Cognitive Inflexibility Among Ruminators and Nonruminators

Robert N. Davis[1,2] **and Susan Nolen-Hoeksema**[1]

Dysphoric people who ruminate about their negative mood experience longer and more intense depressive episodes, yet often persist in ruminating. This study investigated whether a ruminative coping style would be related to a cognitive style marked by perseveration and inflexibility. We examined the performance of ruminators and nonruminators on the Wisconsin Card Sorting Test (WCST), a measure of cognitive flexibility, and tasks measuring related cognitive processes. Ruminators committed significantly more perseverative errors and failed to maintain set significantly more often than nonruminators on the WCST. On an advanced section of the WCST designed for this study, male ruminators exhibited significantly greater inflexibility than male nonruminators. These effects could not be attributed to differences in general intelligence or the presence of depressed mood. Results suggest that rumination may be characterized by, and perhaps prolonged by, an inflexible cognitive style.

KEY WORDS: rumination; cognitive inflexibility; personality; gender.

INTRODUCTION

When they become depressed or dysphoric, some people engage in rumination (Nolen-Hoeksema, 1991). Rumination involves behaviors and thoughts that passively focus one's attention on one's depressive symptoms and on the implications of these symptoms. Examples can include sitting alone thinking about how tired and unmotivated one feels, worrying that one's symptoms will interfere with one's job, and passively reviewing all the things wrong in one's life that might be contributing to one's depression. People engaging in ruminative responses may worry about the causes and consequences of their depression, but they do not take action to change their situation, and they spend much of their time thinking about how badly they feel (Carver, Scheier, & Weintraub, 1989; Lyubomirsky, Caldwell, & Nolen-Hoeksema, 1998; Nolen-Hoeksema, 1991).

[1]Department of Psychology, University of Michigan, Ann Arbor, Michigan 48109-1109.
[2]Correspondence should be directed to Robert N. Davis at (present address) Department of Psychology, University of Houston, Houston, Texas 77204-5341; e-mail robnd@uh.edu.

Both laboratory and field studies have shown that people who ruminate when depressed or dysphoric have longer and more severe periods of depressed mood than those who do not (Lyubomirsky & Nolen-Hoeksema, 1993, 1995; Nolen-Hoeksema, Morrow, & Fredrickson, 1993; Nolen-Hoeksema, Parker & Larson, 1994; Wood, Saltzberg, Neale, Stone, & Rachmiel, 1990). For example, one longitudinal study found that bereaved people who tended to ruminate about their depressive symptoms 1 month after their loss were more severely depressed 6 months after their loss than bereaved people who did not tend to ruminate, even after taking into account initial levels of depressive symptoms at 1 month post-loss (Nolen-Hoeksema et al., 1994). Another recent study found that college students with a ruminative style had more new onsets of major depressive disorder during college years than those without a ruminative style (Alloy & Abramson, 1997). Laboratory studies find that inducing depressed or dysphoric people to ruminate (to focus on their current feeling state and self-evaluations) results in elevation in their depressed moods, whereas inducing depressed or dysphoric people to distract from ongoing ruminations results in significant decrease in depressed mood (Barden, Garber, Leiman, Ford, & Masters, 1985; Fennell & Teasdale, 1984; Gibbons et al., 1985; Lyubomirsky et al., 1998; Lyubomirsky & Nolen-Hoeksema, 1993, 1995).

Further, rumination in the context of a dysphoric mood is associated with increased recall of negative autobiographical memories, more negative interpretations of current situations, more negative predictions about one's future, and less effective interpersonal problem solving (Lyubomirsky et al., 1998; Lyubomirsky & Nolen-Hoeksema, 1995; Pyszczynski, Holt, & Greenberg, 1987; Strack, Blaney, Ganellen, & Coyne, 1985). Taken together, these findings indicate that rumination maintains depressed mood and thinking. A further matter to be resolved is how ruminative responses themselves are maintained.

Why Do Some People Ruminate?

