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The Effects of Rumination and Distraction Tasks on Psychophysiological Responses and Self-Reported Mood in Dysphoric and Nondysphoric Individuals

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THE EFFECTS OF RUMINATION AND DISTRACTION TASKS ON PSYCHOPHYSIOLOGICAL RESPONSES AND SELF-REPORTED MOOD IN DYSPHORIC AND NONDYSPHORIC INDIVIDUALS

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This dissertation, submitted by Kristin S. Vickers Douglas in partial fulfillment of the requirements for the degree of Doctor of Philosophy from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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ABSTRACT

According to the response style theory of depression (Nolen-Hoeksema, 1987), the way in which individuals respond to depressed mood affects the severity and duration of that mood. Prior laboratory studies of response style have not included psychophysiological measures or investigated the relationship between ruminative response style and the conceptually-related constructs of worry and neuroticism. Dysphoric ($\underline{n}$ = 84) and nondysphoric participants ($\underline{n}$ = 86) were randomly assigned to either a rumination task (i.e., self-focused attention) or a distraction task (i.e., other-focused attention). In addition to the pre-task and post-task mood ratings used in prior response style studies, the present study included measures of worry, neuroticism and psychophysiological response. Greater psychophysiological response and self-reported depressed mood and worry were anticipated in the dysphoric ruminators as compared to the dysphoric distractors and the nondysphoric ruminators and distractors. Results supported prior findings that distraction and rumination differentially impact depressed mood in dysphoric individuals; dysphoric ruminators reported significantly higher levels of post-task depressed mood than did dysphoric distractors. Of the psychophysiological responses measured, a significant difference in post-rumination systolic blood pressure was found between nondysphoric men and women. Additionally, post-rumination worry ratings were significantly higher than the post-distraction worry ratings, regardless of initial dysphoria status. The implications of these results for future response style research are discussed.

CHAPTER I

INTRODUCTION

Depression: Definition and Societal Impact

Major depressive disorder is one of the most common psychiatric disorders (Blazer, Kessler, McGonagle, & Swartz, 1994), and its prevalence appears to be rising in the U.S. and world-wide (Cross-National Collaborative Group, 1992). An essential feature of major depressive disorder is a history of one or more major depressive episodes. The symptoms associated with a major depressive episode include a sad, depressed mood; a loss of interest and pleasure in usual activities; disturbances of sleep; a change in activity level; appetite disturbance and associated weight loss or gain; a loss of energy and fatigue; negative feelings about self such as feelings of worthlessness, guilt, and self-blame; difficulty concentrating; and recurrent thoughts of death or suicide (American Psychiatric Association, 1994). In studies using nonclinical samples, self-report of the symptoms associated with major depressive disorders rather than clinical diagnoses are often used to establish groups. Consequently, in the proposed study depressive symptom levels refer to the number of symptoms associated with major depressive disorder endorsed by participants.

Lifetime prevalence rates of major depressive disorder vary from 10% to 25% in women and from 5% to 12% for men (American Psychiatric Association, 1994). The suffering and impairment associated with depression is considerable and comparable to

that of chronic medical conditions (Wells et al., 1989). The economic cost of depression to the U.S. economy is estimated at more than 40 billion dollars annually, measured in terms of cost for treatment, lost work days, and reduced productivity (Harvard Mental Health Letter, 1994). Researchers have recently reported on the dramatic link between major depression and heart disease; their comorbid presence is associated with increased morbidity and mortality (Dwight & Stoudemire, 1997). For these reasons, continued study into the factors related to increased risk, severity, and duration of depression remains an important task for mental health researchers.

Etiological Theories of Depression

Researchers have developed numerous biological and psychological theories of depression. Biological theories have developed from genetic research, somatic symptom patterns, and the responses of depressed individuals to pharmacotherapy, and include genetic and biochemical models. The diathesis-stress theory of depression describes a biological predisposition that produces depression upon the interaction of life stress. Psychological theories include psychodynamic models, behavioral models, and cognitive models. Although a thorough description of all theories of depression is beyond the scope of this paper, some of the most influential theories will be outlined briefly in the following sections.

Biological Models

Several aspects of depression have led researchers to investigate possible biological causes. First, many of the symptoms of depression are somatic in nature, such as loss of energy and appetite and sleep disturbance. Also, medical illnesses such as

certain forms of cancer, stroke, and endocrine disorder have been found to produce depression. Another factor influencing biological models of depression is that certain medications that deplete neurotransmitters induce depression, whereas other medications that increase the availability of these neurotransmitters reduce depression (Kendall & Hammen, 1995; Rehm & Tyndall, 1993; Schwartz & Schwartz, 1993). In reviewing the evidence for biological theories of depression, researchers have cautioned that it is yet unknown whether biological patterns cause depression, result from the depressive symptoms themselves, or result from an additional factor related to the environment (Kendall & Hammen, 1995).

Genetic Evidence

Family, twin, and adoptee studies together have suggested that unipolar depression has heritable components. Goldin and Gershon (1988) have reviewed research based on direct interviews of first-degree relatives of patients with unipolar depression. The authors report that these data are the most consistent and suggestive of heritability of unipolar depression. In these studies, rates of unipolar depression in primary relatives ranged from 14 to 18 percent, compared with rates of 4 to 6 percent in relatives of control subjects. Studies of children of depressed mothers have found 40 to 50 percent of these children show evidence of depressive disorders themselves (Hammen, 1991). In considering first-degree relative studies, researchers caution that the psychological/environmental aspects of living with a depressed family member should be considered (Kendall & Hammen, 1995).

Studies of unipolar depression in twins generally report concordance rates of approximately 40 percent in monozygotic twins, and dizygotic concordances of approximately 11 percent (Allen, 1976). However, Torgersen (1986) found that concordance was only apparent in some forms of major depression. Although adoption studies have not consistently supported heritability of unipolar depression (Kendall & Hammen, 1995), one study reports biological relatives of adopted individuals with depression as being eight times more likely than non-related controls to have a mood disorder (Wender et al., 1986).

New developments in molecular genetics have provided improved methods for locating genes for mood disorders. However, Blehar, Weissman, Gershon and Hirschfeld (1988) argue that the unipolar disorders are considerably heterogeneous, and that it is unlikely that single gene locations will be discovered. Although some genetic evidence exists supporting the heritability of depression, the impact of environmental factors remains a critical factor.

Neurotransmitter System Models

Neurotransmitters are chemical messengers that are released by presynaptic neurons and travel across the synapse to stimulate postsynaptic neurons. High or low levels of neurotransmitters influence the levels of neurological activity and result in abnormal behavior. Researchers have suggested that the monoamines, a small subset of neurotransmitters including norepinephrine, dopamine, and serotonin, play a critical role in depression. The monoamine neurons affect and integrate emotional, psychomotor, and biological functions. The earliest major theory of the biology of depression hypothesized

that too low of a level of neurotransmitters, primarily norepinephrine and serotonin, caused depression, and mania resulted from too high of a level of these chemicals. Antidepressants were thought to alleviate depression by increasing the availability of the monoamines, especially norepinephrine, by blocking their reabsorption. However, later findings shifted the emphasis from the simple model of a neurotransmitter deficit.

First, improved methods of measurement indicated that norepinephrine was not always reduced in depressed patients, and in some patients, levels were higher than average (Gold, Goodwin, & Chrousos, 1988). Second, antidepressants generally require several weeks to produce therapeutic effects, and by that time the neurotransmitter level has already returned to its pre-medication level. These findings led to attention to the postsynaptic receptors; changes in the density or sensitivity of these receptors requires a period of time that more closely corresponds to the time required for antidepressants to produce effects (Kendall & Hammen, 1995; McNeal & Cimbolic, 1986).

Researchers then began to emphasize the role of neurotransmitter system deregulation in depression, which is defined as the instability, desynchronization, and abnormal reactivity of the monoamine neurotransmitter system (Siever & Davis, 1985). Kendall and Hammen (1995) suggest that the question remains whether this dysregulation fully explains the vulnerability to depression, whether it is instead the consequence of a different dysfunction, or whether it is merely a part of a different and larger problem.

Neuroendocrine Abnormalities

While for years neurotransmitters were the primary focus of study in relation to the biological basis of depression, many researchers now emphasize the role of the neuroendocrine system. The neurological and endocrine systems influence each other; norepinephrine, serotonin, and dopamine are involved in the timing and regulation of the release of hormones, and the hormones in turn adjust the activity of the neurotransmitters (Kendall & Hammen, 1995; Papolos & Papolos, 1997).

The limbic area of the brain is closely linked with emotion and has effects on the hypothalamus, which in turn controls various endocrine glands and the levels of hormones they secrete. Described as complex interconnections between the brain and certain hormones and organs, neuroendocrine systems have been implicated in depression. One of these neuroendocrine systems considered relevant to the biology of depression is the hypothalamic-pituitary-adrenal (HPA) axis. The HPA axis is a system involved in readying the body during stress; a hormone is synthesized and secreted by the hypothalamus and is transported to the pituitary gland which in turn releases additional hormones that stimulate the adrenal glands which then produce cortisol. Cortisol is a hormone that physiologically prepares the body for stress response. Elevations in cortisol normally occur in response to stress; however, in depressed individuals, they are elevated without the associated stress symptomatology (Kendall & Hammen, 1995; Schwartz & Schwartz, 1993; Rehm & Tyndall, 1993).

Elevated cortisol levels were discovered in depressed individuals and the dexamethasone suppression test (DST) was subsequently developed as a possible

biological test for depression (Carroll, 1982). Dexamethasone, a cortisol-like drug, suppresses cortisol secretion in nondepressed individuals for 24 hours, but fails to suppress cortisol in many depressed patients. The interpretation is that the failure of dexamethasone to suppress cortisol reflects overactivity in the hypothalamic pituitary-adrenal cortical axis of depressed individuals. However, this test is not effective on many depressed patients (Holsboer, 1992; Shelton, Hollon, Purdon, & Lossen, 1991) and is affected by numerous factors such as weight loss, age, and substance use. Consequently it is not considered specific or sensitive enough for diagnosis (Rehm & Tyndall, 1993). Further evidence of the role of cortisol in depression, however, is found in Cushing's Syndrome, in which an oversecretion of cortisol is caused by growths on the adrenal cortex. Increased levels of cortisol are linked to depression in individuals with this disease, and symptoms such as fatigue, appetite change, and sleep disturbance are common (Papolos & Papolos, 1997).

A second neuroendocrine system implicated in depression is the hypothalamic-pituitary-thyroid (HPT) axis. The HPT regulates the level of thyroid hormones, and those with thyroid diseases often have symptoms of depression or mania. Hyperthyroidism is an increase in thyroid function that is associated with manic symptoms such as hyperactivity, sleeplessness, and pressured speech. Conversely, hypothyroidism is a decrease in thyroid function that often produces the depression-like symptoms of fatigue, lethargy, and sleep disturbance (Papolos & Papolos, 1997; Schwartz & Schwartz, 1993).

Several other endocrine systems have been studied in relation to depression, such as insulin tolerance, growth hormone, and endorphins (see Thase, Frank, & Kupfer, 1985

for review). Additionally some endocrine systems exhibit daily rhythm abnormalities in those with depression, and reduced REM latency has been observed in depressed individuals (Rehm & Tyndall, 1993). While each of these models has improved our understanding of the biology of depression, the biological models of depression do not incorporate the influence of behavior and environment, which are factors emphasized in psychological models of depression.

Psychological Models

Psychoanalytic Theory

The psychoanalytic perspective of depression emphasizes anger turned inward following loss of a loved one. The few studies investigating the psychoanalytic model of depression have not supported the theory (e.g., Beck & Ward, 1961; Weissman, Klerman, & Paykel, 1971). The proposed study is instead influenced by the behavioral, cognitive and response style theories of depression, which will be further elaborated.

Behavioral Theories

Behavioral theories of depression suggest that lack of reinforcement plays a primary role in the development of depressive symptoms. Ferster (1973), in detailing a functional analysis of depression, describes depression as the "reduced frequency of adjustive behavior" (p. 857). The author characterizes depressed individuals as frequently avoiding and escaping aversive stimuli and engaging in few positively reinforced behaviors. Additionally, Ferster details the basic behavioral process involved in the decreased frequency of positively reinforced activity, including such factors as schedules of reinforcement and changes in the environment. Similarly, Lewinsohn's

(1974) behavioral theory proposes that depression is a response to a loss or lack of response-contingent positive reinforcement. Many of the events that precede depression reduce positive reinforcement, leading to dysphoria and a reduction in behavior, both of which are characteristic of depression. Low self-esteem and hopelessness, which are additional symptoms of depression, follow from the reduced level of functioning. Lewinsohn suggests that depressed people may receive insufficient reinforcement due to an environment not conducive to reinforcement, a lack of the necessary social skills to obtain reinforcement, or an inability to enjoy or receive satisfaction from the reinforcers, usually due to anxiety (Lewinsohn 1974; Lewinsohn, Biglan, & Zeiss, 1976). Once depression occurs, the maladaptive behavior of depressed individuals, such as complaining and criticizing themselves, functions to elicit reinforcement from others in the form of sympathy and attention. Eventually, however, the depressed person's behavior pushes people away, reducing reinforcement and increasing isolation and sadness. Both activity and rewards decrease in a vicious cycle. A therapy approach has developed from Lewinsohn's reinforcement theory, based on the proposed causes of loss or lack of reinforcement.

After reviewing research and theoretical approaches to depression, Lewinsohn, Hoberman, Teri, and Hautzinger (1985) developed an expanded version of the behavioral reinforcement theory in an attempt to incorporate a wider range of research data in a more comprehensive way. They suggest that cognitive factors involving increased self-awareness may mediate between reduced reinforcement and depression. Consideration is also given to how depressive behaviors (e.g., loss of interest in

pleasurable activities) may exacerbate and maintain depression by influencing events, reinforcement, and self-awareness.

Many studies support behavioral theories of depression. Research has demonstrated that depressed individuals do demonstrate social skill deficits, such as poor maintenance of eye contact (Gotlib & Robinson, 1982; Gotlib, 1982). Depressed persons also experience significant stress related to their behavior (Hammen, 1991) and elicit negative reactions from others (Joiner, Alfano, & Metalsky, 1992).

Cognitive Theories

Cognitive theories of depression focus on the role of thought processes in determining mood. Beck developed a cognitive theory of depression derived from extensive therapeutic experience with depressed patients (Beck, 1972; Beck, Rush, Shaw, & Emery, 1979). Beck viewed the essential elements of the disorder as the "cognitive triad," consisting of a negative view of self, a negative view of the world, and a negative view of the future. The world is viewed through an organized set of depressive schemata (structural units of stored information that function to interpret new experience) that distort experience about self, the world, and the future. These cognitive biases accelerate the formation of new problems and increase the severity of existing problems. A depressive mind-set then locks the depressed person into a closed system of perceptual processing so that positive information is minimized or ignored (Newman & Beck, 1990).

Clinical observations and questionnaires that demonstrate that depressed individuals do manifest cognitive biases have given support to Beck's theory of depression (e.g., Beck, 1967; Dobson & Shaw, 1986). Many studies give further support

to Beck's theory by demonstrating that depressed individuals think more negatively and more hopelessly about themselves, the future, and the world than nondepressed controls (e.g., Alford, Lester, Patel, Buchanan, & Giunta, 1995). The results of some studies, however, do not support Beck's theory. Researchers have found that although depressives are consistently pessimistic, they are not always cognitively distorted, and others have found that negative thinking does not always precede depression (e.g., Layne, 1986; Lewinsohn, Steimetz, Larsen, & Franklin, 1981). Cognitive theories of depression have stimulated a great deal of research on the cognitive processes of depressed individuals and have contributed to a cognitive therapy for depression. The cognitive therapy developed by Beck may be the most widely used psychological therapy for depression.

