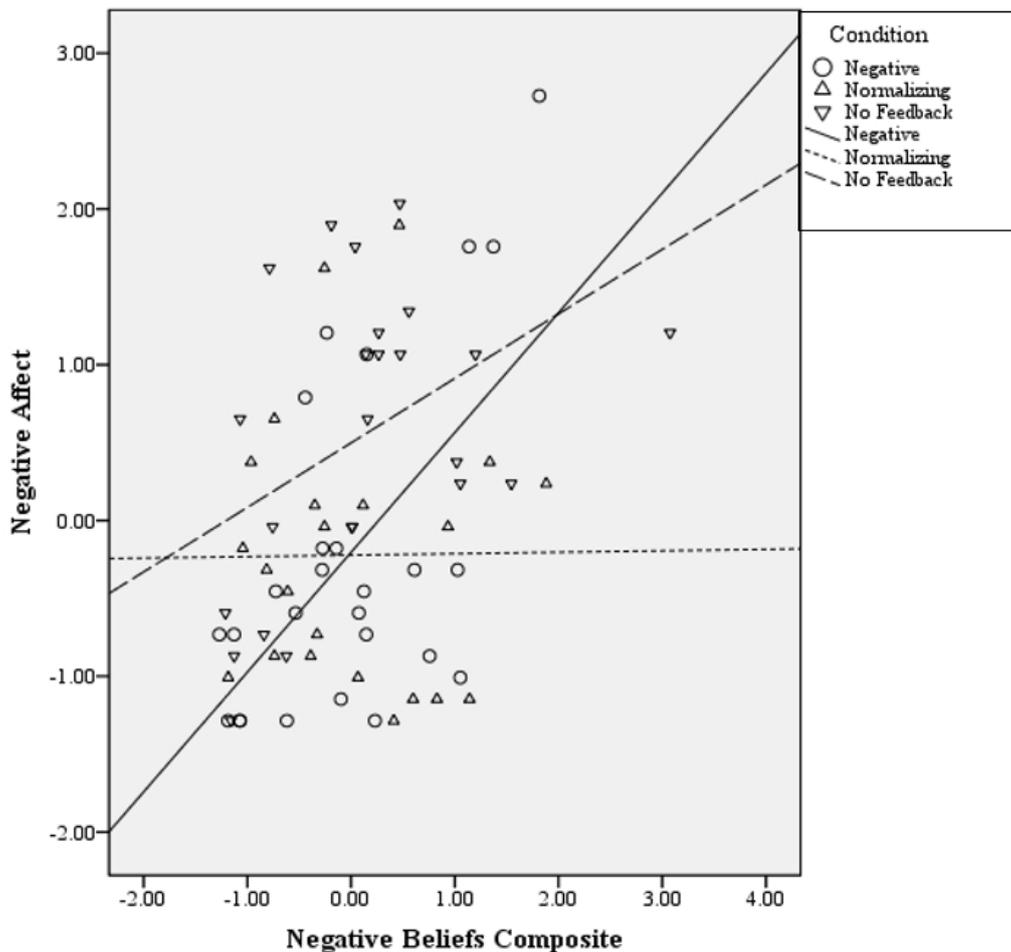
Post hoc analyses were conducted to test for differences between the Normalizing and No Feedback conditions. Again, there was no consistent main effect of experimental condition. However, an interaction between preexisting beliefs and condition emerged across all three thought types, accounting for 3% to 10% of the variance in negative affect associated with worried, ruminative, and obsessional thoughts (see Figure 1). This interaction reached the level of statistical significance only for obsessional thoughts,  $\beta = 1.76$ ,  $p = .021$ , but not for worried or ruminative thoughts, both  $\beta < 1.02$ , both  $p > .172$ . Neither preexisting negative beliefs nor their interaction with experimental condition predicted positive affect for any thought type.

## Discussion

The present study experimentally manipulated appraisals of normal worried, ruminative, and obsessional thoughts by providing healthy participants with negative, normalizing, or no feedback about the severity of these thoughts. We tested whether individuals receiving negative feedback reported greater negative affect and less positive affect relative to those receiving normalizing feedback and no feedback, and whether individuals' preexisting metacognitive beliefs interacted with experimentally induced appraisals to predict affective responses to specific thoughts. We found the expected effect of negative appraisals on affect only for those individuals who came into the study with preexisting negative beliefs about thoughts. In the Negative Feedback condition, the receipt of feedback about the severity of their thoughts relative to peers predicted negative affect among individuals who came into the study with the belief that thoughts are uncontrollable, dangerous, or harmful. In contrast, individuals who came into the study with less negative beliefs about their thoughts were less bothered by this feedback. As expected, a different pattern emerged in the Normalizing Feedback condition, such that the receipt of feedback that their thoughts were normal did not predict emotional experience, regardless of individuals' preexisting negative beliefs.