There is evidence from longitudinal studies (Nolen-Hoeksema & Davis, 1998; Nolen-Hoeksema & Larson, 1998), field studies (Nolen-Hoeksema et al., 1993), and studies of previously depressed individuals (Roberts, Gilboa, & Gotlib, 1998) which suggests that rumination is a stable individual difference characteristic. Given that rumination is associated with longer and more severe periods of depressive symptoms, why do some people ruminate? Lyubomirsky and Nolen-Hoeksema (1993) found that dysphoric rumination reduced people's willingness to engage in pleasant, distracting activities (e.g., going out to dinner with friends) although people felt they would enjoy such activities. Additionally, people induced to ruminate in response to depressed mood felt they were gaining insight into their problems and feelings, which may further encourage rumination (Lyubomirsky & Nolen-Hoeksema, 1993). Thus, two self-perpetuating properties of dysphoric rumination may be decreased willingness to engage in mood-lifting activities and an enhanced sense of gaining insight from ruminating.

Cognitive Inflexibility and Rumination

One further possible explanation for why people continue to engage in rumination despite its negative consequences is that rumination is a manifestation of a

more general tendency toward cognitive inflexibility, or perseveration. Indeed, ruminations have been described as "perseverating self-focused thoughts" (Hertel, 1998). Perseveration is defined as failure to modify behavior effectively when given feedback, modulate behavior in light of expected future consequences, and adjust one's cognitive set in the face of changing environmental contingencies (Lezak, 1995). Several studies have found that depressed and dysphoric people exhibit perseveration (Channon, 1996; Franke, Maier, Hardt, & Frieboes, 1993; Martin, Oren, & Boone, 1991; Silberman, Weingartner, & Post, 1983). Moreover, it has been suggested that people who exhibit significant perseveration may have a difficult time changing the way they think and feel, or engaging in hypothesis testing that might facilitate disconfirmation of depressive cognitive schemata (Crews & Harrison, 1995; Martin et al., 1991). People who are cognitively inflexible may tend to ruminate when feeling sad because they have difficulty generating alternative ways of coping. Cognitive inflexibility may also increase rumination because it makes it difficult for people to switch their attention away from themselves and their problems to pleasant, distracting topics or activities. If cognitive inflexibility is one contributor to rumination, then ruminators should exhibit deficits in their ability to abandon ineffective cognitive behavior and have trouble maintaining effective cognitive behavior. Importantly, these effects must be independent of individual differences in depressed mood, which is frequently associated with rumination, or intellectual functioning, which can confound the measurement of cognitive flexibility (e.g., Martin et al., 1991).

Overview of the Present Study

In the present study, we examined the relationship between the tendency to ruminate and performance on a measure of cognitive flexibility. We hypothesized that ruminators would exhibit greater cognitive inflexibility than nonruminators. The primary focus of the study was on participants' performance on the Wisconsin Card Sorting Test (WCST; Grant & Berg, 1948). The aim of the WCST is to determine what rule should be used to sort cards to match key cards that vary in three stimulus dimensions (color, shape, and number). Feedback is given to participants about correct and incorrect matches. The task permits an assessment of participants' adroitness at adapting their cognitive set to changing environmental contingencies.

We also included measures of working memory, reasoning, and task switching based on previous findings that these cognitive processes covary with dysphoria-related perseveration on the WCST (Davis & Nolen-Hoeksema, 1998). Moreover, these cognitive processes appear to contribute to WCST performance in other populations (e.g., Gold, Carpenter, Randolph, Goldberg, & Weinberger, 1997). Furthermore, Hertel (1998) found that dysphoric people induced to ruminate exhibited poorer memory on a controlled retrieval task. It is therefore necessary to assess these cognitive functions in addition to cognitive inflexibility to determine if rumination is associated with global or specific cognitive deficits.

Previous research on cognitive and neuropsychological functioning in depression has paid scant attention to gender issues (Heller, 1993). Gender differences

have been found in WCST performance. In a sample of 91 healthy middle-aged participants, men exhibited significantly greater perseveration than women (Boone, Ghaffarian, Lesser, Hill-Gutierrez, & Berman, 1993). Men with schizophrenia also have exhibited greater perseveration than women with schizophrenia (Seidman et al., 1997). To assess the possible impact of gender on the cognitive tasks used in this study, gender was included as an independent variable in all analyses.

To ensure that any differences found between ruminators and nonruminators would be a function of rumination, and not simply byproducts of depressed mood, it was necessary in the present study to measure depressed mood and control for its effects statistically. Furthermore, to investigate whether differences between ruminators and nonruminators would relate specifically to problems in cognitive flexibility rather than to problems in related cognitive processes, such as working memory, task switching, and reasoning, we included measures of these cognitive variables as well. Finally, because one previous study found a relationship between depression and WCST performance only after controlling for intellectual functioning (Martin et al., 1991), we included a measure of intellectual functioning to ensure group equivalence on this variable.