A second influential cognitive theory of depression is the attributional revision of the learned helplessness theory originally developed by Seligman and colleagues (Abramson, Seligman, & Teasdale, 1978). The reformulation is a diathesis-stress model, in which a depressive explanatory style is a constitutional weakness (diathesis) which interacts with environmental stressors, resulting in depressed mood (Peterson & Seligman, 1984). According to this theory, three attributional styles in particular make individuals more vulnerable to depression. The first involves whether a person thinks of events as internal or external. Individuals more at risk for depression habitually attribute negative events to internal sources and consider negative events the result of their personal inability to control the outcome. The second is a stable versus unstable dimension in which depressed individuals consider negative situations to be stable

circumstances not likely to change in the future. The third attributional style involves the global-specific continuum, with depressed individuals more likely to consider negative events globally, as evidence of total failure. Following this theory, a depressed person attributes negative outcomes to internal, stable, and global circumstances, while attributing positive events to external, unstable, and specific circumstances (Peterson & Seligman, 1984).

Attributional helplessness and hopelessness theories of depression have been criticized as lacking diagnostic specificity, i.e., the type of depression (e.g., unipolar or bipolar) being modeled is unclear. Seligman (1978) bypassed traditional classification and described learned helplessness as a model for "helplessness depression," while Abramson, Metalsky, and Alloy (1989), with the attributional revision of the theory, described a hopelessness depression. Another criticism is whether attributions are relevant to behavior. The theory suggests that people attempt to explain their own behavior to themselves and the attributions they make affect their behavior, but some research suggests that making attributions is not a universal process (Hanusa & Schulz, 1977) and that people are frequently unaware of the causes of their behavior (Nisbett & Wilson, 1977). Other research suggests that negative attributional style may not be specific to depression (Ahrens & Haaga, 1993; Lavelle, Metalsky, & Coyne, 1979). Despite these criticisms, the learned helplessness theory and the attributional revision of the theory have prompted extensive research on the causes of depression.

Response Styles Theory

Nolen-Hoeksema (1987, 1991) has suggested that the way in which individuals respond to their depressed mood influences the severity and duration of the depressed moods. According to the theory, those who engage in ruminative responses to depression will experience increased and prolonged depressed mood. Those who engage in distracting responses, in contrast, will experience relief from the negative mood state (Morrow & Nolen-Hoeksema, 1990). Ruminative responses are described as behaviors and thoughts that are symptom-focused and contemplative. These responses repetitively direct depressed individuals' attention toward their symptoms and the possible causes and consequences of those symptoms. Examples of ruminative responses include focusing on how unmotivated one feels, expressing to others how badly one feels, worrying about the consequences of the symptoms, isolating oneself to think about negative feelings, and writing about mood in a diary (Morrow & Nolen-Hoeksema, 1990; Nolen-Hoeksema, Morrow & Fredrickson, 1993). Distracting responses are thoughts and behaviors that remove attention from the depressed person's symptoms of depression and place the individual's focus on neutral or pleasant activities. Examples of distractive responses include working on a hobby that requires concentration, engaging in an activity with friends, and engaging in work or sports (Morrow & Nolen-Hoeksema, 1990; Nolen-Hoeksema et al., 1993). Individual differences in response to depressed mood are considered to be consistent and enduring styles.

Criticism of Etiological Theories of Depression

Few theorists have incorporated into their models the important interactions between biology and psychology, and most contemporary theories of depression are narrowly focused. Rehm and Tyndall (1993) have argued that biological models of depression often focus narrowly on a single biological system and do not address psychological phenomena. Similarly, the authors state that psychological theories often do not address subtypes of depression (e.g., endogenous depression) or the contributions of biological factors. In the proposed study, we attempt to expand upon the response style theory of depression by including psychophysiological measures, thus investigating a psychobiological component of depressed mood.

Response Style Theory: Research Findings and Methodological Limitations

The Research of Nolen-Hoeksema and Colleagues

Nolen-Hoeksema and her colleagues have published several studies supporting the hypotheses associated with the response style theory of depression. Laboratory, prospective, correlational, and field studies have supported the contention that ruminative behavior is strongly associated with depression, and that it negatively affects the course of depression. In a lab-based study, Morrow and Nolen-Hoeksema (1990) induced depressed mood in participants and then randomly assigned participants to engage in 1 of 4 responses: an active distracting task; a passive distracting task; an active ruminating task; and a passive ruminative task. The greatest remediation of depressed mood was found in participants who engaged in an active distracting task, followed in order by passive distracting, active ruminating, and passive ruminating. Lyubomirsky and Nolen-

Hoeksema (1993) examined the self-perpetuating properties of ruminative responses to depressed mood in dysphoric and nondysphoric students. Dysphoric students who were induced to ruminate showed similar expectancies for the usefulness of engaging in pleasant activities to those of nondysphoric participants and dysphoric participants induced to distract. Although the dysphoric ruminators rated pleasant activities as being as enjoyable as the other groups, they reported themselves less willing to participate in pleasant activities. In a further laboratory study, dysphoric and nondysphoric students were induced either to ruminate or distract and then were assessed on a measure of perceived insight. As hypothesized, the researchers found that dysphoric participants who ruminated reported having greater insight than those dysphoric subjects who distracted. Lyubomirsky and Nolen-Hoeksema (1993) conclude that a ruminative response to depressed mood may be self-perpetuating in that it may reduce individuals' willingness to engage in the pleasant, distracting activities that may relieve their depressed mood. Also ruminators may feel they are gaining insight into their problems and feelings, which encourages further rumination.

Lyubomirsky and Nolen-Hoeksema (1995) tested the hypotheses that dysphoric ruminators would show more negative thinking and poorer interpersonal problem solving than dysphoric distractors and nondysphorics. Dysphoric students induced to ruminate were found to endorse more negative, biased interpretations of events than dysphoric distractors and nondysphorics. Also dysphoric students induced to ruminate generated poorer solutions to hypothetical problems than the other groups.

In a field study, Nolen-Hoeksema, Morrow, and Fredrickson (1993) examined the relationship between response style and duration of depressed mood. The researchers first administered the Response Styles Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991) and a depression measure to college students, and then instructed them to record their moods and responses to moods daily for 30 consecutive days. Over 80% of the participants demonstrated consistent styles of responding to their depressed moods. These researchers found that the more participants ruminatively responded to their depressed moods, the more severe the depressed mood and the more time spent experiencing symptoms that day. Regression analyses revealed that the more ruminative responses the participants engaged in (e.g., "write about my feelings," and "sit at home and think about how I feel") the longer the period of depressed mood, even after controlling for initial level of mood.

Longitudinal studies have also suggested that response styles predict the duration and severity of depressed moods. In a study of coping with depressed mood following loss, over 200 adults were interviewed following the death of a family member (Nolen-Hoeksema, Parker, & Larson, 1994). Measures of depression, ruminative coping, optimism and pessimism, social support, and stressful life events were completed. These measures were repeated at a 6-month follow-up interview. Individuals with a more ruminative style of coping with depression initially were more depressed at the 6-month follow-up, even after controlling for the initial levels of depression, social support, concurrent stressors, gender, and pessimism. In a study of depression following a natural disaster, college students completed measures of depression and response styles for

depression 14 days prior to the Loma Prieta Earthquake (Nolen-Hoeksema & Morrow, 1991). A follow-up was completed 10 days after the disaster, and once again 7 weeks after the earthquake. Students who had a ruminative style of responding to depressed mood before the earthquake were more likely to be depressed at both follow-ups than those with a less ruminative response style were.

Sex Differences in Response Style

The response style theory was originally introduced to help explain the differences in prevalence rates of depression between men and women. Nolen-Hoeksema (1987) suggested that women are more likely to amplify their moods by ruminating about their depressed mood and the causes and consequences of their mood state, whereas men are more likely to engage in distracting behaviors that are not self- and symptom-focused. Research has supported this notion. After recording mood and responses to mood daily for 30 days, women were found to be more likely than men to have a ruminative response style of coping with their depressed moods (Nolen-Hoeksema et al., 1993). In a study of depressed mood following the loss of a family member, women reported more rumination than did men (Nolen-Hoeksema et al., 1994). Sigmon, Hotovy, and Trask (1996) reported that women utilized more emotion-focused coping strategies in response to stress, and a more ruminative response to depressed mood compared to men. In a prospective, naturalistic study, women were more likely than men to cope with their depressed moods with a ruminative response (Butler & Nolen-Hoeksema, 1994). After controlling for rumination levels, gender was no longer a potent predictor of later depression.

Nolen-Hoeksema (1987) has suggested that women and girls are socialized in a way that promotes a ruminative response to depressed mood, and emotion-focused coping in general. Ali and Toner (1996) investigated whether men and women are given different advice regarding responding to mood. Participants read one of two forms of a scenario describing someone in a negative life situation and then completed a questionnaire assessing the type of advice they would give to that person. In one form, the stimulus person had a female name, and in the other form a male name. The researchers found that participants, regardless whether they themselves were female or male, endorsed more ruminative advice for female stimulus persons than for male stimulus persons.

In laboratory studies in which dysphoric and nondysphoric participants are assigned into ruminative or distraction conditions, Nolen-Hoeksema and colleagues first perform all analyses with sex of participant as a between-subjects variable. Generally, no interactions between sex and response manipulation condition have been found, so analyses are conducted by collapsing across sex of student (e.g., Morrow & Nolen-Hoeksema, 1990; Lyubomirsky & Nolen-Hoeksema, 1995). Most of the laboratory research has involved college students, and Nolen-Hoeksema (1990) reports that college students comprise one of the groups in which sex differences in depression or personality variables are often not found. Given its importance in the response style theory of depression, future studies in this area should continue to investigate the influence of gender.

The Relationship Between Response Style and Anxiety, Worry, and Neuroticism

Depressive and anxious symptoms often coexist, measures of anxiety and depression are often highly correlated, and the strong association between depression and anxiety has been consistently observed by researchers (e.g., Dobson, 1985; Gotlib, 1984; Orme, Reis, & Herz, 1986; for review see Gotlib & Cane, 1989). Many researchers have suggested that the general distress factor neuroticism or negative affectivity underlies measures of depression and anxiety, along with several other factors associated with mood (e.g., Eysenck, 1970; Gotlib, 1984; Clark, Steer, & Beck, 1994; Clark & Watson, 1991). Others have reported that the symptoms of depression and anxiety are distinct, and that depression and anxiety may in fact share nothing but a common determinant (Burns & Eidelson, 1998). Because of the lack of clear understanding regarding the nature of the relationship between depression and anxiety, it is important to assess the influence of anxiety in studies investigating depressed mood.

Although ruminating, as described by Nolen-Hoeksema (1990), seems conceptually similar to anxious worrying, the relationship of a ruminative mood response to anxiety has not been adequately addressed. According to Nolen-Hoeksema et al. (1994), individuals engaged in a ruminative response to depressed mood "worry excessively but passively about their depression," and examples of ruminative responses include "worrying about the implication of one's depression, and worrying about the consequences of one's distress" (p. 92). However, we have found only one study (as yet unpublished) investigating the relationship between worry and ruminative response style. Tsao and Craske (1997) gave participants self-report measures of mood, worry, and

response style before and after a stressor (class exam). The researchers reported that worry and ruminative responding are highly related and share an underlying factor that they characterized as a "maladaptive response mode" which is also comprised of anxiety and depressive symptoms. According to the authors, worry may have been temporarily inflated due to the exam, and may have unintentionally reflected state rather than trait-like worry. Because this is a single study involving only college students, further research is needed to examine the preliminary finding of a significant relationship between worry and ruminative response style.

As previously discussed, some researchers consider anxiety and depression as dimensions of a higher order construct such as neuroticism. Nolen-Hoeksema et al. (1994) have addressed the potential argument that ruminative coping is indistinguishable from neuroticism or negative affectivity. The authors report that in two of their (unpublished) correlational studies, ruminative coping was moderately correlated with neuroticism, but not significantly correlated with negative affectivity scores. They argue, however, that rumination and neuroticism are not the same, that ruminative coping predicts change in depression scores over time even after statistically controlling the effects of neuroticism (Nolen-Hoeksema, 1993), and that ruminative coping may explain a mechanism by which global traits like neuroticism are related to depression (Nolen-Hoeksema et al., 1994). The authors conclude that although ruminative coping is related to neuroticism, ruminative coping is a better predictor of changes in depression than is neuroticism. It is further suggested that ruminative coping may mediate the relationship between neuroticism and depression. Due to the paucity of published research

investigating the relationships between ruminative response style, neuroticism, and worry, further study appears warranted.

Limitations to Response Style Research

Despite the increasing attention given to the response style theory of depression and the robust findings in its supporting body of research literature, several methodological concerns have yet to be addressed by researchers. We have found only two studies (Nolen-Hoeksema, Parker, & Larson, 1994; Vajk, Craighead, Craighead, & Holley, 1997) conducted in this area that did not rely solely on self-report measures of mood. Further, in the majority of research conducted by Nolen-Hoeksema and colleagues, depressed mood scores were based on only two items within a series of Likert scales. Another limitation to this body of research is that the relationship and possible overlap between rumination and the conceptually-related constructs of worry and neuroticism have received only limited research attention.

Another important limitation is the absence of psychophysiological measurement in response style research. Researchers interested in dependent measures less affected by demand characteristics have chosen to use psychophysiological measures in their research (e.g., Blackburn & Bonham, 1980; Orton, Beiman, LaPointe, & Lankford, 1983). For example, Orton et al. (1983) investigated whether induced negative mood and anxiousness led to different physiological responses in participants. The authors found anxiety-inducing self-statements significantly increased heart rate as compared to depressive and neutral self-statements. Negative self-statements affected physiological arousal. Consequently, the authors suggested that cognitions may be important

etiological or maintaining factors in stress-related clinical problems and that further research is required to understand the effects of cognitions on physiological responses. Despite these findings, the prominence of biological theories of depression, the increasing research into the negative impact of depression on physical health (e.g., healthy cardiovascular functioning), and the contention that subjective mood reports are vulnerable to experimental demand (Velten, 1968; Coleman, 1975), response style researchers have not included psychophysiological measures in their studies.

The proposed study will be the first to investigate the effects of rumination and distraction in depressed and nondepressed individuals on various psychophysiological measures while evaluating the relationship between ruminative response, worry, and neuroticism.

In order to increase understanding of potential results attained through physiological measurement of rumination and distraction in depressed and nondepressed individuals, psychophysiological measurement of depression is reviewed in the following sections.

Psychophysiology of Depression

Psychophysiology and the Nervous System

Psychophysiology may be described as the study of emotional, cognitive, and behavioral variables as they relate to and are observed through physiological events and principles (Cacioppo & Tassinary, 1990). Psychophysiology is based on the assumption that bodily responses contain information about emotion, thought, perception, and action. The focus of psychophysiology is not on isolated physiological events or constructs of

the body, but more broadly, on the transactions between human body systems and their environment (environment referring here to both physical and sociocultural environments) (Cacioppo & Tassinary, 1990). Psychophysiology, then, is the study of the relationship between psychological variables (e.g., anxiety) and the resulting physiological responses (e.g., heart rate) (Andreassi, 1995).