This pattern of findings was somewhat unexpected, given that we had hypothesized a main effect of condition; that is, the Negative Feedback group was expected to show increased negative affect and decreased positive affect

relative to Normalizing Feedback and No Feedback groups. However, the absence of a consistent main effect of condition may be explained by the unexpectedly strong and clinically meaningful effect of preexisting beliefs, which accounted for a large proportion of the variance in outcomes both alone and in interaction with experimental condition. We had also hypothesized an additional interaction, such that higher levels of preexisting negative beliefs were expected to predict greater negative affect and less positive affect among those assigned to receive negative feedback, relative to those receiving both normalizing and no feedback. Although the effect of preexisting beliefs differed as expected between the Negative and Normalizing Feedback groups, no significant interaction was found between the Negative and No Feedback groups for worry or obsessive thoughts. In fact, the No Feedback group appears to show a relationship between preexisting beliefs and affect that is quite similar to that seen in the Negative Feedback group, a finding that is consistent with metacognitive theory, which suggests that preexisting negative beliefs may predict affective disturbance when unwanted thoughts are experienced or recalled (Purdon, 2001; Steketee et al., 1997).



*Figure 1: Results from hierarchical linear regression showing interaction between preexisting negative beliefs about thoughts and feedback condition (Negative versus Normalizing) in predicting negative affect following the manipulation. Results shown are for worried thoughts, which are representative of the pattern seen for all three thought types. Negative beliefs and negative affect are represented by standardized scores. Within the Normalizing Feedback condition, preexisting negative beliefs were not a significant predictor of negative affect following the manipulation for any thought type. However, within the Negative Feedback condition, higher levels of preexisting negative beliefs predicted higher negative affect following the manipulation across all thought types. The Negative and No Feedback conditions did not differ significantly from one another.*

The present findings build upon studies by Rassin et al. (1999), Teachman and Clerkin (2007) and Teachman et al. (2006) by showing that the interaction between experimentally induced appraisals and preexisting beliefs about thoughts may predict explicitly reported affective outcomes. The most likely reason that the present study found an

interaction between preexisting beliefs and appraisals in predicting explicitly reported outcomes that was not found in previous research is the use of different outcomes (i.e., explicitly reported negative affect versus self-esteem) and different manipulation feedback. In particular, we expected that affective outcomes may be more sensitive than other explicitly reported outcomes to changes following the manipulation. Additionally, the manipulation used in the present study differed in important ways from those used in previous research. Previous studies have tended to either induce negative appraisals through a generic laboratory task (Rassin et al., 1999) or to provide feedback about thoughts in general and ask participants to quietly reflect on how the information relates to their own thoughts (Teachman et al., 2006; Teachman & Clerkin, 2007). The negative feedback in the present study may have served as a more powerful manipulation because it was more personal and individualized compared to previous studies.

Further, the present findings suggest that this interaction effect extends beyond obsessions to include worry and rumination as well. Although preliminary, the present findings suggest several intriguing implications for the conceptualization and treatment of negative appraisals of diverse thought types. As predicted by extant cognitive-behavioral and metacognitive models, it appears that it was not the experience of worried, ruminative, or obsessional thoughts that predicted outcomes, but rather individuals' beliefs about their thoughts (Beck; 1964; Lazarus, 1982; Papageorgiou & Wells, 2001; Power & Dalgleish, 2008; Rachman, 1997; Wells, 1995). All participants were able to recall a recent experience of each of the three thought types. However, participants who entered the study with more threatening beliefs about thoughts experienced greater negative affect when confronted with noncontingent negative feedback about the severity of their thoughts. These findings are consistent with a diathesis-stress model of psychopathology wherein environmental stressors trigger affective disturbance only in individuals with a preexisting vulnerability. In the present study, negative metacognitive beliefs acted as the diathesis, predicting negative affect in the face of a specific and relevant stressor (feedback that one's thoughts are more severe than normal) but not under conditions in which the vulnerability was not activated (feedback that one's thoughts are normative). In fact, preexisting negative beliefs played an unexpectedly strong role in predicting responses to the experimental manipulation in the present study, explaining a very high proportion of the overall variance in negative affect, both on their own and in interaction with feedback. Responses to the Negative Feedback condition, in particular, suggest that preexisting negative beliefs may represent a specific risk factor that is readily activated and may predict negative affective response to specific stressors even among healthy individuals. These results join with previous findings in highlighting the importance of elucidating these preexisting beliefs, including where they come from, who is at risk of developing them, and what determines whether individuals who hold these beliefs remain below the threshold for clinical significance or develop anxiety or mood disorders. Prior research has generally conceptualized negative metacognitive beliefs as trait-like characteristics that are stable over time, strongly associated with heightened intrusive and repetitive negative thought, and predictive of the development and persistence of anxiety and mood symptoms (e.g., Purdon, 2001; Starr & Moulds, 2006; Steketee et al., 2003; Watkins, 2004). However, little is known about the developmental origins and risk factors of these negative beliefs. Given their robust prediction of negative affective responses to thoughts found across the emotional disorders, these beliefs have the potential to serve as valuable targets for prevention or early intervention.