METHOD

Participants

Sixty-two participants were recruited from courses at a large midwestern university and received $15 for their participation. All participants spoke English as their primary language and were between 18 and 25 years of age ($M = 20.27$, $SD = 1.54$). Participants were selected based on their answers to a shortened (10-item) form of the Ruminative Responses Scale (RRS) of the Response Styles Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991). This scale assesses how participants tend to respond to their own symptoms of negative emotion. The original RRS includes 22 items describing responses to depressed mood that are self-focused (e.g., I think, "Why do I react this way?"), symptom-focused (e.g., I think about how hard it is to concentrate), and focused on the possible causes and consequences of one's mood (e.g., I think "I won't be able to do my job if I don't snap out of this"). Scores on this scale show good test–retest reliability (Nolen-Hoeksema et al., 1994) as well as acceptable convergent and predictive validity (Butler & Nolen-Hoeksema, 1994; Nolen-Hoeksema & Morrow, 1991; Nolen-Hoeksema et al., 1994). Because of time constraints in the current study, we used a 10-item version of this questionnaire to select participants. The 10 items on this shortened scale were based on item analyses conducted with a community sample of 1122 adults (Nolen-Hoeksema, unpublished data). The 10 items from the RRS that correlated most strongly with total scores on the longer scale, and on which at least 15% of the sample endorsed an answer other than "never," were chosen for inclusion on the shortened scale. The internal consistency (Cronbach's alpha) of this 10-item scale in the community sample of 1122 was .87, and the correlation between this 10-item scale and the total 22-item scale was .93.

Participants were assigned to one of two groups depending upon their score on the 10-item version of the RRS and conceptual–empirical criteria for distinguishing ruminators from nonruminators. Participants who did not endorse more than one ruminative response as one that they "often" or "always" engaged in when depressed were assigned to the nonruminator group. Participants who endorsed 5 or more ruminative responses as ones that they "often" or "always" engaged in when depressed were assigned to the ruminator group. This yielded one group of 31 nonruminators (15 males, 16 females) and another group of 31 ruminators (15 males, 16 females).

Materials

Beck Depression Inventory-Short Form

The Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) is one of the most widely used self-report instruments for detecting depression in normal populations. The 13-item short form of the BDI (BDI-SF; Beck and Beck, 1972), which correlates .96 with the long form, was used in this study.

Primary Mental Abilities (PMA)—Reasoning Subtest

The Reasoning subtest from the Primary Mental Abilities test (PMA; Thurstone and Thurstone, 1949) was used to assess reasoning ability. In this task, participants attempt to induce an ordering principle and choose the next letter in a series from sets of alphabetic strings, such as "A B D C D D E F D __?" The task was administered in its standardized format.

Backward Digit Span

The Backward Digit Span subscale from the WAIS-R (Wechsler, 1981) was used to assess working memory capacity. In this task, the experimenter presents groups of digits orally to the participant. Participants are asked to repeat the digits immediately back to the experimenter in the reverse order.

Wisconsin Card Sorting Test (WCST)

The WCST was used to measure cognitive flexibility. It was administered and scored in its standardized format (Heaton, Chelune, Talley, Kay, & Curtiss, 1993). In the WCST, participants attempt to determine what rule should be used to sort cards to match key cards that vary in three stimulus dimensions (color, shape, and number). The task begins with four key cards (1: red triangle; 2: green stars; 3: yellow crosses; and 4: blue circles) arranged in a row in view of the participant. Participants then draw cards from two decks of 64 cards arranged in a fixed random order and attempt to match each card to one of the four key cards. The experimenter provides feedback about correct and incorrect matches. Following 10 correct successive matches, the experimenter changes the correct sorting principle without informing the participant. The task continues until the participant sorts cards correctly according to all six categories or runs out of cards.

To ensure that the WCST would discriminate effectively in this sample, the task was expanded to include three additional categories. Two of these three new categories were more difficult than the original categories and required the grasp of a more abstract principle. The seventh category, Addition, was correctly matched when the number of shapes on a sorted card was one *greater* than the key card to which it was matched. (The key card with four blue dots required a card with one shape on it to be considered correct, as the rule was circular and limited to the numbers 1–4.) The eighth category was one of the original three (color, shape, or number) randomly selected. The ninth category, Subtraction, was correctly matched when the number of shapes on a sorted card was one *less* than the key card to which it was matched. (The key card with one red triangle required a card with four shapes on it to be considered correct.) We refer to these three additional categories as the WCST Advanced Section (WCST-AS). Because the transition from the final WCST category to the first WCST-AS category was hypothesized to be especially difficult, a score was derived from the total number of trials in which a sorting dimension from the WCST (color, shape, or number) was used following an instance of its disconfirmation at the onset of the seventh category (i.e., the beginning of the WCST-AS). This score is reported here as "inflexible sorts."

