MEMORIAL PERFORMANCE IN ANXIETY AND DEPRESSION: 
AN INVESTIGATION USING THE PROCESS DISSOCIATION PROCEDURE

by

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A thesis submitted in conformity with the requirements for the degree of Doctor of Philosophy
Graduate Department of Psychology
University of Toronto

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Memorial Performance in Anxiety and Depression: 

An Investigation Using the Process Dissociation Procedure 

Doctor of Philosophy, 1998 

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Graduate Department of Psychology 

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Abstract 

Both depression and anxiety appear to affect aspects of cognitive processing. The process dissociation procedure (PDP; Jacoby, 1991) was used to assess automatic and consciously-controlled memory biases in anxiety and depression. Memory for six word categories was examined: high positive affect, high negative affect, physical threat, negative self-referent, categorized neutral, and uncategorized neutral words. Study 1 examined differences in memorial performance of students with high and low anxiety sensitivity. The only memory difference between the groups was an unexpected higher conscious recollection for categorized neutral words in the high anxiety sensitive group. Study 2 compared the performance of students with high versus low scores on the Beck Depression Inventory (BDI). Students who scored high on the BDI showed a higher conscious recollection of high positive affect words in addition to a higher conscious recollection of all word categories overall when compared to those with low BDI scores. Study 3 examined memorial performance of patients with major depressive disorder with (SAD) and without (MDD) a seasonal pattern. When compared to a group of healthy controls, the depressed patients
demonstrated a significantly lower conscious recollection of words overall. In addition, the MDD patients demonstrated significantly lower automatic memory overall when compared to SAD patients. Study 4 compared the performance of a subgroup of MDD patients who had been treated with an antidepressant for six weeks to healthy controls who were tested again after the same time period. The patients who responded to treatment did not differ from the controls in their conscious or automatic memory for the words, nor on any of the questionnaire measures. Finally, differences in memorial performance between the male and female participants were examined. The female students with high BDI scores consciously remembered more negative and fewer positive words than the high BDI male students. In contrast, female SAD patients showed a trend for higher automatic memory of positive words compared to male SAD patients. Implications of these results are discussed in relation to several theories of anxiety and depression as well as more general issues related to the study of cognitive processes in mood disorders.
Acknowledgements