Physiological events are under the control of the nervous system, which is divided into two main components, the central nervous system (CNS) and the peripheral nervous system. The CNS is comprised of the brain and spinal cord, and the peripheral nervous system includes nerve tissue outside the brain and spinal cord, including the cranial and spinal nerves. This peripheral nervous system is divided further into the somatic system, involved in muscular activities, and the autonomic nervous system (ANS) which controls the glands and organs of the body. A great deal of the research conducted by psychophysiologists involves measurement of autonomic nervous system activity. The ANS regulates and coordinates many important body activities, including digestion, body temperature, blood pressure, and many aspects of emotional behavior (Andreassi, 1995).

The Autonomic Nervous System

The ANS is subdivided into the sympathetic nervous system and the parasympathetic nervous system. The sympathetic nervous system is involved in the "fight-or-flight" response described by Walter B. Cannon in 1915. It is a system of activation that prepares the body in situations of emergency or stress. Sympathetic reactions include increased heart rate and blood pressure, increased sweating, increased blood sugar to meet changing metabolic needs, decreased blood flow to the internal

organs and extremities and increased blood flow to the voluntary muscles. Because of the organization of the sympathetic nervous system, sympathetic reactions occur simultaneously and the system operates as an integrated whole. The parasympathetic nervous system is dominant during eating, sleeping, and sexual activity. Examples of reactions under the control of the parasympathetic nervous system include decreases in heart rate and blood pressure, stimulation of salivary and digestive secretions, pupillary constriction, and increased blood flow to the genitalia during sexual arousal. These two systems work together to regulate body systems (Andreassi, 1995; Matsumoto, Walker, Walker, & Hughes, 1990).

The main function of the ANS is to maintain a stable internal body environment throughout internal and external changes. Although the sympathetic and parasympathetic systems have contrasting functions, the activities are integrated and these two systems work together to regulate body many important bodily processes (Andreassi, 1995; Matsumoto, et al., 1990).

Measurement of Autonomic Nervous System Responses

The most common psychophysiological measures of activities controlled by the autonomic nervous system are measures of the electrodermal system and the cardiovascular system.

Electrodermal System. The electrical activity of the skin, or electrodermal activity (EDA), is one of the most frequently measured response systems in psychophysiology (Dawson, Schell, & Filion, 1990). Researchers observed in the late 1800's that various physical and emotional stimuli produced changes in the electrical

activity of the skin (Andreassi, 1995). Although the exact physiological bases for changes in EDA are not fully understood, numerous studies have strongly implicated changes in sweat gland activity (Edelberg, 1972). Human sweat glands are now thought to receive predominantly sympathetic activation (Shields, MacDowell, Fairchild, & Campbell, 1987); thus control of EDA is considered predominantly sympathetic.

Measurement of Electrodermal Activity. In order to measure electrodermal activity, researchers either pass a small current through a pair of electrodes placed on the skin surface (skin conductance) or measure the natural differences in electrical potential between skin areas without the use of an external current (skin potential). There are several types of EDA (Andreassi, 1995; Dawson, Schell, & Filion, 1990). Exosomatic measures rely on an external source of current for observation and include skin resistance response (SRR), which refers to momentary fluctuations in skin resistance, and skin resistance level (SRL), which indicates the baseline skin resistance. Skin conductance response (SCR) is a conductance unit measure of SRR, whereas skin conductance level (SCL) is a conductance unit measure of SRL. The unit of conductance is the mho, however some researchers refer to these same units as micro Siemens, or uS. Endosomatic measures do not require the application of current, and include skin potential response (SPR), which refers to fluctuations in skin potential, and skin potential level (SPL), the level of skin potential at any given time. The responses are measured in millivolts. Examples of advantages of choosing EDA as a measure of autonomic activity are that it is able to provide direct representation of sympathetic nervous system activity

and that it is relatively free from somatic influences (see Dawson et al., 1990, for further advantages).

Research Related to Electrodermal Activity. Since the discovery of electrodermal activity, this response system has been found to be closely associated with emotion and arousal (Dawson, Schell & Filion, 1990). In a study of EDA and emotional expression, participants generated facial expressions of the negative emotions of anger, fear, sadness, and disgust, and the positive emotions of happiness and surprise. The researchers found greater electrodermal activity during the portrayal of the negative emotions versus the positive emotions (Levenson, Ekman, & Friesen, 1990). Additionally, EDA abnormalities have been linked to depression. For example, in unmedicated depressed individuals, researchers have found lower levels of SCL as compared to nondepressed controls (Dawson, Schell & Catania, 1977; Iacono et al., 1983; Mirkin & Coppon, 1980).

Cardiovascular System Activity. The cardiovascular system is a primary focus of interest in psychophysiology, and researchers are increasingly interested in change in heart activity during emotional and stressful situations, differential heart rate in various emotional states, heart activity during task performance, and the impact of individual differences on cardiovascular health and disease (Andreassi, 1995; Papillo & Shapiro, 1990). The cardiovascular system is considered an apparatus for moving the blood throughout the body in order to allow exchanges between tissues and organs, and the primary function of this system is to maintain blood flow adequately amidst constantly fluctuating metabolic requirements. Factors affecting the circulation of blood, including temperature and hunger and behaviors related to emotion, pain, arousal, and stress are

mediated by cardiovascular control centers in the brain. Research attention is often focused upon the effects of psychological phenomena on circulation, which provides information about bodily processes occurring in association with psychological variables (Papillo & Shapiro, 1990).

Measurement of Cardiovascular Activity. Several methods exist to monitor cardiovascular activity, including heart rate, blood flow, and blood pressure measures (Andreassi, 1995; Pappillo & Shapiro, 1990). Heart rate (HR) is a commonly used measure of heart activity and is based on the number of heart beats during an interval of time, for example, the number of beats per minute. Electrical impulses generated by specialized cells (pacemaker cells) initiate the contraction of the heart muscle, and the transmission of electrical activity through the heart creates an electrical field that can be measured by placing electrodes on the body surface. An electrocardiogram (ECG) is used to graphically represent the pattern of electrical activity that occurs during each heart beat (Papillo & Shapiro, 1990). HR is based on the occurrence of the R wave, which is the most prominent component of the ECG. HR may be recorded continuously and beats per minute calculated. The heart beats an average rate of 70 beats per minute in a healthy adult at rest. The heart period (also called interbeat interval) may also be measured with an ECG; it is the time between one R wave and the next and is expressed in milliseconds (Andreassi, 1995). Another method of measuring cardiac changes is heart rate variability, which is a measure of HR during baseline or during task performance. Heart rate variability is calculated with a variance statistic (the standard

deviation of RR intervals in sinus rhythm), and good cardiac function is associated with a high degree of variability (Dwight & Stoudemire, 1997).

Blood pressure is an important general index of cardiovascular health and function, and is one of the most frequently measured physiological variables (Andreassi, 1995). Blood pressure describes the force of blood against the blood vessel walls, and the primary function of this pressure is to move blood through the circulatory system. Methods for measuring blood pressure are primarily indirect, as a direct measure involves inserting a sensing apparatus directly into one of the major arteries. The auscultatory method of obtaining blood pressure is commonly used by physicians to determine if the patient's pressure falls within a normal range. This method involves use of a pressure cuff, a mercury manometer, and a stethoscope. The pressure cuff is placed around the upper arm and inflated and the stethoscope is placed over the brachial artery. The cuff pressure is reduced and diastolic and systolic blood pressure readings are taken from the manometer. The systolic reading is taken when the heart contracts to push blood into the arteries, and the diastolic reading is taken between beats when the heart relaxes. Blood pressure values are expressed in millimeters of mercury (mm HG) units. Systolic blood pressure ranges between 110 and 150 mm Hg for a normal adult and normal diastolic pressure ranges between 60 and 89 mm Hg. Another measure of blood pressure is determined by the difference between systolic and diastolic pressure, called pulse pressure. The average pressure during the cardiac cycle is called mean arterial pressure (MAP). MAP reflects the average pressure that pushes the blood through the circulatory system (Andreassi, 1995; Papillo & Shapiro, 1990). For research purposes, more precise

and automated methods of blood pressure measurement are sometimes used, including the constant cuff technique, the beat-to-beat technique, and the oscillometric technique (see Papillo & Shapiro, 1990, for a review of these techniques).

Blood flow to the body tissues fluctuates in response to changing metabolic requirements for the area, and psychophysiologists are interested in measuring blood flow as a nonintrusive measure of cardiovascular activity. The most widely used psychophysiological methods of measuring changes in peripheral blood flow include plethysmography which measures electrical impedance or electrical resistance and photoplethysmography which measures light absorption characteristics of the blood (see Papillo & Shapiro, 1990, for a review).

Research Related to Cardiovascular Activity. Research supports the conclusion that cardiovascular activity can be influenced by thoughts, images, and tasks (Andreassi, 1995). For example, Lynch, Lynch and Friedmann (1992) report observations that in certain patients whose blood pressure was monitored continuously throughout psychotherapy sessions, blood pressure would drop as much as 50 percent when the patients alluded to or discussed feelings of extreme hopelessness or helplessness.

Additionally, many researchers have induced various mood states to assess for cardiovascular differentiation. Sinha, Lovallo, and Parsons (1992) examined the blood pressure, heart rate, and other cardiovascular measures in individuals as they imagined various emotional conditions. Anger produced the greatest increase in heart rate, followed by fear, sadness and joy. Blood pressure significantly increased in all imagery conditions except the neutral condition, with anger- and sadness-induced blood pressure

significantly higher than blood pressure for the other emotional states. In a study of psychophysiological response to the induced mood states of anxiety and depression, researchers reported that anxiety-producing self-statements led to significantly greater increases in heart rate than depressive and neutral self-statements (Orton, Beiman, LaPointe, & Lankford, 1983).

The Psychophysiology of Depression: An Increasing Area of Investigation

Accumulating evidence supports a link between major depression and heart disease. In a recent review of articles published between 1966 and 1996, Dwight and Stoudemire (1997) report that there exists convincing evidence that depressive disorders are common among patients with coronary artery disease (CAD), and that the comorbid existence of CAD and depression is associated with increased rates of morbidity and mortality. Further, the influence of depressive disorders on negative outcome in CAD patients appears to be equal to or exceed that of other well-established cardiovascular risk factors, such as smoking (e.g., Carney et al., 1988b; Frasure-Smith, Lesperance, & Talajic, 1993; Silverstone, 1987). The exact nature of the relationship between depression and mortality in CAD patients is still unknown, but increasingly investigators have implicated increases in the autonomic nervous system (e.g., Carney et al., 1988b; 1995; Lahmeyer & Bellur, 1987). Increasingly, research is supporting the contention that abnormalities in autonomic regulation (e.g., alterations in heart-rate variability and resting heart rate) increase the risk for heart attack and death in CAD patients with comorbid depression (Dwight & Stoudemire, 1997). In order to better understand depression and autonomic activity, an increasing number of researchers are investigating

the psychophysiology of depression. Many such studies have compared the resting heart rates, heart rate variability, and/or electrodermal activity of depressed patients to those of non-depressed controls.

Cardiovascular Activity and Depression

Many studies have shown that individuals with major depression have significantly higher resting heart rates than non-depressed controls (e.g., Dawson, Schell, & Catania, 1977; Lake et al, 1982; Lechin et al., 1995; Rechlin, Weis, Spitzer, & Kaschka, 1994). In a study of sleep and wakefulness in patients with major depressive disorder, heart rate was significantly higher in the depressed patients than in the nondepressed controls during wakefulness. Additionally, the heart rates of the depressed patients continued to be elevated throughout sleep. The authors report that the results suggest change in the autonomic regulation of heart rate in depressed individuals (Lahmeyer & Bellur, 1987). Cardiovascular response to a cognitive task was measured in depressed individuals of two age groups (<30 and >60 years of age) and non-depressed age-matched controls. At baseline, heart rates were higher in the depressed patients, regardless of their age (Gotthardt et al., 1995). Lehofer et al. (1997) investigated heart rate in patients with major depression being treated with tricyclic antidepressants, unmedicated depressed patients, and non-depressed controls. The medicated patients exhibited the highest heart rates, possibly due to the effects of the antidepressants. Depressed patients not on medication did evidence a significantly higher heart rate than the controls. In a study of cardiovascular activity in depressed patients with coronary artery disease, the mean heart rate for depressed patients with CAD was significantly

higher than that for the nondepressed patients with CAD. Multiple regression analysis revealed that depression was significantly associated with heart rate even after controlling for the effects of age, smoking status, and beta blocker therapy (Carney et al., 1988a). Many researchers comparing heart rate in depressed and nondepressed individuals report that the psychophysiology of depression involves an increased baseline heart rate.

Heart rate variability has also been measured in depressed individuals. Variability in heart rate is related to the ability of the autonomic nervous system to vary intervals between heart beats, depending on physiological requirements (Rechlin, Weis, Spitzer, & Kaschka, 1994). Increased heart rate variability is associated with good cardiovascular functioning, whereas decreased heart rate variability has been observed in heart disease states (Dwight & Stoudemire, 1997). Several researchers have reported decreased heart rate variability in depressed individuals (e.g., Carney et al., 1988b; Dalack & Roose, 1990). Carney et al. (1995) compared depressed and nondepressed patients with cardiovascular artery disease, and found heart rate variability was significantly lower in depressed versus nondepressed patients. In a recent study of heart rate variability in patients with CAD, patients were split into a high depression group and a low depression group based on scores on a self-report depression measure. Heart rate variability and average heart rate measures were obtained from 24-hour ambulatory electrocardiography monitoring. The authors report that heart rate variability was significantly lower, and average heart rate significantly higher, in patients with higher depression scores (Krittayaphong et al., 1997). Rechlin, Weis, Spitzer, and Kaschka (1994) found significantly lower heart rate variability in unmedicated patients with major depression as

compared to patients with panic disorder and healthy controls. In addition to resting heart rate, heart rate variability appears to differ in depressed versus non-depressed individuals. Also, elevated blood pressure has been found in depressed patients as compared to non-depressed controls (Gotthardt et al., 1995). In sum, the research literature does seem to support differences in cardiovascular activity in depressed individuals.

Electrodermal Activity and Depression

Skin conductance measures have also been used to investigate possible differences in the autonomic nervous system response of depressed individuals. Although fewer studies have assessed skin conductance in depressed individuals, researchers have indicated that depressed individuals have lower skin conductance as compared to controls (e.g., Bagg & Crookes, 1966; Iacono et al., 1983; Noble & Lader, 1971; Ward, Doerr, & Storrie, 1983). Donat and McCullough (1983) studied heart rate, skin conductance, and finger pulse amplitude prior to and during stress tasks (e.g., mental arithmetic and imaginal stress situations). Only skin conductance revealed a significant main effect attributable to group, with lower skin conductance levels in the depressed group. The ability of skin conductance level to predict group membership was assessed with a discriminant analysis, and resting skin conductance level was found to correctly identify 90% of the depressed group and 70% of the control group. Similarly, Ward et al. (1983) reported that skin conductance level distinguished depressed patients from normal controls with a sensitivity of 87% and a specificity of 89%. Dawson, Schell, Braaten, and Catania (1985) also assessed diagnostic utility of skin conductance level in

distinguishing hospitalized depressed patients from non-depressed controls, but additionally assessed skin conductance rate, heart rate level, and heart rate response. The overall efficiency of skin conductance level was 70%. Skin conductance response was 90%, heart rate level was 83%, and heart rate response was 83%. These studies support the contention that skin conductance levels are lower in depressed individuals.