Vocabulary Subscale

The Vocabulary subscale of the WAIS-R was used as a measure of general intellectual ability since it has the best individual correlation with WAIS-R Full Scale IQ (Wechsler, 1981). The task was administered and scored in its standardized format (Wechsler, 1981).

Colors Subtest

The Colors subtest (CS; adapted from Zazzo, 1969) was used as a measure of task switching. In this task, participants are presented with a grid of dots that are red, blue, yellow, and green and situated in a random order. For the first trial, they are instructed to point to each dot and name its color aloud as quickly as possible. After 15 sec, they are abruptly directed to name the colors of the dots again, but to say "blue" when they see a red dot and "red" whenever they see a blue dot. After another 15 sec, they are abruptly instructed to name the actual colors of the dots, just as in the first trial. Finally, they are interrupted once again after 15 sec and instructed to name the color of the dots one final time, but saying "blue" whenever they see a red dot and "red" whenever they see a blue dot. Scores are obtained for the number of red and blue dots named correctly in each of the four trials. A weighted score is then obtained by summing scores on the first and third (naming) trials and then dividing by the sum of the second and fourth (switching) trials.

Procedure

The RRS, BDI-SF, and a demographics questionnaire were administered to groups of potential participants in screening sessions 1–2 weeks before the labora-

tory sessions in which the cognitive tasks were administered. People who met the selection criteria for being either ruminators or nonruminators were called and invited to participate in a study of "cognition and personality." They were not told the specific basis on which they were selected or anything about the hypotheses of the study. One to 2 weeks after completing the RRS and BDI-SF, participants came to our laboratory to complete the cognitive tasks. All participants were tested individually and the experimenter was blind to participants' rumination status.

RESULTS

Analysis of Group Characteristics

Rumination group and gender differences were assessed using 2×2 ANOVAs. These analyses revealed no gender or rumination group differences in general intelligence as measured by the WAIS-R vocabulary subscale, $p > .05$. Moreover, Vocabulary scores were not significantly correlated with any other measure in this study, all $ps > .10$. Given these results, we did not use Vocabulary scores as a covariate in our later analyses. However, a main effect of rumination group did emerge on BDI-SF scores, $F(1,58) = 20.84, p < .01$. Because previous research has found correlations between depression and the cognitive measures used in this study (e.g., Channon, 1996; Channon, Baker, & Robertson, 1993), participants' BDI-SF scores were entered as a covariate in all subsequent analyses.

Analyses of Cognitive Variables

Table I presents the means and standard deviations of the cognitive variables by rumination group and gender. Table II presents the intercorrelations among the cognitive variables for all participants. We assessed rumination group and gender differences on the cognitive measures using a series of 2×2 ANCOVAs, with mean scores for each task as dependent variables. Ruminators committed significantly more perseverative errors than nonruminators, $F(1,56) = 5.52, p < .05$, and failed to maintain set significantly more often than nonruminators, $F(1,56) = 4.09, p < .05$, on the WCST.[3] The groups did not differ significantly in the number of nonperseverative errors, $p > .05$. No significant main effects of gender or significant interactions between rumination group and gender were found on these variables.

On the WCST-AS,[4] there were no main effects of rumination group or gender. However, two significant rumination group $\times$ gender interactions were found. There was a significant interaction between rumination group and gender on the percent-

---

[3]In analyses recommended by an anonymous reviewer, we found that these main effects remained significant even when vocabulary, reasoning, working memory, task switching, and depression were entered simultaneously as covariates.
[4]Four participants (one female nonruminator, one male ruminator, and two female ruminators) did not attempt the WCST-AS because they used up all 128 cards on the standard WCST.