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<tr>
<td>A</td>
<td>Probability of a word automatically coming to mind</td>
</tr>
<tr>
<td>A'</td>
<td>Automatic influences of memory</td>
</tr>
<tr>
<td>ASI</td>
<td>Anxiety Sensitivity Index</td>
</tr>
<tr>
<td>ATQ</td>
<td>Automatic Thoughts Questionnaire</td>
</tr>
<tr>
<td>ATQ-P</td>
<td>Automatic Thoughts Questionnaire-Positive</td>
</tr>
<tr>
<td>B</td>
<td>Baseline probability of putting a checkmark next to a critical word that has not been previously studied</td>
</tr>
<tr>
<td>BDI</td>
<td>Beck Depression Inventory</td>
</tr>
<tr>
<td>CN</td>
<td>Categorized neutral</td>
</tr>
<tr>
<td>HAM-21</td>
<td>21-item Hamilton Rating Scale for Depression</td>
</tr>
<tr>
<td>HAM-29</td>
<td>29 questions of the SIGH-SAD</td>
</tr>
<tr>
<td>HAM-SAD</td>
<td>Additional eight items in the Hamilton Rating Scale for Depression which assess severity of seasonal patterns of major depressive disorder</td>
</tr>
<tr>
<td>HAS</td>
<td>Students participants with high scores on the ASI</td>
</tr>
<tr>
<td>HAS only group</td>
<td>Group of participants with high ASI scores and BDI scores less than 16</td>
</tr>
<tr>
<td>HBD</td>
<td>Student participants with high scores on the BDI</td>
</tr>
<tr>
<td>HBD only group</td>
<td>Group of participants with high BDI scores and ASI scores less than 30 for the females and less than 23 for the males</td>
</tr>
<tr>
<td>HNA</td>
<td>High Negative Affect</td>
</tr>
<tr>
<td>HPA</td>
<td>High Positive Affect</td>
</tr>
<tr>
<td>HSD</td>
<td>Honest significant difference</td>
</tr>
<tr>
<td>LAS</td>
<td>Student participants with low scores on the ASI</td>
</tr>
<tr>
<td>LBD</td>
<td>Student participants with low scores on the BDI</td>
</tr>
<tr>
<td>LSD</td>
<td>Least Significant Difference</td>
</tr>
<tr>
<td>MASQ</td>
<td>Mood and Anxiety Symptom Questionnaire</td>
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<tr>
<td>Term</td>
<td>Definition</td>
</tr>
<tr>
<td>--------------</td>
<td>--------------------------------------------------------------</td>
</tr>
<tr>
<td>MCM</td>
<td>Mood congruent memory</td>
</tr>
<tr>
<td>MDD</td>
<td>Patients with major depressive disorder without a seasonal pattern</td>
</tr>
<tr>
<td>Mixed HAS/HBD group</td>
<td>Participants with both high ASI scores and high BDI scores</td>
</tr>
<tr>
<td>MPQ</td>
<td>Multidimensional Personality Questionnaire</td>
</tr>
<tr>
<td>N</td>
<td>Sample size</td>
</tr>
<tr>
<td>NA</td>
<td>Negative Affect</td>
</tr>
<tr>
<td>NEO short form</td>
<td>Short form of the Neuroticism scale of the NEO Five-Factor Inventory (Abbreviated as NEO S.F. in tables in Appendices)</td>
</tr>
<tr>
<td>NSR</td>
<td>Negative self-referent</td>
</tr>
<tr>
<td>PA</td>
<td>Positive Affect</td>
</tr>
<tr>
<td>PANAS-X</td>
<td>Positive and Negative Affect Schedule-Expanded Form</td>
</tr>
<tr>
<td>PDP</td>
<td>Process dissociation procedure</td>
</tr>
<tr>
<td>PT</td>
<td>Physical threat</td>
</tr>
<tr>
<td>R</td>
<td>Probability of recollection of a studied word</td>
</tr>
<tr>
<td>SAD</td>
<td>Patients with major depressive disorder with a seasonal pattern</td>
</tr>
<tr>
<td>SCID</td>
<td>Structured Clinical Interview for DSM-IV</td>
</tr>
<tr>
<td>SD</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>SIGH-SAD</td>
<td>Hamilton Depression Rating Scale-Seasonal Affective Disorders Version</td>
</tr>
<tr>
<td>STAI</td>
<td>State-Trait Anxiety Inventory</td>
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<tr>
<td>UN</td>
<td>Uncategorized neutral</td>
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Memorial Performance in Anxiety and Depression:  
An Investigation Using the Process Dissociation Procedure

Introduction

Anxiety and depressive disorders have been researched by theorists with differing perspectives. Whether theorists of mood and anxiety disorders consider behavioral, cognitive, or physiological functioning, they should not ignore the substantial overlap between these groups of disorders. Overlap between anxiety and depressive disorders is found at the level of syndrome comorbidity, symptom overlap, and questionnaire measures and may indicate that a common mechanism exists in both groups of disorders. The similarities and differences between anxiety and depressive disorders have important implications for both diagnosis and treatment.

Affect-Related Terminology

Anxiety and mood disorders are recognized in psychiatric nomenclature as discrete groups of disorders (American Psychiatric Association, 1994). However, there is overlap in the self-report scales, symptoms, and diagnostic criteria of the two groups of disorders (Watson & Kendall, 1989a).