Taken together, the cardiovascular and electrodermal activity studies point to an alteration in the autonomic nervous system of the depressed. Although autonomic nervous system differences are not yet fully understood, researchers have suggested the possibility that changes in autonomic regulation (Lahmeyer & Bellur, 1987), increased sympathetic activity (Carney, 1988b; 1995; Lechin et al., 1995), and alteration of parasympathetic cardiac function (Rechlin et al., 1994) are involved in major depression. Although autonomic nervous system differences have been found in depressed patients, little attention has been given to psychophysiological measurement in dysphoric or dysthymic individuals. Lechin et al. (1995) measured cardiovascular system response during sitting, standing, and moderate exercise in dysthymic patients. The authors found no significant differences in resting blood pressure or heart rate between the dysthymic and control groups. In another study, non-clinically depressed CAD patients were split into two groups at the median of a depression measure. The higher scorers on the depression measure had higher heart rates and lower heart rate variability than the lower scorers (Krittayaphong et al., 1997). Given the negative impact of autonomic differences on patients with coronary artery disease as well as the lack of sufficient investigation

regarding autonomic nervous system activity in dysphoric individuals, additional studies including measures of cardiovascular and electrodermal activity appear warranted.

Psychophysiology of Depression: The Influence of Anxiety

Depressive and anxious symptoms frequently co-occur to varying degrees within major depressive disorder, panic disorder, and generalized anxiety disorder (Shores et al., 1992; Stavrakaki & Vargo, 1986), and personality traits such as neuroticism have been related to the occurrence of depressive episodes (Hirshfeld et al., 1989). As is the case in the ruminative response style literature, few studies measuring autonomic nervous system activity in depressed individuals investigate the potential influence of trait anxiety, worry, or neuroticism. In a recent study of cardiac autonomic control and major depression, depressed patients on antidepressants and non-medicated depressed patients were compared to age and sex-matched control groups. Although the researchers found significantly higher heart rate in the depressed groups, the authors report that patients in both depressed groups had scores on a self-report anxiety measure within a range commonly seen in generalized anxiety disorder patients, and that increase in heart rate may be due to sympathetic activation caused by anxiety (Lehofer et al., 1997). In a study addressing the potential influence of anxiety in autonomic investigations of major depression, Tulen et al. (1996) divided a sample of female depressed patients into one group high on trait anxiety (HTA) and a second group low or normal on trait anxiety (LTA). Trait anxiety in this study was based on psychiatric and medical history information, an interview with a first-degree relative or partner, and scores on a trait anxiety questionnaire developed by the researchers. The two groups of depressed

patients were compared to age-matched female controls on measures of heart rate, blood pressure, and respiration during rest, upon standing, and resting following standing. The groups did not differ at rest. While standing, the HTA patients demonstrated significantly higher heart rate and respiration frequency as compared to controls. Both patient groups failed to show normal increases in blood pressure while standing. The HTA group also demonstrated significantly higher respiratory frequency than controls. The authors conclude that trait anxiety may be an important factor in investigations assessing parasympathetic and sympathetic imbalances in individuals with major depression. In a study of the effects of worry and somatic anxiety on physiological measures, participants completed a mood inventory, then received worry induction, somatic anxiety induction, or a neutral induction, and then repeated the same mood inventory. Participants in both the worry induction and somatic anxiety induction groups evidenced significant increases in heart rate relative to the control group. Worry was correlated with depression on the mood inventory, and the authors suggest that worry consists partially of depressed emotions. Although researchers continually investigate and theorize on the relationship of anxiety and depression, few have controlled for the influence of anxiety or neuroticism in studies of autonomic response in depressed individuals. The proposed study will investigate whether differences in baseline measures of autonomic response exist between dysphoric and nondysphoric individuals, after controlling for neuroticism and worry.

Sex Differences in Psychophysiological Measurement

The sex of participants may influence physiological activity, according to some researchers (e.g., DeMeersman, 1993; Donat & McCollough, 1983; Forsman & Lindblad, 1983; Hellman and Stacy, 1976). However, we did not find reports of baseline psychophysiological differences between men and women in the many studies reviewed on the psychophysiology of depression. However some of these studies used single-sex samples (e.g., Donat & McCullough, 1983; Tulen et al., 1996). Other studies with mixed gender samples controlled for the influence of sex as a variable. For example, in a study examining the relationship between cardiovascular measures and depression in patients with coronary artery disease, Carney et al. (1988a) entered sex and other potentially confounding variables into a multiple regression to control for their influence. Similarly, Krittayaphong et al. (1997) investigated heart rate variability in CAD patients at high and low levels of depressive symptoms. The influence of gender was addressed by controlling for gender differences by using multiple regression analyses as well as performing additional analyses on men and women separately. The same effects were found in the male and female groups.

In a study of sex differences in physiological reactions to stress, van Doornen (1986) found no differences between men and women on systolic blood pressure or heart rate. Sigmon, Hotovy and Trask (1996) found no differences in baseline measures of electrodermal response between women and men in a study of sensitivity to aversive events. The relationship between psychophysiological response and sex of the participant is not thoroughly understood. Consequently, in the proposed study potential sex

differences in baseline measures of autonomic response will be assessed for and controlled if necessary.

The Psychophysiology of Cognitive Coping Strategies in Depressed Mood

Although many studies, particularly in the heart disease literature, report baseline differences in autonomic arousal between depressed and non-depressed individuals, fewer studies have investigated psychophysiological differences between depressed and non-depressed during physical (e.g., standing) and mental stressors (e.g., mental arithmetic) (e.g., Donat & McCullough, 1983; Gotthardt et al., 1995; Lechin, et al., 1995). We have found only four studies investigating the psychophysiological response of depressed individuals during a cognitive task (e.g., thought-stopping; thinking a sad thought; distancing self from distressing thought) (Blackburn & Bonham, 1980; Schwartz, 1975; Teasdale & Bancroft, 1977; Teasdale & Rezin, 1978); these studies are the most relevant to the proposed study.

These four studies were reportedly conducted to obtain experimental evidence related to cognitive therapy techniques for the treatment of depression. In a sample of depressed inpatients, Teasdale and Rezin (1978) compared the effects of thought-stopping in response to depressive thoughts to a control technique on measures of mood and electromyographic activity (EMG). The authors report that EMG activity was significantly related to the frequency of spontaneously occurring depressive thoughts, but no significant effect was found for the thought-stopping technique on depressed mood or EMG activity. Teasdale and Bancroft (1977), in five single-case experiments, measured self-report of mood and EMG activity while the depressed participants thought happy and

unhappy thoughts. EMG activity was significantly higher in the unhappy condition than in the happy condition for all but one participant. Schwartz (1975) reported that depressed and non-depressed individuals demonstrated different EMG patterns in response to thinking about a sad thought. These studies are limited in that only EMG activity was measured and the effects of these cognitive tasks on autonomic arousal (now commonly linked to depression) cannot be understood.

We have found only one study that examined the effects of a cognitive strategy on mood and autonomic nervous system measures. Blackburn and Bonham (1980) conducted five single-case experiments to study the physiological effects of different strategies for coping with pleasant and unpleasant thoughts. Unpleasant and pleasant thoughts were generated by the participants and rated on a mood scale. The most pleasant and two most unpleasant thoughts were used in the experiment. In one condition the participants were instructed to think about the pleasant thought (control condition), in another they were directed to distance themselves from an unpleasant thought (distancing condition) and in the third condition they were instructed to involve themselves with an unpleasant thought (involvement condition). According to the researchers "distancing" was described to the participants as standing away from negative thoughts and examining their content objectively, whereas "involvement" was described as engaging in the thought and associated feelings by creating a vivid mental picture. All participants showed significant differences in mood ratings for the thought conditions. The pleasant thought was associated with less self-reported depressed mood, and involvement with the unpleasant thought elicited higher ratings of depressed mood than distancing. Heart rate

for the involved thought was significantly higher than for the distanced thought in three participants, while there were no significant difference between pleasant and distanced thoughts for any subject on the heart rate measure. Heart rate, corrugator muscle EMG (brow), and mood measures were all significantly correlated. Among the limitations to this study are the very small number of participants and the lack of investigation into the influence of anxiety. Further investigation is required to understand the effect of cognitive coping strategies such as rumination and distraction on psychophysiological measures. Such information may extend theories of depression by including a maladaptive arousal component.

Summary and Conclusions

Major depression has a tremendous negative impact on society in terms of human suffering and economic cost; consequently, factors associated with increased duration and exacerbation of depressive symptoms remain an important area of investigation for mental health researchers. The response styles theory of depression asserts that the way in which individuals respond to depressed mood affects the severity and duration of that mood. Although this body of research has received initial support, the research has been limited by the use primarily of self-report measures of mood, and the lack of investigation into the relationship between response style and the conceptually related constructs of worry and neuroticism. The use of psychophysiological measures in the proposed study is important in extending upon the self-report findings. Additionally these measures improve our understanding of the psychophysiology of depression, which

is an area of increasing interest given the high mortality rate of patients with comorbid heart disease and depression.

Hypotheses

Psychophysiological Response

Baseline levels of heart rate, skin conductance, and blood pressure were compared between men and women and dysphoric and nondysphoric groups. We expected to find baseline differences for the dysphoric participants, based on previous research with depressed patients. After controlling for baseline levels, we expected to find post-task psychophysiological differences in the groups similar to the results Nolen-Hoeksema has found with self-reported mood. More specifically, we expected to find a significant dysphoria status by experimental condition interaction, with dysphoric ruminators having more post-task physiological arousal than dysphoric distractors and the nondysphoric groups.

Self-Reported Depressed Mood and Worry

Because we were partially replicating laboratory studies of Nolen-Hoeksema and colleagues (e.g., Lyubomirsky & Nolen-Hoeksema, 1993) we expected to find similar results for post-task depressed mood. Based on their findings, we predicted an experimental condition by dysphoria status interaction, with dysphoric ruminators reporting higher levels of post-task depressed mood than nondysphoric ruminators or distractor groups. Additionally we expected to find similar results when we investigated post-task worry, with dysphoric ruminators reporting higher post-task worry than the other groups.

Neuroticism, Worry, and Response Style

Neuroticism and worry have not been adequately investigated in terms of their influence on post-task mood ratings following a ruminative or distractive task. We predicted that the consistent finding in previous studies of a dysphoria status by experimental condition interaction for post-task mood ratings would not be found once the influence of neuroticism (as measured by the GTS-Neuroticism scale) and worry (as measured by the Penn State Worry Questionnaire) were statistically controlled. Also we expected to find high correlations between a ruminative response style (as measured by the Response Style Questionnaire), depressive symptoms (BDI), worry (PSWQ), and neuroticism (GTS-Neuroticism). Further we expected that a ruminative response style would not significantly predict depression over and above gender, worry, and neuroticism.

CHAPTER 2

METHOD

Participants

Participants of this study included 170 undergraduate students (99 women and 71 men) enrolled at a Midwestern university who received either psychology course credit or cash ($10) for completing the study. The mean age of participants was 20.49 years (SD =2.41; range = 18-30 years) and mean year in college was 2.22 (SD = 1.16). Prior to participation, students completed several screening questionnaires, which included the Beck Depression Inventory and a demographic information sheet. A total of 1,061 students completed the screening questionnaires. Of those screened, 105 students qualified for the dysphoric group (BDI scores of 15 and above) and 594 students qualified for the nondysphoric group (BDI scores of 5 and below). Students taking antidepression or antianxiety medication were excluded. Of the qualifying students, 192 students were contacted and recruited for the study; 170 of these students agreed to participate and completed the study. Participants were then randomly assigned to either the rumination task or the distraction task, resulting in eight experimental groups: (a) female dysphoric ruminators; (b) male dysphoric ruminators; (c) female dysphoric distractors; (d) male dysphoric distractors; (e) female nondysphoric ruminators; (f) male nondysphoric ruminators (g) female nondysphoric distractors and (g) male nondysphoric distractors. The mean BDI score for the 84 dysphoric participants was 20.95 (SD =

6.48), and the mean BDI score for the 86 nondysphoric participants was 2.74 (SD = 1.73).

Measures

Questionnaires

Participants completed self-report measures of depression, worry, neuroticism, and response style, along with a series of filler items (See Appendix).

Depressed Mood

Symptoms of depression were measured with the Beck Depression Inventory (BDI; Beck, 1967) and with Likert rating scales (Morrow & Nolen-Hoeksema, 1990). The BDI consists of 21 items related to depressive symptoms, each rated on a 4-point scale. The BDI is considered high in test-retest reliability (Rehm, 1988) and has been extensively validated. A questionnaire developed for response style studies (Morrow & Nolen-Hoeksema, 1990) containing several filler items, two mood items, and two anxiety items was used to assess depressed mood before and after the experimental task. Likert ratings of sadness (1 = not sad; 9 = very sad) and depression (1 = not depressed; 9 = very depressed) were averaged to compute one measure of depressed mood.

Response Style

The Response Styles Questionnaire (RSQ; Nolen-Hoeksema & Morrow, 1991) consists of 71 items that measure individual responses to negative emotions. The Ruminative Responses Scale of the RSQ includes items describing self and symptom-focused responses to depressed mood (e.g., "think about how sad you feel"). The Distractive Responses Scale of the RSQ includes items describing responses that are not

symptom or self-focused (e.g., "concentrate on your work"). Adequate reliability and convergent and predictive validity ratings for the RSQ have been reported (Nolen-Hoeksema & Morrow, 1991).

Anxiety

Anxiety was measured with the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) and Likert rating scales (Morrow & Nolen-Hoeksema, 1990). The PSWQ is a 16-item measure of the frequency and intensity of concerns related to generalized anxiety disorder. Studies in clinical and nonclinical samples have reported high internal consistency, short-term retest reliability, and convergent and criterion-related validity (Brown, Antony, & Barlow, 1992; Davey, 1993). A questionnaire containing several filler items, two mood items, and two anxiety items was used to assess anxiety before and after the experimental task. Likert ratings of anxiety (1 = not anxious; 9 = very anxious) and worry (reverse scored, 1 = very worried; 9 = not worried) were averaged to compute one measure of anxiety.

Neuroticism

Neuroticism, was measured with the short form of the General Temperament Survey (GTS; Clark & Watson, 1995). The short form of the GTS is a 43-item, true-false format inventory with three subscales: Negative temperament (neuroticism), Positive temperament, and Disinhibition. Clark and Watson (1995) report that test-retest and alpha reliability coefficients for the short form of the GTS is highly correlated with the longer, 90-item version, which has demonstrated reliability.

Vocabulary

Part I of the Shipley Institute of Living Scale (Shipley, 1940) was used as a brief measure of vocabulary. Part I of the scale consists of 40 multiple choice items.

Filler Questionnaires

Several questionnaires designed by Morrow and Nolen-Hoeksema (1990) were used to divert participants from the study's focus on mood, anxiety, and response style. The Color Imagination scale asked participants to rate on Likert scales their difficulty in imagining eight different colors (1 = very easy; 7 = very difficult). The Levels of Consciousness and Daydreaming scale consists of 14 yes/no questions related to dreaming. The Absorption and Imaging Inventory asks participants to rate on 5-point Likert scales the degree to which they agree/disagree with nine statements about themselves (1 = strongly agree; 5 = strongly disagree).