Table I. Mean Scores of Male and Female Ruminators and Nonruminators on Cognitive Tasks

| | Males | | Females | |
| | Ruminators | Nonruminators | Ruminators | Nonruminators |
Measure	M (SD)	M (SD)	M (SD)	M (SD)
Backward Digit Span	5.67 (1.80)	6.00 (1.56)	5.63 (1.09)	5.69 (1.62)
Reasoning	21.87 (5.07)	25.33 (3.13)	24.13 (3.90)	24.00 (4.43)
Colors	1.21 (0.19)	1.21 (0.27)	1.18 (0.23)	1.14 (0.16)
Vocabulary	56.80 (8.69)	52.73 (10.86)	51.63 (7.47)	51.94 (5.97)
WCST measures				
Perseverative errors	8.47 (5.76)	5.67 (1.18)	9.69 (7.74)	8.13 (3.16)
Nonperseverative errors	6.80 (5.03)	4.60 (1.92)	6.06 (4.22)	7.75 (6.93)
Failure to maintain set	1.00 (1.25)	0.20 (0.41)	0.37 (0.72)	0.13 (0.34)
WCST-AS measures				
Percent inflexible sorts	44.57 (14.17)	36.64 (11.98)	32.21 (19.48)	42.80 (20.75)
Percent perseverative errors	12.14 (4.88)	9.71 (2.92)	8.43 (4.47)	12.13 (7.95)
Percent nonperseverative errors	45.00 (17.77)	37.50 (19.57)	37.57 (16.76)	44.87 (14.72)

age of inflexible sorts in the seventh category, $F(1,52) = 4.78$, $p < .05$.[5] Also on the WCST-AS, significant rumination group $\times$ gender interactions were found on the percentage of perseverative errors, $F(1,52) = 5.33$, $p < .05$. The rumination group $\times$ gender interaction on the percentage of nonperseverative errors was not significant, $p > .05$.

The nature of the significant rumination group $\times$ gender interactions on the WCST-AS was investigated in post-hoc comparisons of ruminators and nonruminators within each gender separately (still using BDI-SF scores as a covariate). On the WCST-AS, there was a significant difference between male ruminators and male nonruminators on the number of inflexible sorts, $F(1,25) = 4.14$, $p = .05$, but differences on the percentage of perseverative errors were not statistically significant, ps $> .05$. Despite the overall rumination group $\times$ gender interactions, no differences between female ruminators and female nonruminators were statistically significant on these variables, both ps $> .05$.

Regarding the other cognitive tasks, on the Reasoning subtest, there were no significant main effects of gender or rumination group, but a significant interaction between rumination group and gender was found, $F(1,56) = 4.07$, $p < .05$. Post-hoc analyses showed no significant difference between ruminators and nonruminators

[5]Percentages rather than raw scores are reported for these measures because the number of trials on the WCST-AS varied as a function of WCST performance, e.g., someone who committed many perseverative errors on the WCST would have had fewer overall trials on the WCST-AS since 128 total cards were used for both tasks combined.

Table II. Zero-Order Correlations Among Cognitive Tasks

Variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Vocabulary	—											
2. Reasoning	.00	—										
3. Backward Digit Span	.10	.41**	—									
4. Colors (WS)	.02	-.21+	-.21	—								
5. Colors (naming)	.22+	.34**	.17	.04	—							
6. Colors (switching)	.19	.38**	.28*	-.66**	.64**	—						
7. Perseverative errors	-.17	-.25*	-.10	.09	-.29*	-.34**	—					
8. Nonperseverative errors	-.20	-.16	-.20	.21+	-.25*	-.36**	.51**	—				
9. Failure to maintain set	-.05	-.28*	-.15	.20	-.21+	-.35**	.55**	.23+	—			
10. Percent perseverative errors	.00	-.10	.06	.01	-.11	-.08	.20	.28*	.13	—		
11. Percent nonperseverative errors	-.07	-.22	-.05	-.04	-.20	-.14	.35**	.21	.15	.37**	—	
12. Percent inflexible sorts	-.08	-.29*	-.06	.11	-.12	-.21	.33*	.21	.19	.55**	.71**	—

Notes: $^+p < .05$; $^{**}p < .01$. $N = 62$. Colors subtest (WS), Colors subtest (weighted score); Colors (naming), Colors subtest (naming trials); Colors (switching), Colors subtest (switching trials). WCST variables are 7–9, WCST-AS variables are 10–12.

within either gender on this task, however. There were no significant main effects of rumination group or gender, nor significant interactions, on measures of working memory or task switching performance, all $ps > .05$.