Before discussing the similarities and differences in anxiety and mood disorders, it is important to distinguish between the terms "symptom" and "syndrome" as related to mental disorders. A symptom can be defined as any feature of a person's actions, thoughts, or feelings that are typical aspects of a particular disorder (DiNardo & Barlow, 1990; p. 605, Gray, 1994). In contrast, a syndrome is a cluster of interrelated symptoms manifested by a given individual (p. 605, Gray, 1994).
When examining anxiety and mood disorders, there is much evidence of syndrome comorbidity. For example, about 50%-65% of patients with panic disorder are also diagnosed with concurrent major depression (American Psychiatric Association, 1994). Similarly, studies have shown that 10%-20% of individuals with major depressive disorder have co-occurring agoraphobia or panic, and 33%-50% concurrently meet diagnostic criteria for generalized anxiety disorder (Clark, 1989). There is also an apparent familial link between panic disorder and major depression which suggests a common diathesis in these disorders (Leckman, Weissman, Merikangas, Pauls, & Prusoff, 1983).

Because of the substantial overlap between anxiety and affective syndromes, the symptoms related to each of these groups of disorders have been examined closely (DiNardo & Barlow, 1990). Several symptoms appear to be relevant to both anxiety and depressive disorders. This overlap in symptoms includes restlessness, loss of energy, difficulty concentrating, fatigue, and insomnia (Clark, 1989; Pasnau & Bystritsky, 1994).

Perhaps partly due to this overlap in symptomatology, both self-report and observer-based measures for anxiety and depression are highly correlated (mean rs of .60 and a range of .27 to .94; Clark, Beck, & Stewart, 1990) regardless of the scale used or population examined (Watson, Clark, & Carey, 1988; Watson & Kendall, 1989a).

In addition to distinguishing between the terms "syndromes" and "symptoms", it is important to discuss both "state" and "trait" issues as related to mood and anxiety. Emotional arousal or disturbance can be experienced as a temporary state or as a relatively stable or chronic personality trait (Spielberger, 1975; J. M. G. Williams, Watts, MacLeod, & Mathews, 1988). When examining patients with anxiety and/or mood disorders, it is
difficult, although important, to differentiate between effects which are due to state versus trait disturbances. For example, comparing depressed patients to non-patient control subjects who are currently experiencing a high level of depressive symptoms may help predict which cognitive effects are due to more stable trait effects and which are simply due to the present mood of the participants.

**Importance of Dissociating Anxiety and Mood Disorders**

Because of the many common features of anxiety and mood disorders, one cannot study one of these disorders while ignoring the other. Much of the past research on these disorders unfortunately did this and, therefore, must be examined with caution. Findings in studies of anxiety disorder patients which did not control for levels of depression (e.g., Mathews, Mogg, May, & Eysenck, 1989; Mogg, Gardiner, Stavrou, & Golombok, 1992) may be due to the confound of a high level of depression. Similarly, data in mood disorder studies which did not control for the level of anxiety of the subjects (e.g., Denny & Hunt, 1992; Elliott & Greene, 1992; Watkins, Mathews, Williamson, & Fuller, 1992) may have resulted from their anxiety level as a confounding variable.

Although anxiety and mood disorders share several common elements, there are obvious differences between the disorders. There is a strong correlation between anxiety and depression scales, but a substantial amount of variation is not accounted for by a model which assumes that these disorders cannot be differentiated. Statistical techniques such as principal components analysis (Roth, Gurney, Garside, & Kerr, 1972) and discriminant function analysis (Gurney, Roth, Garside, Kerr, & Schapira, 1972) have been used to examine patients categorized as anxious or depressed on the basis of the predominant mood.
change during the course of their illness. The evidence from these studies suggests that two
distinct syndromes (Roth et al., 1972) and two distinct patient groups (Gurney et al., 1972)
corresponding to anxiety and depression can be defined.

Several symptoms do distinguish anxiety and mood disorders. For example, criteria
for major depressive disorder include marked anhedonia, appetite disturbance and recurrent
thoughts of death; whereas, anxiety disorder symptoms include sweating, nausea, dry mouth,
and trembling (American Psychiatric Association, 1994; Pasnau & Bystritsky, 1994). These
symptoms are unique to each respective group of disorders.