Response Manipulation Materials

Developed by Morrow and Nolen-Hoeksema (1990), the response manipulation tasks are designed to influence the thought content of the participants by requiring them to focus their attention and think about a series of written phrases. In the ruminative condition, participants were asked to view and think about emotion-focused, self-focused, and symptom-focused phrases, such as "what your feelings might mean." Participants in the distraction condition were asked to focus on items not related to symptoms, emotions, or the self, such as "the layout of a typical classroom." The items in both conditions were rated as equally neutral by nondysphoric judges (Morrow and Nolen-Hoeksema, 1990).

One slide was made for each of the phrases and participants either viewed a set of ruminative slides or a set of distractive slides (see Appendix).

Psychophysiological Measures

Diastolic and Systolic Blood pressures values were recorded and expressed in standard millimeters of mercury (mm HG) units. Heart rate was recorded as the average number of beats per minute during a given time period. Skin conductance was calculated in mean tonic level, total amplitude of waves, and mean amplitude of waves. Mean tonic level is the average level of a continuous measure of skin conductance during a time epoch. For total amplitude and mean amplitude, a set of parameters are assigned to detect waves (e.g., valid slope) and electrodermal activity meeting those parameters is counted as a wave. Total amplitude of waves is calculated by adding the amplitude of each wave during a given time epoch to obtain a total score. Mean amplitude is computed by dividing the total amplitude of waves by the number of waves in a given time epoch. Because each of the different skin conductance calculations provides unique information, we chose to calculate skin conductance using the three different methods in order to compare the results.

Apparatus

The experimental procedure took place in a laboratory room fitted with a one-way mirror, intercom system, and video camera to facilitate communication with the participant and provide visual and audio monitoring throughout the experiment. During the experiment participants were seated in a comfortable recliner chair. Slides for the rumination and distraction experimental tasks were presented via a Kodak Extagraphic

Carousel projector with a slide projector remote control that was operated by the participant. Skin conductance recordings were obtained by placing two silver/silver chloride electrodes (0.5 cm^2; manufactured by Med Associates) on the distal phalanges of the 3rd and 4th finger on the participant's nondominant hand. The electrodes were filled with a standard skin conductance paste (see Fowles et al., 1981), and attached with an adhesive collar. The electrodes were connected to a SC4 Skin conductance Amplifier with Automatic Back-off system, manufactured by Contact Precision Instruments. The constant voltage level of 0.6 V was undetectable to the participant. To measure heart rate, participant's first finger of the nondominant hand was placed in a finger photoplethysmograph transducer connected to a finger pulse amplifier, both of which were manufactured by Contact Precision Instruments. The amplified signals were sent to a MC16 A-D convertor interfaced with an IBM-compatible computer and data reduction and analysis for skin conductance and heart rate were obtained through use of PSYLAB software designed by Contact Precision Instruments. Diastolic and systolic blood pressure were measured with a self-inflating, digital readout unit manufactured by Critikon/Dinamap Corporation.

Procedure

In the first phase of the study, participants completed a questionnaire packet consisting of measures of depression, neuroticism, worry, response style, and several filler items. Completion of the packet required approximately 30 minutes, and students received psychology course credit for participation. Those meeting eligibility criteria for participation in the second phase of the study (those with BDI scores of 5 and below or

BDI scores of 15 and above) were invited to participate in the laboratory phase of the study within two weeks of completing the questionnaires. Participants completed the laboratory phase of the study individually. They were seated in a comfortable chair and given a consent form that described the experimental procedure and the psychophysiological measures. The participants were then asked to wash their hands, in preparation for placement of the psychophysiological devices. The blood pressure cuff, skin conductance electrodes, and finger photoplethysmograph were then attached to the participant's non-dominant arm. Participants then sat quietly for 10 minutes for an adaptation and baseline measurement phase. Blood pressure was taken once during adaptation and once immediately following the baseline phase.

Participants then completed the pre-task questionnaire set that included mood and anxiety ratings and several filler items. Participants were then given instructions for the experimental task. They were given a remote control for a slide projector and asked to focus on a series of ideas and thoughts for the purposes of examining the processes of imagination, dreaming, and cognition in general, in order to reduce demand characteristics related to the experimental hypotheses. Participants were randomly assigned to view either the ruminative slides (rumination condition) or the distractive slides (distraction condition). The information and instructions given to participants were the same regardless of their assigned experimental condition. Participants were instructed to think about and visualize the phrase written on the slide and then advance to the next slide and continue through the set for 8 minutes. Participants were signaled via intercom when to begin and again when to finish after the 8 minute period. Heart rate

and skin conductance was recorded throughout the experimental task, and blood pressure was taken during the last minute of the task before the participant was signaled to stop. A two-way mirror and video camera were used to ensure the participant was properly oriented to the projected phrases. After the 8-minute experimental task, participants completed a second questionnaire set which included mood and anxiety ratings, several filler items, and a vocabulary test. The participants were then fully debriefed, given a community resource sheet of psychological services, and awarded either cash or research credit for participation. The laboratory phase of the study required approximately 1.5 hours for completion.

CHAPTER III

RESULTS

Baseline Psychophysiological Measures

Baseline differences in level of psychophysiological responding were evaluated with a 2 (dysphoria status) X 2 (gender) analysis of variance (ANOVA) for each of the psychophysiological measures. No significant main effects or interactions were found for baseline heart rate or diastolic blood pressure. An ANOVA conducted on systolic blood pressure revealed a significant main effect for gender [F (1, 165) = 45.44, $p < .001$], but not for dysphoria status, and no interaction was found. The mean systolic blood pressure for women [110.86 (SD = 9.73)] was lower than that for men [122.57 (SD = 12.58)] at baseline. A significant main effect of dysphoria status was found for skin conductance level (SCL) when measured as mean tonic level [F (1, 165) = 9.67, $p < .005$]; mean SCL for the nondysphoric group [23.42 (SD = 2.44)] was higher than the mean for the dysphoric group [22.39 (SD = 1.46)]. No significant main effect for gender or interaction was found for mean tonic SCL. Additionally, no significant main effects or interactions were found for skin conductance level at baseline when measured as total amplitude of waves or when measured as mean amplitude of waves.

Psychophysiological Responses Following Experimental Task

Group differences in psychophysiological response following the experimental task were assessed with several 2 (dysphoria status) X 2 (experimental condition) X 2

(gender) analyses of covariance (ANCOVAs), with baseline psychophysiological responses as the covariates and post-experimental task psychophysiological responses as the dependent variables. No significant main effects or interactions were found for skin conductance level whether measured as total amplitude of waves, mean amplitude of waves, or mean tonic level. Analyses also failed to reveal significant main effects or interactions for heart rate and diastolic blood pressure.

A significant three-way interaction was found for post-experiment systolic blood pressure [$\underline{F}$ (1,157) = 4.677, $\underline{p} < .05$]. In order to better understand group differences, four contrasts were selected for post-hoc analysis, and alpha level was set at .0125 following Bonferroni adjustment (.05/4). Contrast information is presented in Table 1. Contrast analysis revealed a significant difference in post-experimental systolic blood pressure between nondysphoric men in the rumination condition ($\underline{M}$ = 119.88; $\underline{SE}$ = 1.29) and nondysphoric women in the ruminating condition ($\underline{M}$ = 114.88; $\underline{SE}$ = 1.20); means listed are adjusted for the covariate.

Table 1

Post-Experimental Systolic Blood Pressure

	Women	Men
Rumination Condition		
Dysphoric Group	116.48	116.39
	(1.08)	(1.52)
Nondysphoric Group	114.89_a	119.88_a
	(1.20)	(1.29)
Distraction Condition		
Dysphoric Group	114.02	118.68
	(1.13)	(1.50)
Nondysphoric Group	115.00	117.04
	(1.22)	(1.26)

Note. Values represent means adjusted for baseline systolic blood pressure and other variables in the model. Standard errors are in parentheses. Row means having the same subscript differ significantly at $p < .01$.

Baseline Mood and Anxiety Ratings

Prior to the experimental task, participants completed self-report ratings of depressed mood and anxiety that were used as baseline measures in data analysis. Group differences in these baseline ratings were analyzed with 2 (dysphoria status) X 2 (experimental condition) X 2 (gender) ANOVAs, with mood and anxiety scores as the dependent measures. As was expected, a significant main effect for dysphoria status was found for depressed mood ratings [F (1,162) = 145.15, $p < .001$] such that those in the dysphoric group (M = 4.79, SD = 1.91) reported higher levels of depressed mood than those in the nondysphoric group (M = 1.79, SD = 1.18). Similarly, a significant main effect for dysphoria status was found for anxiety ratings [F (1,162) = 53.63, $p < .001$], with those in the dysphoric group (M = 5.39, SD = 1.54) reporting higher ratings of anxiety than the nondysphoric group (M = 3.35, SD = 1.82). Importantly, there were no differences between ruminating and distracting conditions, nor any significant interactions between dysphoria status and experimental condition at baseline for depressed mood ratings or anxiety ratings. Additionally, no significant main effect for gender was found for pre-experiment mood and anxiety ratings.

Mood and Anxiety Ratings Following Experimental Task

Mood Ratings

Group differences in post-experimental task mood ratings were assessed with a 2 (dysphoria status) X 2 (experimental condition) X 2 (gender) ANCOVA, with baseline mood rating as the covariate and post-experiment mood rating as the dependent variable. Results of the ANCOVA supported previous findings that rumination and distraction

differentially influence mood ratings in dysphoric individuals. A significant main effect for experimental condition [$\underline{F}$ (1,161) = 25.78, $\underline{p} < .001$] was qualified by a significant experimental condition X dysphoria status interaction [$\underline{F}$ (1,161) = 16.18, $\underline{p} < .001$]. Means for post-experimental depressed mood (adjusted for the covariate) were as follows: dysphoric-ruminators $\underline{M}$ = 4.00, $\underline{SE}$ = .19; dysphoric-distractors $\underline{M}$ = 2.51, $\underline{SE}$ = .18; nondysphoric-ruminators $\underline{M}$ = 3.30, $\underline{SE}$ = .17; nondysphoric-distractors $\underline{M}$ = 3.12 , $\underline{SE}$ = .18 (see Figure 1). Contrast analysis revealed a significant difference in post-experiment depressed mood between dysphoric ruminators and dysphoric distractors. No significant difference in post-experiment mood was found between nondysphorics who ruminated and nondysphorics who distracted. Additionally, no significant effect for gender was found.

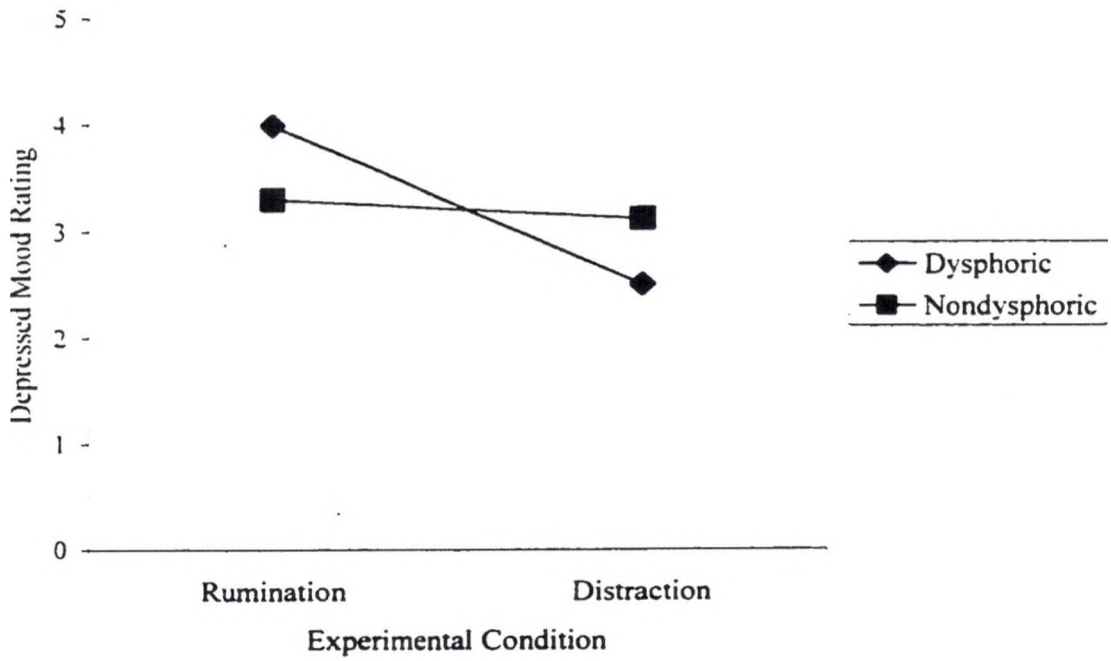

Figure 1. Experimental condition by dysphoria status interaction.

Worry Ratings

A 2 (dysphoria status) X 2 (experimental condition) X 2 (gender) ANCOVA was also used to assess group differences in post-experiment anxiety with pre-task anxiety rating entered as a covariate. A significant main effect was found for experimental condition [F (1, 161) = 15.52, $p < .001$], with those in the ruminating condition reporting greater increases in post-task anxiety (M = 4.47, SE = .13) than those in the distraction condition (M = 3.72, SE = .13), regardless of their initial dysphoria status (means adjusted for the covariate).

Supplementary Analyses

Additional Covariates

To test whether neuroticism, ruminative response style, distractive response style, or worry impacted post-experimental mood, a series of 2 (dysphoria status) X 2 (experimental condition) X 2 (gender) ANCOVAs were conducted. Post-experimental mood was entered as the dependent variable, and neuroticism, ruminative response style, distractive response style, and worry were each (independently) entered as covariates along with pre-task mood rating. In each of these analyses, the addition of a second covariate did not substantially change the previously obtained results. No significant effect for gender was found in any of the analyses. As in the original 2 X 2 X 2 ANCOVA on post-task mood, a significant main effect of experimental condition was found, qualified in each of the analyses by a significant dysphoria status X experimental condition interaction. In each case, the interaction remained significant at $p < .001$. Post-hoc tests revealed that for each of these analyses, dysphoric ruminators reported

significantly higher levels of post-task depressed mood than did dysphoric distractors. Nondysphorics did not differ significantly in their post-task depressed mood ratings, regardless of experimental group.

Worry Status and Neuroticism Status

In order to test further the dysphoria status by experimental condition interaction on post-task depressed mood, the dysphoria status factor was removed and replaced with a worry status factor. Scores on the Penn State Worry Questionnaire were divided into thirds. A high worry group was created with the top 1/3 of scores on the PSWQ, and a low worry group was created with the lowest 1/3 of PSWQ scores. A 2 (worry status) X 2 (experimental condition) X 2 (gender) ANCOVA was conducted with post-task mood ratings as the dependent variable, and pre-task mood ratings as the covariate (N = 119). This ANCOVA is the same as that described above in the mood ratings section except that dysphoria status was replaced with worry status. Similar to the previous results, a main effect for experiment was found [F (1,110) = 12.81, p < .01], qualified by a significant experimental condition X worry status interaction [F (1,110) = 7.75, p < .01]. The high worry/ruminator group (M =4.08; SE =.22) reported significantly higher post-task depressed mood than did the high worry/distractor group (M = 2.73; SE = .24), while the low worry/distractor group (M = 3.02; SE = .20) and the low worry/ruminator group (M = 3.19; SE = .23) did not significantly differ (means adjusted for the covariate; see Figure 2).