DISCUSSION

In this study, we attempted to determine if rumination would be associated with cognitive inflexibility. In addition, we were interested in examining any possible relationships rumination might have with other cognitive variables. The results support our hypothesis that rumination is associated with a tendency to perseverate: ruminators committed more perseverative errors on the WCST than nonruminators. Moreover, rumination was associated with problems in maintaining an adaptive set: ruminators failed to maintain set more often on the WCST than nonruminators. These findings suggest that ruminators have difficulty adapting their cognitive set to changing environmental contingencies. Ruminators become mentally "stuck" in a style of relating to the environment even when the adaptiveness of that style has been invalidated by negative feedback. Moreover, ruminators prematurely abandon adaptive cognitive sets. Ruminators therefore have trouble inhibiting perseverative tendencies and maintaining adaptive tendencies.

Our results also suggest that the cognitive impairments exhibited by ruminators on these tasks are specific to difficulties with maintaining an adaptive cognitive set and abandoning a maladaptive cognitive set. Ruminators did not differ from nonruminators on measures of working memory or task switching, and follow-up tests did not clarify the rumination × gender interaction found on our reasoning task. These results imply that rumination is not characterized by problems in cognition generally.

These findings are consistent with studies of dysphoric individuals that have found cognitive impairment under conditions in which attention is poorly controlled, in contrast to conditions in which attention is focused on the relevant task (Hertel, 1997, 1998). In the present study, ruminators exhibited perseveration when required to self-initiate cognitive set shifting, whereas they did not evidence difficulty on a measure of task switching in which they were explicitly instructed to change response set while under time pressure. Attention-demanding tasks have also been shown to disrupt rumination in depressed states (Teasdale et al., 1995). Taken together, these findings suggest that manipulations of the external environment may facilitate distraction and decrease opportunities for self-focused rumination. However, cognitive inflexibility may hinder ruminators from taking the incipient initiative at selecting environments that minimize opportunities for self-focused rumination. For example, dysphoric ruminators rated the perceived enjoyment of several activities no differently than dysphoric individuals who distracted themselves and nondysphoric individuals, yet reported less willingness to engage in such activities (Lyubomirsky & Nolen-Hoeksema, 1993).

Furthermore, we found that male ruminators exhibited greater cognitive rigidity compared to male nonruminators on the WCST-AS when abdication of

useless strategies and production of new ones was required for successful performance. Surprisingly, the association between rumination and perseveration was not as consistent among the women as among the men on the WCST-AS. On the WCST-AS, female ruminators did not score significantly differently from female nonruminators, whereas male ruminators did score significantly differently from male nonruminators on the number of inflexible sorts. However, the gender × rumination interactions on the WCST-AS should be interpreted cautiously both because they were not predicted and because not all participants attempted the WCST-AS.

Several studies have shown that men are *less* likely to report and to be observed engaging in rumination and emotion focusing around sad moods than are women (Butler & Nolen-Hoeksema, 1994; Nolen-Hoeksema et al., 1993, 1994). When a man does become a ruminator, however, this coping style may be part of a more pervasive problem with cognitive inflexibility and allocation of cognitive resources. In contrast, a recent study suggests that the sources of rumination for women may be rooted more in their social environment—their lack of power and affirmation in their relationships and their lack of resources (Nolen-Hoeksema & Larson, 1998). This social environment may lead women to engage in rumination even when they do not have more general problems with cognitive inflexibility and allocation of cognitive resources.

There are two important differences between the current study and previous studies of rumination and cognition. First, the previous studies all focused on self-relevant materials, e.g., solving self-relevant interpersonal problems. Because rumination involves focusing on depression-related memories, events, and feelings, it is not surprising that it might have a stronger effect on self-relevant cognitions than on the non-self-relevant cognitive processing assessed in this study.

Second, in all our previous studies, we have induced dysphoric and nondysphoric participants to ruminate or distract from ruminations, then had them complete cognitive tasks. These rumination and distraction inductions may produce stronger differences in cognitive processing in both men and women in the laboratory compared to selecting participants based on their RRS scores. We emphasize, however, that there were differences between the ruminators and nonruminators among both the men and women on the standard WCST. Whereas we considered using rumination and distraction inductions in the current study, we chose not to do so because the cognitive tasks used in this study are natural distraction inductions. Thus, we expected any effects of a rumination induction to be quickly wiped out by the cognitive tasks (Brockner & Hulton, 1978).