Influential Theories of Anxiety and Depressive Disorders

Influential theories which attempt to explain the similarities and differences in anxiety
and depressive disorders include: (1) Beck's (1976) cognitive content-specificity hypothesis;
(2) J. M. G. Williams et al. (1988) model of cognition and emotional disorders; (3) the
positive-negative affect model (Watson & Tellegen, 1985) and (4) the tripartite model of
anxiety and depression (Clark & Watson, 1991).

Cognitive Content-Specificity Hypothesis

Model:

Beck (1976) proposed that many psychiatric disorders, including anxiety and
depressive disorders, may be characterized as disorders in thinking. The main differences
among these disorders involve the specific content of the thoughts, not the form. Beck
suggested that a depressed patient experiences automatic thoughts related to loss and defeat;
whereas, an anxious patient has automatic thoughts concerned with danger. Automatic
thoughts are cognitions that emerge rapidly and reflexly. Identifying the specific cognitions
or automatic thoughts of an individual enables one to understand the emotional disturbance of that person. According to Beck's view, anxiety arises when cognitive structures (schemata) related to processing information concerned with danger are activated. An anxious individual feels distressed because of an overinterpretation of experiences in terms of danger. In contrast, depression occurs when cognitive structures concerned with loss are activated. A depressed individual has a negative view of herself, her world, and her future, a set of cognitive distortions labelled the *cognitive triad* (Beck, 1976).

*Related Research and Its Implications:*

Beck's (1976) cognitive content-specificity hypothesis has been supported by research with anxious and depressed subjects. Anxious and depressed subjects were found to be distinguishable by the specific cognitive content related to the disorders (Beck, Brown, Steer, Eidelson, & Riskind, 1987) and by the endorsement and recall of mood-related adjectives (Greenberg & Beck, 1989). Another study found that threat cues were processed differently by generalized anxiety disorder patients and nonanxious individuals (e.g., Mathews & MacLeod, 1985; Mathews & MacLeod, 1986). Similarly, panic disorder patients demonstrated a processing bias for threat information since these patients recalled more anxiety than nonanxiety words in comparison to nonanxious subjects who actually recalled more nonanxiety words than anxiety words (McNally, Foa, & Donnell, 1989). Panic disorder patients were found to have both better perceptual memory (memory for the perceptual features of a stimulus) and better conceptual memory (memory for the meaning of the stimulus) for threat words when compared to normal controls (Cloitre & Liebowitz, 1991). These experiments suggest that cognitive structures related to evaluating personal danger
(i.e., danger schemata) were indeed activated in the anxious, but not the nonanxious, individuals.

If Beck's model is correct, depressed patients should also show abnormal activation of schemata, but these cognitive structures would be involved in processing negative information related to loss instead of stimuli related to danger. Evidence indicates that a negative self-schema does exist in depressed individuals. For example, Segal, Hood, Shaw, & Higgins (1988) found that depressed subjects endorsed a significantly larger number of negative words as self-referent when compared to both normal and anxious subjects. Derry and Kuiper (1981) similarly found that clinically depressed patients demonstrated better recall for depressed-content adjectives which had been rated in a self-referent task, in contrast to normal and non-depressed psychiatric controls who showed superior recall for self-referenced, non-depressed-content adjectives. This bias for better remembering affective stimuli which are congruent with the individual's present mood state is often called mood congruent memory (MCM; Blaney, 1986).

Together, these studies support Beck's (1976) cognitive theory. However, studies exist that do not support this theory. For example, Mogg, Mathews, and Weinman (1987) found no evidence of a self-referent recall bias for negative or threat-related words in generally anxious patients when compared to non-anxious controls.