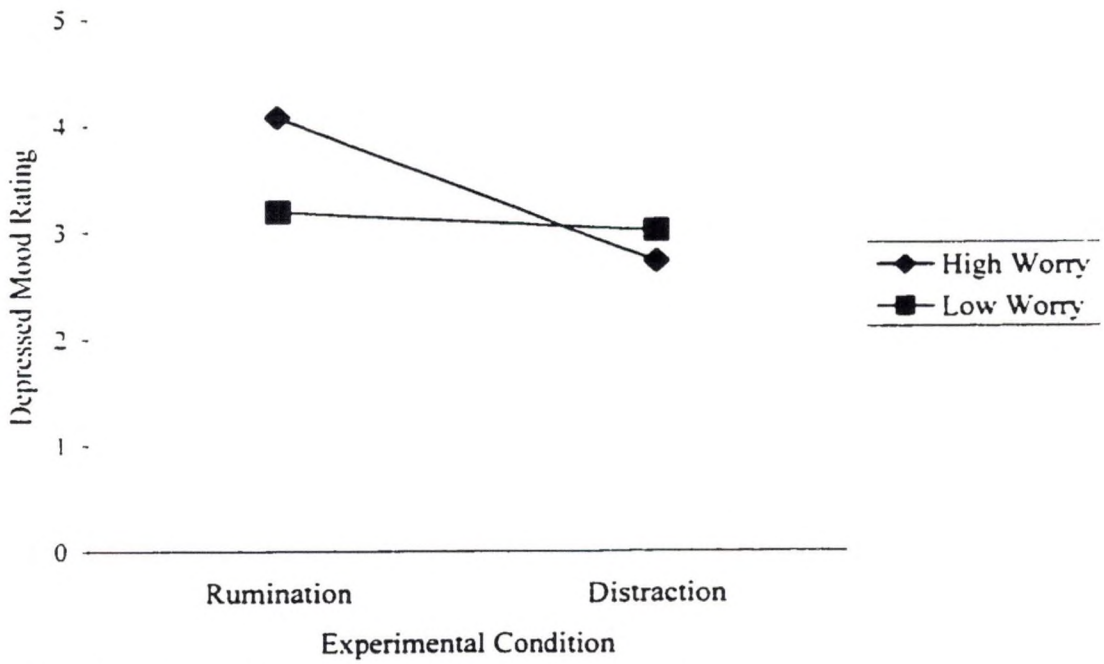

Figure 2. Experimental condition by worry status interaction.

The same procedure was used to create a neuroticism status factor, by dividing GTS-neuroticism scores into thirds to create a high neuroticism group and a low neuroticism group. A 2 (neuroticism status) X 2 (experimental condition) X 2 (gender) ANCOVA was conducted with post-task mood ratings as the dependent variable, and pre-task mood ratings as the covariates (N = 115). Again, a significant main effect for experiment was found [F (1,106) = 12.57, p < .01], qualified by a significant experimental condition X neuroticism status interaction [F (1,106) = 4.52, p < .05]. The high neuroticism/ruminator group (M =3.75; SE =.20) reported significantly higher post-task depressed mood than did the high neuroticism/distractor group (M = 2.58; SE = .25),

while the low neuroticism/distractor group (M = 3.37; SE = .19) and the low neuroticism/ruminator group (M = 3.66; SE = .24) did not significantly differ (means adjusted for the covariate; see Figure 3).

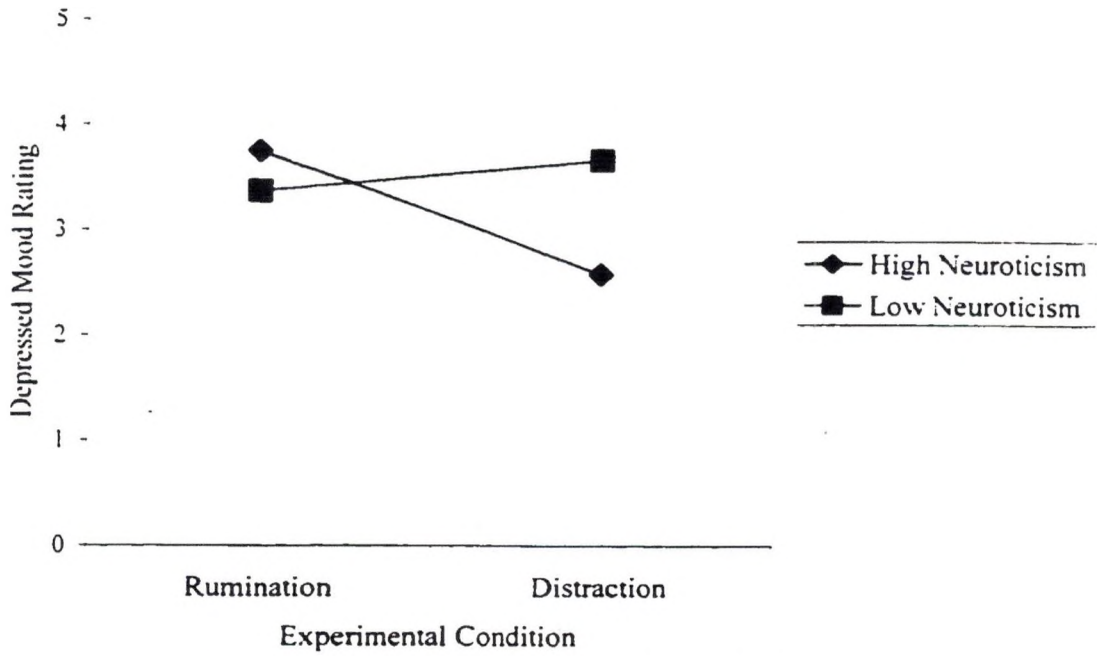

Figure 3. Experimental condition by neuroticism status interaction.

Response Style Questionnaire

In order to understand better the relationship of self-reported ruminative response style to other conceptually-related factors, bivariate correlations of the RSQ-rumination scale, RSQ-distraction scale, Beck Depression Inventory, GTS-neuroticism scale, and the Penn State Worry Questionnaire were conducted. Pearson's correlation coefficients for these variables are found in Table 2. The correlations between the RSQ-rumination scale

and the Beck Depression Inventory, the GTS-neuroticism scale, and the Penn State Worry Questionnaire were each significant ($p < .01$).

Table 2

Correlations Between Depression, Worry, Neuroticism, and Response Style Measures (N= 170)

	BDI	PSWQ	GTSN	RSQR	RSQD
Beck Depression Inventory	----	.66**	.70**	.76**	-.29**
Penn State Worry Questionnaire		----	.81**	.64**	-.25**
General Temperament Scale--Neuroticism			----	.68**	-.26**
Response Style Questionnaire--Rumination				----	-.12
Response Style Questionnaire--Distraction					----

** $p < .01$

In order to assess the relationship of ruminative response to depressive symptoms while considering the influence of worry, neuroticism, gender, and distractive response style, hierarchical multiple regression analyses were used. Because of the strong correlation between our measures of neuroticism and worry (.81, $p < .01$), these predictors were entered individually into two separate regression analyses. The first

model included neuroticism as a predictor of scores on the Beck Depression Inventory [F (4,162) = 77.10, $p < .001$; Adj. $R^2 = .65$] (Table 3) and the second included worry as a predictor of BDI scores [F (4,165) = 76.56, $p < .001$; Adj. $R^2 = .64$] (Table 4). Results of regression analyses suggest that ruminative response is related to depressed mood even after considering the effects of worry, neuroticism, gender, and distractive response style.

Table 3

Summary of Hierarchical Regression Analysis for Variables (Including Neuroticism) Predicting Depressive Symptoms

Variable	SE B	Beta	t
GTS-Neuroticism	.07	.30	4.50***
Gender	1.00	.02	.32
RSQ-Distraction	.09	-.15	-3.10**
RSQ-Rumination	.05	.53	8.40***

**$p < .01$. ***$p < .001$.

Table 4

Summary of Hierarchical Regression Analysis for Variables (Including Worry) Predicting Depressive Symptoms

Variable	SE B	Beta	t
Penn State Worry Questionnaire	.05	.26	4.05***
Gender	1.02	-.01	-.10
RSQ-Distraction	.09	-.15	-3.18**
RSQ-Rumination	.05	.57	9.49***

**$p < .01$. ***$p < .001$.

The Influence of Experimental Procedures on Outcome

The total number of slides viewed during the 8-minute experimental phase was recorded. In order to determine if groups differed in the number of slides viewed during the experiment, a 2 (dysphoria status) X 2 (experimental condition) X 2 (gender) ANOVA was conducted, with total number of slides as the dependent variable. A significant main effect was found for experimental condition [F (1, 158) = 19.93, $p < .001$], with those in the rumination condition viewing fewer slides (M = 37.89, SD = 23.71) than those in the distraction condition (M = 57.48, SD = 27.62). No significant interactions were found or main effects for dysphoria status or gender, suggesting that

regardless of group status prior to the experiment, those assigned to the rumination condition viewed fewer slides, possibly thinking longer about each slide, than those in the distraction condition.

Vocabulary

Because the experimental task involved reading a series of phrases, participants completed a written test of vocabulary in order to determine if differences in vocabulary level existed between those randomly assigned to the rumination versus the distraction condition. An ANOVA with vocabulary score as the dependent variable was used to assess experimental group differences. No significant main effect for experimental condition was found.

Likert Scales

Rather than administer mood and anxiety measures with an obvious emphasis on mood symptoms and worry, participants completed Likert rating scales developed by Nolen-Hoeksema. Correlations between the Likert scale score for worry and the Penn State Worry Questionnaire were examined as well as the correlation between the depressed mood Likert score and the Beck Depression Inventory. The Likert scale measure of pre-experiment depressed mood was highly correlated with BDI scores (Pearson's $r = .80$, $p < .01$) and the Likert scale measure of pre-experiment worry was significantly correlated with Penn State Worry Questionnaire scores (Pearson's $r = .65$, $p < .01$).

Mood Study Disguise

In this study, a number of filler items and tasks developed by Nolen-Hoeksema and colleagues were used to help disguise the study's focus on mood. During debriefing participants were asked "What do you think this study is about?" In response to this question, 32 of 170 participants (18.8%) responded by saying "depression" or "mood." In order to determine if there were differences between experimental groups, dysphoric and nondysphoric groups, or men and women in correctly determining the nature of the study, a 2 (dysphoria status) X 2 (experimental condition) X 2 (gender) ANOVA was conducted with a dichotomous variable (1= thought study was about depression, mood; 0 = other) as the dependent variable. No significant main effects were found for gender or experiment. However, a significant main effect for dysphoria status was found [F (1, 162) = 23.26, $p < .001$], with dysphoric participants more often reporting that the study was about depression or mood than the nondysphoric participants were.

CHAPTER IV

DISCUSSION

The purpose of the present study was to extend upon the response style research literature by including psychophysiological measures and investigating the influence of the conceptually-related constructs of worry and neuroticism.

Psychophysiological Response

The inclusion of psychophysiological measures allowed us to investigate the potential physiological effects of ruminating. The physiology of depression is not yet fully understood, and the majority of studies in this area are based on clinical populations (coronary artery disease patients in particular). Further, response style research has relied primarily on self-report measures, which are considered less objective than psychophysiological measures. Previous studies have found differences at baseline between depressed patients and nondepressed controls for measures of heart rate (e.g., Lechin et al., 1995), blood pressure (e.g., Gotthardt et al., 1995), and skin conductance (e.g., Iacono et al., 1983). In the present study, no baseline differences between the dysphoric and nondysphoric groups were found for heart rate, diastolic blood pressure, or systolic blood pressure. Also no differences between the dysphoric and nondysphoric groups were found at baseline for skin conductance level when measured as total amplitude or mean amplitude of waves. Because our sample consisted of dysphoric students, we would not assume to find the same baseline psychophysiological differences

as are found in studies of depressed patients. However, when measured as mean tonic level, the dysphoric participants had lower SCL levels than did the nondysphoric participants, which is consistent with studies of SCL in depressed patients (e.g., Iacono et al., 1983; Ward, Doerr, & Storrie, 1983).

Based on our finding of significant baseline differences between dysphoric and nondysphoric participants on mean tonic SCL, further study of tonic SCL may reveal its sensitivity as a physiological measure able to detect group differences in dysphoric and nondysphoric individuals, even in nonclinical, student samples. In the present study, gender differences at baseline for the psychophysiological measures were not found for heart rate, skin conductance, or diastolic blood pressure. However, women were found to have lower systolic blood pressure at baseline than men.

Of our psychophysiological dependent variables, significant group differences were found only for post-experimental systolic blood pressure. Post-hoc analysis of the significant three-way interaction revealed that nondysphoric men in the ruminating condition had a significantly greater systolic blood pressure response than did nondysphoric women in the ruminating condition. These results suggest that nondysphoric men had stronger responses to concentrating on their own feelings and the consequences of those feelings than did nondysphoric women. This finding of different response level between men and women in the dysphoric/ruminator group underscores the importance of investigating gender differences in response style studies.

Because we have not seen a prior study investigating the psychophysiological effects of rumination and distraction, we are unable to compare these results to past

research. Our finding of no significant differences between groups for post-experimental heart rate, skin conductance, and diastolic blood pressure requires further investigation to see if these results would be replicated with a clinical sample. Because of our finding of no significant differences in baseline psychophysiological measures between dysphoric and nondysphoric groups, researchers should examine the psychophysiological effects of rumination and distraction in a clinically depressed sample in which we may be more likely to see baseline differences in these measures. Also, the role of anxiety should be considered in future psychophysiological studies or response style. In our study, those in the dysphoric group were significantly higher on measures of anxiety than the nondysphoric group. Researchers may also wish to consider the possible impact of age on psychophysiological responding. Gotthardt et al. (1995) compared the cardiovascular response of depressed patients of two age groups (<30 and >60 years of age) with age-matched controls following a mental stressor (signal-detection task). All groups responded with an increase of the cardiovascular parameters during the mental stressor except for the young depressed patient group. Psychophysiological studies of response style using college samples may not generalize well for older or more depressed adults. Lastly, a few studies of depressed individuals have used electromyographic activity (EMG) activity as an outcome measure and have found EMG activity to correlate significantly with measures of depressed mood (e.g., Blackburn & Bonham, 1980). Future response style studies may wish to investigate the effect of rumination on EMG activity.

Self-Reported Mood and Worry Response

Likert scale ratings for depressed mood and worry were highly correlated with valid and reliable measures of these constructs. Baseline comparisons were made for mood and anxiety ratings between the dysphoric and nondysphoric groups. As was expected, those in the dysphoric group reported higher levels of depressed mood and worry than did those in the nondysphoric group. Although gender differences in depression exist, Nolen-Hoeksema (1990) reports that gender differences in depression and personality variables are usually not found in college students. Consistent with her findings, no gender differences were found for mood or anxiety ratings in the present study. It is important to note that baseline ratings of anxiety have not been considered in Nolen-Hoeksema's laboratory studies, and the finding of significantly more anxiety in our dysphoric group at baseline (using selection criteria similar to that of Nolen-Hoeksema and colleagues), demonstrates the importance of considering the impact of anxiety on the experimental task and subsequent findings.

As has been found repeatedly in previous studies, dysphoric participants in our study who ruminated reported experiencing significantly higher levels of depressed mood than did dysphoric participants who distracted. The self-focused attention on feelings and consequences of those feelings negatively impacts the already dysphoric participants, while distraction seems to give a brief reprieve from depressed mood. Also consistent with prior studies, nondysphoric participants did not vary significantly in their mood ratings following the experimental task, regardless of whether they ruminated or

distracted. As in Nolen-Hoeksema's studies, we did not find gender differences for post-experimental mood ratings.