The tendency to ruminate when dysphoric may be a consequence of cognitive inflexibility and perseveration. People who cannot inhibit perseverative tendencies and who fail to maintain productive lines of reasoning may become trapped in nonproductive perseveration on negative moods and events that they experience. Alternately, preoccupation with one's negative moods and life circumstances may decrease confidence in one's judgments, leading to perseveration and the abandonment of productive reasoning. Whether the cognitive impairments observed are a cause or consequence of rumination, they may contribute to difficulties in problem solving that help to perpetuate negative mood.

ACKNOWLEDGMENTS

REFERENCES

Alloy, L. B., & Abramson, L. Y. (1997, May). *The Temple-Wisconsin Cognitive Vulnerability to Depression Project.* Paper presented to the annual meeting of the Midwestern Psychological Association, Chicago, Illinois.

Barden, R. C., Garber, J., Leiman, B., Ford, M. E., & Masters, J. C. (1985). Factors governing the effective remediation of negative affect and its cognitive and behavioral consequences. *Journal of Personality and Social Psychology*, *49,* 1040–1053.

Beck, A. T., & Beck, R. W. (1972). Screening depressed patients in family practice: A rapid technique. *Postgraduate Medicine*, *52,* 81–85.

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, *4,* 561–571.

Boone, K. B., Ghaffarian, S., Lesser, I. M., Hill-Gutierrez, E., & Berman, N. G. (1993). Wisconsin Card Sorting Test performance in healthy, older adults: Relationship to age, sex, education, and IQ. *Journal of Clinical Psychology*, *49,* 54–60.

Brockner, J., & Hulton, A. J. B. (1978). How to reverse the vicious cycle of low self-esteem: The importance of attentional focus. *Journal of Experimental Social Psychology*, *14,* 564–578.

Butler, L. D., & Nolen-Hoeksema, S. (1994). Gender differences in responses to a depressed mood in a college sample. *Sex Roles*, *30,* 331–346.

Carver, C. S., Scheier, M. F., & Weintraub, J. K. (1989). Assessing coping strategies: A theoretically based approach. *Journal of Personality and Social Psychology*, *56,* 267–283.

Channon, S. (1996). Executive dysfunction in depression: The Wisconsin Card Sorting Test. *Journal of Affective Disorders*, *39,* 107–114.

Channon, S., Baker, J. E., & Robertson, M. M. (1993). Working memory in clinical depression: An experimental study. *Psychological Medicine*, *23,* 87–91.

Crews, W. D., & Harrison, D. W. (1995). The neuropsychology of depression and its implications for cognitive therapy. *Neuropsychology Review*, *5,* 81–123.

Davis, R. N., & Nolen-Hoeksema, S. (May 1998). *Cognitive impairment in depression*: *A componential analysis.* Poster presented at the American Psychological Society 10th Annual Convention, Washington, DC.

Fennell, M. J. V., & Teasdale, J. D. (1984). Effects of distraction on thinking and affect in depressed patients. *British Journal of Clinical Psychology*, *23,* 65–66.

Franke, P., Maier, W., Hardt, J., & Frieboes, R. (1993). Assessment of frontal lobe functioning in schizophrenia and unipolar major depression. *Psychopathology*, *26,* 76–84.

Gibbons, F. X., Smith, T. W., Ingram, R. E., Pearce, K., Brehm, S. S., & Schroeder, D. (1985). Self-awareness and self-confrontation: Effects of self-focused attention on members of a clinical population. *Journal of Personality and Social Psychology*, *48,* 662–676.

Gold, J. M., Carpenter, C., Randolph, C., Goldberg, T. E., & Weinberger, D. R. (1997). Auditory working memory and Wisconsin Card Sorting Test performance in schizophrenia. *Archives of General Psychiatry*, *54,* 159–165.

Grant, D. A., & Berg, E. A. (1948). A behavioral analysis of degree of reinforcement and ease of shifting to new responses in a Weigl-type card sorting problem. *Journal of Experimental Psychology*, *34,* 404–411.

Heaton, R. K., Chelune, G. J., Talley, J. L., Kay, G. G., & Curtiss, G. (1993). *Wisconsin Card Sorting Test manual*: *Revised and expanded.* Odessa, FL: Psychological Assessment Resources.

Heller, W. (1993). Gender differences in depression: Perspectives from neuropsychology. *Journal of Affective Disorders*, *29,* 129–143.

Hertel, P. T. (1997). On the contributions of deficient cognitive control to memory impairments in depression. *Cognition and Emotion*, *11,* 569–583.