In addition, later studies found evidence that the cognitive processing of depressed and anxious subjects differs in process as well as content. Cognitive processes can operate either unconsciously and automatically or strategically and nonautomatically. Automatic processes take place without conscious awareness, do not interfere with ongoing mental
activity, use little or no attentional resources, and occur without subject intention or control (Hartlage, Alloy, Vazquez, & Dykman, 1993; Kihlstrom, 1987); effortful processing requires attention, is influenced by cognitive capacity limitations, and improves with practice (Hartlage et al., 1993). Automatic processes which operate outside our awareness can still influence our thoughts, experiences, and actions (Kihlstrom, 1987). Automatic memory is often called implicit memory and is measured as a facilitation of performance on a task without the aid of conscious recollection of a previous experience (Kihlstrom, 1987; Roediger, Guynn, & Jones, 1994; Schacter, 1987). In contrast, explicit (effortful) memory is measured with more traditional tests of cued or free recall and recognition which rely on recollection of past experiences.

Automatic and effortful (consciously-controlled) processes are dissociable (Schacter, 1987). This implies that disruptions in one type of memory need not affect the other. Tests of implicit and explicit memory have been used to assess automatic and nonautomatic processing in depressed and anxious subjects. Results of these studies revealed that bias toward mood-congruent stimuli is not shown with all depressed and anxious stimuli in every paradigm (J. M. G. Williams et al., 1988).

Anxiety disorder patients have generally been found to show an automatic attentional bias toward threat-related stimuli, but no strategic, conscious bias for threat words was evident (e.g., MacLeod & McLaughlin, 1995; Mathews et al., 1989; Mogg, Bradley, Williams, & Mathews, 1993; Mogg et al., 1992; Mogg, Mathews, & Weinman, 1989). In contrast, depressed subjects have generally been reported to have an explicit (strategic) memory bias for negative stimuli, without any automatic attentional biases (e.g., Denny &
Hunt, 1992; Dunbar & Lishman, 1984; Hill & Knowles, 1991; Watkins et al., 1992). This explicit memory bias in depression was not found for all negative information. For example, there was no MCM bias for physical threat words (which are not directly related to depression) in depressed participants (Watkins et al., 1992). In addition, there is evidence for a decrease in explicit memory for positive material as well as, or instead of, an increase in strategic memory for negative information in depressed individuals (see Blaney, 1986 for review). Thus, the content of the recalled words were congruent with Beck's (1976) model, however, his theory did not predict these differences in the form and extent of maladaptive cognitions.

**J. M. G. Williams et al. (1988) Model of Cognition and Emotional Disorders**

*Model:* The model of cognition and emotional disorders proposed by J. M. G. Williams et al. (1988) attempted to explain why these maladaptive cognitions in anxiety and depressive disorders are not as pervasive as anticipated by Beck (1976). This integrative model tried to account for the different pattern of results of cognitive processing studies which are found in different mood states (Williams, Watts, MacLeod, & Mathews, 1997).

J. M. G. Williams et al.'s (1988) integrative model proposed that the encoding and retrieval of information involve both automatic and consciously-controlled components. Although there may be a bias for a particular type of information in one (e.g., automatic) component, there need not be a bias in the other (e.g., consciously-controlled) component. This proposal was used to explain the results of cognitive processing studies of anxious and depressed participants.
Related to the distinction of automatic and consciously-controlled processes, J. M. G. Williams et al. (1988) made an important distinction between integration/priming and elaboration. Priming is described as a process in which a stimulus (e.g., a word) automatically activates the various components which are involved in the mental representation of the stimulus. This automatic activation results in a strengthening of the internal representation of the stimulus, thereby making the word more accessible. The word will therefore be accessed more readily even if only some of its features are presented. In contrast, elaboration is a consciously-controlled, strategic process in which the activation of the representation of a stimulus leads to the activation of other associated representations. This spread of activation forms new relationships between the representations and also activates old relationships. This elaborative process makes the word more easily retrieved. Again, the dissociation between priming and elaboration implies that a bias in one aspect of cognitive processing does not mean that a bias need occur in the other aspect.