Rumination is often described as "worrying" about the symptoms and consequences of depression (Nolen-Hoeksema et al., 1994, p.92). However, we have found only one published study investigating the effects of rumination and distraction on anxiety (Blagden & Craske, 1996) and have found none that have done so while replicating Nolen-Hoeksema's experimental procedure for studying post-experimental depressed mood. We expected to find an interaction similar to that consistently found when post-task depressed mood is used as the dependent variable and pre-task depressed mood is entered as the covariate. Specifically, after replacing post-task depressed mood with post-task worry as the dependent variable and pre-task depressed mood with pre-task worry as the covariate, we expected to find higher levels of worry in dysphoric ruminators than dysphoric distractors, and no difference for the nondysphoric groups.

Instead we found only a significant difference between experimental groups, such that ruminators reported more post-task worry than distractors, regardless of their initial dysphoria status. According to Nolen-Hoeksema and colleagues (e.g., Lyubomirsky and Nolen-Hoeksema, 1993), all items in the rumination condition and the distraction condition were rated as equally neutral by nondepressed judges. Consequently, these items should not have any mood induction or worry induction effect on nondysphoric individuals. Rather, the rumination items are only supposed to influence dysphoric individuals by having them focus on their own feelings. Our findings call into question whether the items in the rumination condition truly are as neutral as those in the

distraction condition. During debriefing, participants were asked to recall three slides as a check of their compliance with task instructions to read and think about the items. Many of the participants listed "the expectations your family has for you" and "the kind of student you are and wish you were." It is possible that these items may be neutral for the nondepressed judges who initially rated the items (see Nolen-Hoeksema & Morrow, 1993) but are not neutral for many students and actually act to induce worry in these individuals. Consequently, we recommend that these items be rated again by an independent group of nondyphoric judges, and if necessary, we recommend development of new items to replace any judged to be insufficiently neutral (i.e., potentially inducing negative mood or worry).

Worry Status and Neuroticism Status

After replacing dysphoria status in our original post-experimental depressed mood model with worry status and neuroticism status, we found significant interactions between group status (worry status or neuroticism status) and the experimental condition. Post-experimental depressed mood ratings were significantly higher for depressed ruminators, worried ruminators, and neurotic ruminators than for the corresponding depressed, worried and neurotic groups who instead distracted. These results suggest that rumination has a negative impact on mood for those experiencing a broad range of symptoms related to negative affectivity, including anxiety, depression, and neuroticism. These results must be considered as preliminary, because participants were selected based on BDI scores, not scores on worry and neuroticism measures. Future research

investigating the effect of rumination should include groups selected on depressive levels, and anxiety or worry.

The Influence of Neuroticism, Worry, and Response Style on Post-Experimental Mood

Our results supported prior findings of a robust interaction of dysphoria status and experimental condition on post-task depressed mood ratings. However, previous studies have failed to consider the potential influence of neuroticism, worry, ruminative response style, and distractive response style when investigating group differences in post-task mood ratings. By entering each of these variables individually into an analysis already containing pre-task depressed mood as a covariate, we were able to control for the impact of these factors on post-experimental mood. Although we predicted that the dysphoria status by experimental condition interaction would not remain significant following the statistical control of the influence of worry, neuroticism, and response style, the interaction effect did remain significant in each analysis. These results extend upon past studies that have found a significant experimental condition by dysphoria status interaction effect but have not investigated the impact of trait-like variables such as neuroticism and response style.

The relationship of response style to other conceptually-related factors was assessed with bivariate correlations. As was expected, a ruminative response style was significantly correlated with depressive symptoms, neuroticism, and worry. The relationship between ruminative response style and depressive symptoms was assessed while controlling for the influence of worry, neuroticism, gender, and distractive response style. Results of hierarchical regression analyses supported the ability of response style

to predict depressive symptoms above and beyond the effects of worry, neuroticism, gender, and distractive response style. Researchers are now beginning to look at these variables with structural equation modeling (Tsao & Craske, 1997) and remission designs (Roberts, Gilboa, & Gotlib, 1998) in order to understand paths from ruminative coping to depressive symptoms, and to discover potential moderating variables.

The Influence of Experimental Procedure

The number of slides viewed during the experiment was compared between those in the rumination condition and those in the distraction condition. Number of slides viewed may be considered a type of analog for rumination, in that more time spent thinking and focusing on an item would seem to relate more to rumination, where as moving more quickly from slide to slide and spending less time thinking about and concentrating on the items would seem more like distraction. Interestingly, we found that those in the rumination condition viewed significantly fewer slides than did those in the distraction condition, regardless of their dysphoria status. This finding was not due to differing instructions given to the groups, as all participants received identical instructions regarding the experimental task. Experimental group differences in number of slides viewed suggest that the rumination items may not be as neutral as the distraction items, and that the rumination condition engages participants differently than the distraction condition. These findings cannot be compared to Nolen-Hoeksema's studies, because her participants were given paper packets containing written items, and no count was made of the number of items each participant read and thought about during the 8-minute experiment. A further difference between the present study and past response

style research is that in our study participants completed the experimental task by viewing slides while alone in a darkened room. In Nolen-Hoeksema's studies (e.g., Nolen-Hoeksema et al., 1993) participants completed the experimental task by reading the phrases printed in a paper packet, while in a large-group setting. These procedural differences may have impacted our results. However, behaviors described as ruminative include isolating oneself to think about mood; consequently, our laboratory protocol may induce rumination to a greater degree than would the previously described large-group format.

In summary, this study supports prior findings that distraction and rumination differentially impact depressed mood in dysphoric individuals. Our results have extended upon these past findings by including measures of psychophysiological response, and measures of worry and neuroticism. The finding of a 3-way interaction for post-experimental systolic blood pressure suggests that men and women may have different physiological responses to ruminating and that psychophysiological measures should continue to be utilized in response style studies. This will not only further our understanding of the potential physiological effects of ruminating, but also may provide an additional biological dimension to the response style theory of depression, as well as improve our knowledge of the psychophysiology of depression in general. Additionally, our results have indicated the influence of rumination on worry, regardless of initial dysphoria status. This finding has strong implications for response style studies, in that the experimental conditions may not be equally neutral. It is recommended that the items in each condition be rated again to determine if an independent panel of non-

depressed judges agrees that they are indeed equally neutral. We also found support for Nolen-Hoeksema and colleagues (1994) assertion that ruminative response style is a better predictor (i.e., more unique variance) of depressive symptoms than other related measures (e.g., neuroticism).

Limitations of the present study include the use of a nonclinical, student population. Nolen-Hoeksema (1990) reports that male and female college students often do not differ on depression and personality variables; consequently, results based on clinical samples may improve our understanding of potential gender differences in response following rumination. Additionally, participants for the present study were selected based only on self-reported level of depressive symptoms as measured by the Beck Depression Inventory. Researchers in future studies may instead utilize clinical interviews and consider level of anxiety in creating groups; for example, it would be interesting to compare participants reporting high levels of anxiety and depression to those reporting only depressive symptoms or anxious symptoms--clearly a challenge given the high comorbidity of anxiety and depression. Another limitation of the present study is that we did not assess history of depression or recent negative life events, and future studies assessing these factors may improve our understanding of how depression and ruminative response style are related over time and context.

BECK DEPRESSION INVENTORY

This questionnaire consists of 21 groups of statements. After reading each group of statements carefully, circle the number (0, 1, 2, or 3) next to the one statement in each group which best describes the way you have been feeling **the past week**, including today. If several statements within a group seem to apply equally well, circle the highest one. Be sure to read all the statements in each group before making your choice.

1.	0	I do not feel sad.
	1	I feel sad.
	2	I am sad all the time and I can't snap out of it.
	3	I am so sad or unhappy that I can't stand it.
2.	0	I am not particularly discouraged about the future.
	1	I feel discouraged about the future.
	2	I feel I have nothing to look forward to.
	3	I feel that the future is hopeless and that things cannot improve.
3.	0	I do not feel like a failure.
	1	I feel I have failed more than the average person.
	2	As I look back on my life, all I can see is a lot of failures.
	3	I feel I am a complete failure as a person.
4.	0	I get as much satisfaction out of things as I used to.
	1	I don't enjoy things the way I used to.
	2	I don't get real satisfaction out of anything anymore.
	3	I am dissatisfied or bored with everything.
5.	0	I don't feel particularly guilty.
	1	I feel guilty a good part of the time.
	2	I feel quite guilty most of the time.
	3	I feel guilty all of the time.
6.	0	I don't feel I am being punished.
	1	I feel I may be punished.
	2	I expect to be punished.
	3	I feel I am being punished.
7.	0	I don't feel disappointed in myself.
	1	I am disappointed in myself.
	2	I am disgusted with myself.
	3	I hate myself.
8.	0	I don't feel I am any worse than anybody else.
	1	I am critical of myself for my weaknesses or mistakes.
	2	I blame myself all the time for my faults.
	3	I blame myself for everything bad that happens.
9.	0	I don't have any thoughts of killing myself.
	1	I have thoughts of killing myself, but I would not carry them out.
	2	I would like to kill myself.
	3	I would kill myself if I had the chance.
10.	0	I don't cry any more than usual.
	1	I cry more now than I used to.
	2	I cry all the time now.
	3	I used to be able to cry, but now I can't cry even though I want to.

11.
0 I am no more irritated now than I ever am.
1 I get annoyed or irritated more easily than I used to.
2 I feel irritated all the time now.
3 I don't get irritated at all by the things that used to irritate me.

12.
0 I have not lost interest in other people.
1 I am less interested in other people than I used to be.
2 I have lost most of my interest in other people.
3 I have lost all of my interest in other people.

13.
0 I make decisions about as well as I ever could.
1 I put off making decisions more than I used to.
2 I have greater difficulty in making decisions than before.
3 I can't make decisions at all anymore.

14.
0 I don't feel I look any worse than I used to.
1 I am worried that I am looking old or unattractive.
2 I feel that there are permanent changes in my appearance that make me look unattractive.
3 I believe that I look ugly.

15.
0 I can work about as well as before.
1 It takes an extra effort to get started at doing something.
2 I have to push myself very hard to do anything.
3 I can't do any work at all.

16.
0 I can sleep as well as usual.
1 I don't sleep as well as I used to.
2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
3 I wake up several hours earlier than I used to and cannot get back to sleep.

17.
0 I don't get more tired than usual.
1 I get tired more easily than I used to.
2 I get tired from doing almost anything.
3 I am too tired to do anything.

18.
0 My appetite is no worse than usual.
1 My appetite is not as good as it used to be.
2 My appetite is much worse now.
3 I have no appetite at all anymore.

19.
0 I haven't lost much weight, if any lately.
1 I have lost more than 5 pounds.
2 I have lost more than 10 pounds.
3 I have lost more than 15 pounds. I am purposely trying to lose weight by eating less.
Yes_____ No_____

20.
0 I am no more worried about my health than usual.
1 I am worried about physical problems such as aches and pains; or upset stomach; or constipation.
2 I am very worried about physical problems and it's hard to think of much else.
3 I am so worried about my physical problems that I cannot think about anything else.

21.
0 I have not noticed any recent change in my interest in sex.
1 I am less interested in sex than I used to be.
2 I am much less interested in sex now.
3 I have lost interest in sex completely.

RESPONSE STYLE QUESTIONNAIRE

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

		almost never	sometimes	often	almost always
1	Ask someone to help you overcome a problem	____	____	____	____
2	Write about your feelings in a diary or journal	____	____	____	____
3	Think about how someone (or how some fictional character) you respect would deal with the situation	____	____	____	____
4	Think "I am not going to think about how I feel"	____	____	____	____
5	Think about how alone you feel	____	____	____	____
6	Think "I won't be able to do my job/work because I feel badly"	____	____	____	____
7	Think about your feelings of fatigue and achiness	____	____	____	____
8	Think about how hard it is to concentrate	____	____	____	____
9	Try to find something positive in the situation or something you learned	____	____	____	____
10	Think "people will see what I'm really like"	____	____	____	____
11	Take recreational drugs or drink alcohol	____	____	____	____
12	Think "I'm going to do something to make myself feel better"	____	____	____	____
13	Help someone else with something in order to distract yourself	____	____	____	____
14	Think "What am I doing to deserve this?"	____	____	____	____
15	Think about how passive and unmotivated you feel	____	____	____	____
16	Remind yourself that these feelings won't last	____	____	____	____
17	Think "I'm embarrassing my family/friends/mate"	____	____	____	____
18	Analyze recent events to try to understand why you are depressed	____	____	____	____
19	Think about how you don't seem to feel anything anymore	____	____	____	____
20	Daydream, fantasize or think about good things	____	____	____	____
21	Think "why can't I get going?"	____	____	____	____
22	Think "why do I always react this way?"	____	____	____	____
23	Watch TV to distract yourself	____	____	____	____
24	Go to a favorite place to get your mind off your feelings	____	____	____	____
25	Go away by yourself and think about why you feel this way	____	____	____	____
26	Talk it out with someone whose opinions you respect	____	____	____	____

		almost never	sometimes	often	almost always
27	Think "I'll concentrate on something other than how I feel."	____	____	____	____
28	Write down what you are thinking about to analyze it	____	____	____	____
29	Do something that has made you feel better in the past	____	____	____	____
30	Think about a recent situation, wishing it had gone better	____	____	____	____
31	Think "I'm going to go out and have some fun"	____	____	____	____
32	Make a plan to overcome a problem	____	____	____	____
33	Stay around people	____	____	____	____
34	Think "I'm ruining everything."	____	____	____	____
35	Concentrate on your work	____	____	____	____
36	Think "there must be something wrong with me or I wouldn't feel this way"	____	____	____	____
37	Think "I'm disappointing my friends/family/mate"	____	____	____	____
38	Deny how your are feeling	____	____	____	____
39	Think "I've ruined another school year/job/relationship"	____	____	____	____
40	Think "why do I have problems other people don't have?"	____	____	____	____
41	Do something reckless or dangerous	____	____	____	____
42	Think "why can't I handle things better?"	____	____	____	____
43	Think about how bad you feel	____	____	____	____
44	Think about all your shortcomings, failings, faults, mistakes	____	____	____	____
45	Do something you enjoy	____	____	____	____
46	Think about how you don't feel up to doing anything	____	____	____	____
47	Think "I have no right to feel this way—I am really selfish"	____	____	____	____
48	Think "my friends are getting sick of me and my problems"	____	____	____	____
49	Call your therapist to talk about your feelings	____	____	____	____
50	Decide to try to improve some area of your life	____	____	____	____
51	Think "I'm disappointing God"	____	____	____	____
52	Do something fun with a friend	____	____	____	____
53	Analyze your personality to try to understand why you are depressed	____	____	____	____
54	Go to sleep to escape how you feel	____	____	____	____
55	Take your feelings out on someone else	____	____	____	____
56	Go someplace alone to think about your feelings	____	____	____	____
57	Deliberately do something to make yourself feel worse	____	____	____	____
58	Eat	____	____	____	____

		almost never	sometimes	often	almost always
59	Pray	____	____	____	____
60	Read	____	____	____	____
61	Think about how angry you are with yourself	____	____	____	____
62	Think about how angry you are with someone else	____	____	____	____
63	Think back to other times you have felt depressed	____	____	____	____
64	Take prescription medication to make yourself feel better	____	____	____	____
65	Think "I've got things under control"	____	____	____	____
66	Think "no one wants to be around me because of my mood"	____	____	____	____
67	Listen to sad music	____	____	____	____
68	Isolate yourself and think about the reasons why you feel sad	____	____	____	____
69	Think "I must really have serious problems or I wouldn't feel this way so often"	____	____	____	____
70	Try to understand yourself by focusing on your depressed feelings	____	____	____	____
71	Do something active to get your mind off of your feelings (i.e., job/aerobic/exercise).	____	____	____	____

PENN STATE WORRY QUESTIONNAIRE

Enter the number that best describes how typical or characteristic each item is of you. putting the number next to the item.