Hertel, P. T. (1998). Relation between rumination and impaired memory in dysphoric moods. *Journal of Abnormal Psychology*, *107,* 166–172.

Lezak, M. D. (1995). *Neuropsychological assessment (3rd edition).* New York: Oxford University Press.

Lyubomirksy, S., Caldwell, N. D., & Nolen-Hoeksema, S. (1998). Effects of ruminative and distracting responses to depressed mood on retrieval of autobiographical memories. *Journal of Personality and Social Psychology*, *75,* 166–171.

Lyubomirksy, S., & Nolen-Hoeksema, S. (1993). Self-perpetuating properties of dysphoric rumination. *Journal of Personality and Social Psychology*, *65,* 339–349.

Lyubomirksy, S., & Nolen-Hoeksema, S. (1995). Effects of self-focused rumination on negative thinking and interpersonal problem solving. *Journal of Personality and Social Psychology*, *69,* 176–190.

Martin, D. J., Oren, Z., & Boone, K. (1991). Major depressives' and dysthymics' performance on the Wisconsin Card Sorting Test. *Journal of Clinical Psychology*, *47,* 684–690.

Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology*, *100,* 569–582.

Nolen-Hoeksema, S., & Davis, C. G. (1998). ''*Thanks for sharing that''*: *Ruminators and their social support networks.* Manuscript submitted for publication.

Nolen-Hoeksema, S., & Larson, J. (1998). *A dynamic model of the gender differences in depressive symptoms.* Manuscript submitted for publication.

Nolen-Hoeksema, S., & Morrow, J. (1991). A prospective study of depression and posttraumatic stress symptoms after a natural disaster: The 1989 Loma Prieta earthquake. *Journal of Personality and Social Psychology*, *61,* 115–121.

Nolen-Hoeksema, S., Morrow, J., & Fredrickson, B. L. (1993). Response styles and the duration of episodes of depressed mood. *Journal of Abnormal Psychology*, *102,* 20–28.

Nolen-Hoeksema, S., Parker, L., & Larson, J. (1994). Ruminative coping with depressed mood following loss. *Journal of Personality and Social Psychology*, *67,* 92–104.

Pyszczynski, T., Holt, K., & Greenberg, J. (1987). Depression, self-focused attention, and expectancies for positive and negative future life events for self and others. *Journal of Personality and Social Psychology*, *52,* 994–1001.

Roberts, J. E., Gilboa, E., & Gotlib, I. H. (1998). Ruminative response style and vuherability to episodes of dysphona: Gender, neuroticism, and episode durition. *Cognitive Therapy and Research*, *22,* 401–423.

Seidman, L. J., Goldstein, J. M., Goodman, J. M., Koren, D., Turner, W. M., Faraone, S. V., & Tsuang, M. T. (1997). Sex differences in olfactory identification and Wisconsin Card Sorting performance in schizophrenia: Relationship to attention and verbal ability. *Biological Psychiatry*, *42,* 104–115.

Silberman, E. K., Weingartner, H., & Post, R. M. (1983). Thinking disorder in depression: Logic and strategy in an abstract reasoning task. *Archives of General Psychiatry*, *40,* 775–780.

Strack, S., Blaney, P. H., Ganellen, R. J., & Coyne, J. C. (1985). Pessimistic self-preoccupation, performance deficits, and depression. *Journal of Personality and Social Psychology*, *49,* 1076–1085.

Teasdale, J. D., Dritschel, B. H., Taylor, M. J., Proctor, L., Lloyd, C. A., Nimmo-Smith, I., & Baddeley, A. D. (1995). Stimulus-independent thought depends on central executive resources. *Memory and Cognition*, *23,* 551–559.

Thurstone, L. L., & Thurstone, L. L. (1949). *SRA Primary Mental Abilities Test.* Chicago: Science Research Associates.

Wechsler, D. (1981). *Wechsler Adult Intelligence Scale-Revised*: *Manual.* New York: Psychological Corporation.

Wood, J. V., Saltzberg, J. A., Neale, J. M., Stone, A. A., & Rachmiel, T. B. (1990). Self-focused attention, coping responses, and distressed mood in everyday life. *Journal of Personality and Social Psychology*, *58,* 1027–1036.

Zazzo, R. (1969). *Manuel pour l'examen psychologique de l'enfant.* Paris: Delachaux & Niestle.