The present findings are quite preliminary and replication studies are needed to further disentangle the effect of appraisals and determine the robustness of their role in predicting affect and ultimately symptom development. However, the present findings join with those of previous studies (Lang et al., 2009; Woud et al., 2012; Zucker et al., 2006) in generating additional questions about how negative beliefs might be addressed to reduce vulnerability for psychopathology. Although the Normalizing Feedback was not the focus of the present study, the absence of an association between preexisting beliefs and negative affect in that condition generates hypotheses for future study; namely, that fostering normalizing interpretations of negative thoughts may neutralize the negative emotions to which negative beliefs predispose. Our findings further hint at the potential utility of brief psychoeducational interventions for preventing symptom development among individuals whose negative beliefs about thoughts (of any kind) make them vulnerable to anxiety or mood disorders (e.g., Fisher & Wells, 2007; Wells, Fisher, Myers, Wheatley, Patel, & Brewin, 2009; Wells & King, 2006; Zucker et al., 2006). In particular, it is notable that our manipulation consisted of only a few moments of feedback regarding the normality of these thoughts, making it extremely brief even relative to other effective single-session psychoeducational interventions (e.g., Zucker et al., 2006). If replicated, this finding raises questions about how brief of an intervention may have an impact on

appraisals or related affective consequences, how long these effects last, and whether corrective information needs to be administered by a trained professional, or whether even very brief feedback provided by peers may provide corrective or protective information for healthy individuals experiencing elevated levels of maladaptive metacognitive beliefs.

Finally, this study provides evidence that a process previously studied only in relation to obsessional thoughts may operate similarly across worried and ruminative thoughts. This raises the intriguing possibility that metacognitive treatments focusing on one type of unwanted thought could potentially be applied more broadly to other types of thoughts or expanded to address all forms of intrusive or repetitive negative thought. Although these findings require replication, they provide initial support for a transdiagnostic process linking intrusive or repetitive negative thoughts to negative outcomes, and importantly, for transdiagnostic interventions aimed at modifying this process across distinct thought types (Harvey et al., 2004).

Findings from the present study must be interpreted in the context of certain limitations. The present study included two comparison conditions. The Normalizing Feedback condition was intended to control for the receipt of feedback about thoughts. The No Feedback condition was intended to control for the effects of testing, including the recollection of intrusive or repetitive negative thoughts. In contrast to the negatively-valenced Negative Feedback condition, the Normalizing condition was expected to be neutral- to positively-valenced and the No Feedback condition was expected to be strictly neutral. However, state positive affect across all three conditions was extremely low following the manipulation, in comparison to norms for college students (Watson et al., 1988), perhaps helping to account for the lack of differences on this outcome. Future research might include an additional positive feedback condition in order to test whether positive feedback may improve positive affect.

A second limitation is that the PANAS is a very simple measure of momentary positive and negative affect. The PANAS was selected as the primary outcome measure due to its ability to capture immediate fluctuations in affect evoked by the manipulation, its appropriateness for use in a healthy (nonclinical) sample, and its inclusion of negative affect items reflecting anxiety, as well as dysphoria, both of which have been shown to relate to the types of unwanted thoughts included in the present study (Watson et al., 1988). However, future research might include more specific or clinically-relevant measures of outcomes such as state anxiety (e.g., the State-Trait Anxiety Inventory; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983).

A third limitation is that, for the sake of feasibility, we provided each participant with a single feedback manipulation and a single composite score encompassing all three thought types. Although the assessment of multiple thought types within individuals enabled us to compare thoughts more directly than in previous studies, the receipt of a single score may have biased subjects towards similar responding for all three thought types. It is encouraging, however, that results were not identical across thought types, with participants reporting different mean levels of negative and positive affect related to each thought type, and a somewhat different overall pattern of results emerging for rumination than for obsessions and worry. These differences suggest that participants did discriminate among thought types when processing the feedback. Moreover, there was no evidence of order or carryover effects across thought types. However, future studies attempting a more conservative test of the transdiagnostic hypothesis might use a strictly between-subjects design in which each participant receives feedback about a single thought type. Alternatively, future research might elicit multiple thought types from each participant, providing different feedback for each.

A final limitation of the present study is the lack of a manipulation check immediately following the feedback manipulation. The manipulation used in the present study was carefully designed to be both powerful and ecologically valid and results from pilot testing showed that the Negative Feedback condition successfully induced negative appraisals, relative to the Normalizing and No Feedback conditions. We were concerned that a manipulation check might introduce additional demand characteristics or take up enough time that the effects of the manipulation would wear off before participants completed outcome measures. However, future research should include a manipulation check to ensure that appraisals of thoughts change in the expected direction in concert with other outcomes of interest (i.e., negative and positive affect).

The present study is notable for showing an interaction between experimentally induced appraisals and preexisting beliefs about worried, ruminative, and obsessional thoughts in predicting affective outcomes (i.e., negative affect).

Findings are consistent with cognitive-behavioral and metacognitive models of anxiety and mood symptoms, as well as with a diathesis-stress model of psychopathology. Further, findings support the utility of brief, psychoeducational interventions for preventing symptom development among individuals whose negative beliefs about thoughts (of any kind) make them vulnerable to anxiety or mood disorders.

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