Experiments involving paradigms such as the Stroop (1935) color-naming task, visual dot probe test (MacLeod, Mathews, & Tata, 1986), and word stem completion tasks all tap into more automatic processes which reflect priming. In contrast, tests of free recall, cued recall, and recognition memory tasks appear to be more strategic in nature and reflect elaborative processes. The results of studies using these paradigms examine the different aspects of cognitive processing, that is, automatic processing (i.e., priming) versus consciously-controlled processing (i.e., elaboration).

J. M. G. Williams et al. (1988, 1997) attempt to account for the studies discussed above by proposing that anxiety affects the passive, automatic element of encoding and
retrieval, and, in contrast, depression affects the active, strategic aspect of encoding and retrieval. Specifically, an automatic attentional bias for threatening information is demonstrated by anxious patients, enabling them to orient their cognitive resources toward the threatening stimulus or situation. Depression, on the other hand, appears to affect the conscious recall of memory, thereby contributing to the depressed individual's focus on negative information and away from positive material. These proposals contrast with Beck's (1976) hypothesis which assumes that affect-congruent effects are evident throughout the entire cognitive system.

Related Research and Its Implications:

The J. M. G. Williams et al. (1988) model regarding automatic versus consciously-controlled aspects of encoding and retrieval has been supported by studies examining memory and attention in the emotional disorders (see discussion above and Dalgleish & Watts, 1990 for review.) However, it should be noted that not all of the research regarding cognitive processing in anxiety and depression is congruent with the J. M. G. Williams et al. (1988) model.

Some studies indicate that a depression-congruent bias operates in automatic as well as strategic processing in individuals with depressive symptoms (Bradley, Mogg, & Williams, 1994; Ruiz-Caballero & Gonzalez, 1994) and clinically depressed patients (Bradley, Mogg, & Williams, 1995; Watkins, Vache, Verney, Mathews, & Muller, 1996). In addition, Elliott and Greene (1992) found an overall impairment in consciously-controlled and automatic memory in clinically depressed patients when compared to healthy controls. Unfortunately, they did not assess any effects of the emotionality of the words used in the
study so MCM biases could not be examined.

Roediger & McDermott (1992) argue that these results found by Elliott and Greene (1992) may be due to (1) the use of normative data from past studies to estimate automatic memory or (2) to the severity of depressive symptoms in the patients. However, the results of the Elliott and Greene study cannot be discounted simply because of these reasons. The differences in automatic processing were too large to be accounted for by differences in baseline performance and the level of depression of their participants appears to be equivalent of that in patients in other studies which did not find deficits in automatic memory (Roediger & McDermott, 1992). In addition, Roediger & McDermott do recognize that there has been a nonsignificant trend towards MCM biases on several implicit memory tests with depressed participants. As mentioned earlier, several recent studies (Bradley et al., 1994; Bradley et al., 1995; Ruiz-Caballero & Gonzalez, 1994; Watkins et al., 1996) have confirmed this pattern and demonstrated significant differences in MCM biases in automatic measures between healthy and depressed participants.

Other studies involving anxious patients also fail to support the J. M. G. Williams et al. (1988) model. Cloitre, Shear, Cancienne, and Zeitlin (1994) found both an implicit and an explicit memory bias for catastrophic association-bodily sensation word pairs in panic disorder patients. Also, another study demonstrated that panic disorder patients showed neither an implicit nor an explicit memory bias for physical threat words (Rapee, 1994). Studies using various types of tests of automatic memory are needed to clarify these conflicting results.

A final limitation of the J. M. G. Williams et al. (1988) model centers on the
generalizability of the model. In contrast to Beck's (1976) theory which is largely based on clinical observation, this model is mainly based on studies of word stimuli (J. M. G. Williams et al., 1988). In addition, the J. M. G. Williams et al. model is that it is more descriptive than explanatory. Thus, on its own, the J. M. G. Williams et al. model does not appear to be sufficient to explain the similarities and differences in cognitive processing in anxiety and depressive disorders.