1	2	3	4	5
not at all typical		somewhat typical		very typical

___ 1. If I don't have enough time to do everything I don't worry about it.

___ 2. My worries overwhelm me.

___ 3. I don't tend to worry about things.

___ 4. Many situations make me worry.

___ 5. I know I shouldn't worry about things. but I just can't help it.

___ 6. When I am under pressure I worry a lot.

___ 7. I am always worrying about something.

___ 8. I find it easy to dismiss worrisome thoughts.

___ 9. As soon as I finish one task. I start to worry about everything else I have to do.

___ 10. I never worry about anything.

___ 11. When there is nothing more I can do about a concern. I don't worry about it any more.

___ 12. I've been a worrier all my life.

___ 13. I notice that I have been worrying about things.

___ 14. Once I start worrying, I can't stop.

___ 15. I worry all the time.

___ 16. I worry about projects until they are all done.

PRE-TASK LIKERT SCALES

Please use the scales below to describe yourself **RIGHT NOW**. Be sure to read each scale carefully. Circle the number that best describes you right now.

1 2 3 4 5 6 7 8 9
Not Very
Angry Angry

1 2 3 4 5 6 7 8 9
Very Not
Joyful Joyful

1 2 3 4 5 6 7 8 9
Sharp Dull

1 2 3 4 5 6 7 8 9
Confined Free

1 2 3 4 5 6 7 8 9
Not Very
Sad Sad

1 2 3 4 5 6 7 8 9
Careful Reckless

1 2 3 4 5 6 7 8 9
Not Very
Anxious Anxious

1 2 3 4 5 6 7 8 9
Very Not
Happy Happy

1 2 3 4 5 6 7 8 9
Very Not
Hostile Hostile

1 2 3 4 5 6 7 8 9
Not Very
Enthusiastic Enthusiastic

1 2 3 4 5 6 7 8 9
Not Very
Depressed Depressed

1 2 3 4 5 6 7 8 9
Very Not
Worried Worried

1 2 3 4 5 6 7 8 9
Tame Wild

1 2 3 4 5 6 7 8 9
Not Very
Impatient Impatient

1 2 3 4 5 6 7 8 9
Very Not
Content Content

1 2 3 4 5 6 7 8 9
Very Not
Agreeable Agreeable

1 2 3 4 5 6 7 8 9
Very Not
Egocentric Egocentric

1 2 3 4 5 6 7 8 9
Very Not
Dreamy Dreamy

POST-TASK LIKERT SCALES

Please use the scales below to describe yourself **RIGHT NOW**. Circle your answer.

1	2	3	4	5	6	7	8	9
Not Curious								Very Curious
Very Happy								Not Happy
Not Anxious								Very Anxious
Not Angry								Very Angry
Not Sad								Very Sad
Very Hostile								Not Hostile
Not Depressed								Very Depressed
Very Worried								Not Worried
Very Helpless								Not Helpless
Very Joyful								Not Joyful
Sharp								Dull

GENERAL TEMPERAMENT SURVEY

The following statements might be used to describe a person's attitudes, opinions, and feelings. Your answers will help us to understand your personality—how you feel and act most of the time. For each statement, circle the number that best describes what you're like, using this scale:

1 means that it's really NOT like you

2 means that it's not much like you

3 means that it's somewhat like you

4 means that it's A LOT like you

For example, suppose the statement was, "I have trouble controlling my anger." If you have a lost of trouble controlling your anger, you'd circle 4; if you have only a little trouble controlling your anger, you'd circle 2.

		NO	no	yes	YES
1	Most days I have a lot of energy	1	2	3	4
2	Small problems often irritate me	1	2	3	4
3	I find lots of reasons to goof off instead of work	1	2	3	4
4	People think I am a pretty enthusiastic person	1	2	3	4
5	I frequently find myself worrying about things	1	2	3	4
6	I am a cautious person	1	2	3	4
7	I lead a very interesting life	1	2	3	4
8	I sometimes feel angry for no good reason	1	2	3	4
9	I like to take chances on something that isn't sure, such as gambling	1	2	3	4
10	My way of doing things is usually quick and lively	1	2	3	4
11	Sometimes I feel edgy all day	1	2	3	4
12	When I decide things, I always refer to the basic rules of right and wrong	1	2	3	4
13	I am able to make chores interesting or fun	1	2	3	4
14	Little things upset me too much	1	2	3	4
15	I've done a lot of things for which I could have been (or was) arrested	1	2	3	4
16	In my life, interesting and exciting things happen every day	1	2	3	4
17	I often take my anger out on those around me	1	2	3	4
18	I often stop in the middle of doing one thing to start doing something else	1	2	3	4
19	I believe in playing strictly by the rules	1	2	3	4
20	I live a very satisfying life	1	2	3	4
21	I worry too much about things that don't really matter	1	2	3	4

22	I find it easy to tell lies	1	2	3	4
23	People think I am a pretty energetic person	1	2	3	4
24	I am often nervous for no reason	1	2	3	4
25	The way I behave often gets me into trouble on the job, at home, or at school	1	2	3	4
26	I can easily find ways to make a boring day exciting	1	2	3	4
27	I can get very upset when little things don't go my way	1	2	3	4
28	I usually think very carefully when making up my mind	1	2	3	4
29	I lead an active life	1	2	3	4
30	I get a kick out of really scaring people	1	2	3	4
31	I don't keep very close track of my money	1	2	3	4
32	I worry about terrible things that might happen	1	2	3	4
33	I have more energy than most of the people I know	1	2	3	4
34	I don't work any harder than I have to	1	2	3	4
35	I am often troubled by guilt feelings	1	2	3	4
36	I can make a game out of things that other people think is work	1	2	3	4
37	I rarely, it ever, do anything reckless	1	2	3	4
38	I often have trouble sleeping because of my worries	1	2	3	4
39	I put a lot of energy into everything I do	1	2	3	4
40	I always try to be completely prepared before I start working on anything	1	2	3	4
41	I often feel nervous and "stressed."	1	2	3	4
42	I often get out of things by making up good excuses	1	2	3	4
43	Things seem to bother me less than they bother most other people	1	2	3	4

VOCABULARY

In the test below, the first work in each line is printed in capital letters. Opposite it are four other words. Circle the one word that means the same thing, or most nearly the same thing, as the first word. A sample has been worked out for you. If you do not know, guess. Be sure to circle the one word in each line that means the same thing as the first word.

			Sample		
	LARGE	red	**big**	silent	wet
			Begin here		
1	TALK	draw	eat	speak	sleep
2	PERMIT	allow	sew	cut	drive
3	PARDON	forgive	pound	divide	tell
4	COUCH	pin	eraser	sofa	glass
5	REMEMBER	swim	recall	number	defy
6	TUMBLE	drink	dress	fall	thing
7	HIDEOUS	silvery	tilted	young	dreadful
8	CORDIAL	swift	muddy	leafy	hearty
9	EVIDENT	green	obvious	skeptical	afraid
10	IMPOSTOR	conductor	officer	book	pretender
11	MERIT	deserve	distrust	fight	separate
12	FASCINATE	welcome	fix	stir	enchant
13	INDICATE	defy	excite	signify	bicker
14	IGNORANT	red	sharp	uninformed	precise
15	FORTIFY	submerge	strengthen	vent	deaden
16	RENOWN	length	head	fame	loyalty
17	NARRATE	yield	buy	associate	tell
18	MASSIVE	bright	large	speedy	low
19	HILARITY	laughter	speed	grace	malice
20	SMIRCHED	stolen	pointed	remade	soiled
21	SQUANDER	tease	belittle	cut	waste
22	CAPTION	drum	ballast	heading	ape
23	FACILITATE	help	turn	strip	bewilder
24	JOCOSE	humorous	paltry	fervid	plain
25	APPRISE	reduce	strew	inform	delight

26	RUE	eat	lament	dominate	cure
27	DENIZEN	senator	inhabitant	fish	atom
28	DIVEST	dispossess	intrude	rally	pledge
29	AMULET	charm	orphan	dingo	pond
30	INEXORABLE	untidy	involatile	rigid	sparse
31	SERRATED	dried	notched	armed	blunt
32	LISSOM	moldy	loose	supple	convex
33	MOLIFY	mitigate	direct	pertain	abuse
34	PLAGIARIZE	appropriate	intend	revoke	maintain
35	ORIFICE	brush	hole	building	lute
36	QUERULOUS	maniacal	curious	devout	complaining
37	PARIAH	outcast	priest	lentil	locker
38	ABET	waken	ensue	incite	placate
39	TEMERITY	rashness	timidity	desire	kindness
40	PRISTINE	vain	sound	first	level

LEVELS OF CONSCIOUSNESS AND DAYDREAMING

Please take a few minutes to answer the following questions. (Circle the appropriate answer.)

1. Do you often remember your dreams after you wake up? YES NO
2. Do you often dream in color? YES NO
3. Does your attention wander frequently during the day? YES NO
4. Do you daydream a great deal? YES NO
5. Do you ever feel like your body is floating? YES NO
6. Do you often confuse dreamed events with those of real life? YES NO
7. Do you frequently dream of events that occurred earlier during that day? YES NO
8. Have you ever analyzed your dreams while still asleep? YES NO
9. Have you ever sleep-walked? YES NO
10. Do you remember listening to music in your dreams? YES NO
11. Do you sleep with your eyes open? YES NO
12. Do you often dream of a romantic partner (real or imagined)? YES NO
13. Have you ever dreamt of yourself as having different physical characteristics than in waking life? YES NO
14. Are you easily able to recall your favorite dream? YES NO

ABSORPTION AND IMAGING INVENTORY

Please circle the number on the scale to indicate how much you agree and disagree with each of the statements below.

1. I get "swept away" in conversations.

strongly agree 1 2 3 4 5 strongly disagree

2. I like to watch people open presents.

strongly agree 1 2 3 4 5 strongly disagree

3. I really get involved with characters in a novel.

strongly agree 1 2 3 4 5 strongly disagree

4. Another's laughter is not catching for me.

strongly agree 1 2 3 4 5 strongly disagree

5. I get absorbed when I watch a movie.

strongly agree 1 2 3 4 5 strongly disagree

6. I rarely become impatient when waiting in lines.

strongly agree 1 2 3 4 5 strongly disagree

7. I like looking at paintings more than listening to music.

strongly agree 1 2 3 4 5 strongly disagree

8. I like deep colors better than bright colors.

strongly agree 1 2 3 4 5 strongly disagree

9. I like to play with animals and children.

strongly agree 1 2 3 4 5 strongly disagree

COLOR IMAGINATION

In this task we are interested in how easily people are able to imagine different colors. Below you will find a list of colors. Your task is to first imagine each color and then, using the scales provided, rate it on how easy or difficult it was for you to imagine it.

BLUE

very easy 1 2 3 4 5 6 7 very difficult

RED

very easy 1 2 3 4 5 6 7 very difficult

YELLOW

very easy 1 2 3 4 5 6 7 very difficult

PURPLE

very easy 1 2 3 4 5 6 7 very difficult

GRAY

very easy 1 2 3 4 5 6 7 very difficult

GREEN

very easy 1 2 3 4 5 6 7 very difficult

BROWN

very easy 1 2 3 4 5 6 7 very difficult

ORANGE

very easy 1 2 3 4 5 6 7 very difficult

RESPONSE MANIPULATION MATERIALS: DISTRACTION

Think about:
and imagine a boat slowly crossing the Atlantic

Think about:
the layout of a typical classroom

Think about:
the shape of a large black umbrella

Think about:
the movement of an electric fan on a warm day

Think about:
raindrops sliding down a windowpane

Think about:
a double-decker bus driving down a street

Think about:
and picture a full moon on a clear night

Think about:
clouds forming in the sky

Think about:
the layout of the local shopping center

Think about:
and imagine a plane flying overhead

Think about:
fire darting around a log in a fireplace

Think about:
and concentrate on the expression on the face of the Mona Lisa

Think about:
a parking lot at a drive-in

Think about:
two birds sitting on a tree branch

Think about:
the shadow of a stop sign

Think about:
the layout of the local post office

Think about:
the structure of a high-rise office building

Think about:
and picture the Eiffel Tower

Think about:
and imagine a truckload of watermelons

Think about:
the pattern on an Oriental rug

Think about:
the "man in the moon"

Think about:
the shape of the continent of Africa

Think about:
a band playing outside

Think about:
a group of polar bears fishing in a stream

Think about:
the shape of the torch on the Statue of Liberty

Think about:
the shape of the state of California

Think about:
the way the Grand Canyon looks at sunset

Think about:
the structure of the Golden Gate Bridge

Think about:
a train stopped at a station

Think about:
a lone cactus in the desert

Think about:
the shape of the country of Italy

Think about:
a row of shampoo bottles on display

Think about:
a gas station on the side of a highway

Think about:
the fuzz on the shell of a coconut

Think about:
the Presidents' faces on Mount Rushmore

Think about:
and picture the Eiffel tower

Think about:
a band playing "The Star-Spangled Banner"

Think about:
the shape of a cello

Think about:
the shape of the United States

Think about:
the baggage claim area at the airport

Think about:
the size of the Statue of Liberty

Think about:
the shape of a baseball glove

Think about:
a freshly painted door

Think about:
the shiny surface of a trumpet

RESPONSE MANIPULATION MATERIALS: RUMINATION

Think about:
the physical sensations you feel in your body

Think about:
your character and who you strive to be

Think about:
the degree of clarity in your thinking right now

Think about:
why you react the way you do

Think about:
the way you feel inside

Think about:
the possible consequences of your current mental state

Think about:
how similar/different you are relative to other people

Think about:
what it would be like if your present feelings lasted

Think about:
why things turn out the way they do

Think about:
trying to understand your feelings

Think about:
how awake/tired you feel now

Think about:
the amount of tension in your muscles

Think about:
whether you are fulfilled

Think about:
your physical appearance

Think about:
whether you feel stressed right now

Think about:
the long-term goals you have set

Think about:
the amount of certainty you feel

Think about:
You're present feelings of fatigue/energy

Think about:
possible explanations for your physical sensations

Think about:
how hopeful/hopeless you are feeling

Think about:
the level of motivation you feel right now

Think about:
the degree of helplessness you feel

Think about:
the degree of calmness/restlessness you feel

Think about:
the possible consequences of the way you feel

Think about:
what your feelings might mean

Think about:
how sad/happy you are feeling

Think about:
the expectations your family has for you

Think about:
why your body feels this way

Think about:
why you get this way sometimes

Think about:
how passive/active you feel

Think about:
what people notice about your personality

Think about:
the kind of student you are and wish you were

Think about:
how weak/strong your body feels now

Think about:
the degree of relaxation/agitation you feel

Think about:
the kind of person you think you should be

Think about:
the degree of control you feel right now

Think about:
what would happen if your current physical state lasted

Think about:
sitting down and analyzing your personality

Think about:
why you turned out this way

Think about:
the things that are most important in your life

Think about:
how quick/slow you're thinking is right now

Think about:
the degree of decisiveness you feel

Think about:
trying to understand who you are

Think about:
how you feel about your friendships

Think about:
whether you have accomplished a lot so far

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