**Positive-Negative Affect Model**

*Model:*

The positive-negative affect model (Watson & Tellegen, 1985) attempts to distinguish between anxiety and depressive disorders in terms of mood states instead of cognitive processes. Watson and Tellegen's model states that two independent factors, Negative Affect (NA) and Positive Affect (PA), form the basic structure of mood. NA is the general factor of subjective distress (Watson et al., 1988; Watson & Kendall, 1989a) and indicates differences in negative emotionality and self-concept (Watson & Clark, 1984). NA represents "the extent to which a person reports feeling upset or unpleasantly aroused" (p. 221, Watson & Tellegen, 1985). PA reflects the pleasurable engagement with one's environment (Watson et al., 1988; Watson & Kendall, 1989a) and is "the extent to which a person avows a zest for life" (p. 221, Watson & Tellegen, 1985). These dimensions developed out of factor analyses of self-report mood scales and have been shown to be distinctive, uncorrelated dimensions.

Unpleasant states including *fearful, hostile,* and *gloomy* are related to high NA, and *calm, placid,* and *relaxed* are descriptive of low NA. In contrast, high PA is represented by states such as *active, elated,* and *enthusiastic,* and low PA is described by words which
include *drowsy, dull, and sluggish.*

Both NA and PA can be considered state and/or trait mood factors. The construct of trait NA is a stable, pervasive factor which is related to specific characteristics of mood and self-concept (Watson & Clark, 1984). An individual who is high in trait NA tends to be more distressed and dissatisfied over time, even in the absence of a stressful situation. Although NA is a mood factor, not a cognitive factor, NA has also been found to be related to negative cognitions (Clark et al., 1990). This general negative trait is proposed to be a vulnerability factor for psychopathology in general and thus relates to both anxiety and depressive disorders (Clark, Watson, & Mineka, 1994).

The positive-negative affect model indicates that anxious mood involves a state of high NA, whereas, a depressed mood state is a combination of high NA and low PA (Watson et al., 1988; Watson & Tellegen, 1985). In terms of clinical disorders, there is evidence that trait NA is correlated with anxiety and depressive disorders generally, whereas trait PA is only related to depressive disorders (Watson et al., 1988). Low PA may even be a risk factor for developing depression (Clark et al., 1994). This indicates that anhedonia, or low PA, appears to be critical for differentiating between anxiety and depressive disorders.

High NA is proposed to be common to anxiety and depressive disorders, but low PA is only an integral part of depressed mood. In this way, this model attempts to account for both the differences and similarities of the two disorders.

**Tripartite Model of Anxiety and Depression**

*Model*:

Clark and Watson (1991) further expand on the positive-negative affect model in their
tripartite model of anxiety and depressive disorders. Similar to the positive-negative affect model, they suggest that general distress (i.e., high trait NA) is common to both disorders, while anhedonia (i.e., low PA) is specific to depressive disorders. To this proposal, they add that physiological hyperarousal is specific to anxiety disorders. This autonomic hyperarousal dimension appears to be related to anxiety sensitivity, a fear of anxiety symptoms because of harmful consequences (Clark et al., 1994). Anxiety sensitivity has been proposed as a risk factor for the development of anxiety disorders such as panic disorder (Maller & Reiss, 1992; Reiss & McNally, 1985; Schmidt, Lerew, & Jackson, 1997). Thus, there is some support for the addition of a physiological hyperarousal component to the predictive validity of this model.

In addition to low PA and physiological hyperarousal factors, if stress contributes to the development of an anxiety or depressive episode, the type of stress experienced may relate to specific emotional disorders. The general vulnerability related to NA combined with the specific stress experienced (i.e., danger versus loss) could relate to the development of anxiety disorders versus depressive disorders, respectively. There is in fact evidence that suggests that stressful events involving loss are correlated more strongly with depressive disorders, whereas events involving danger are more strongly related to anxiety disorders (Watson & Kendall, 1989b).

Related Research and Its Implications:

Both the positive-negative affect model and the tripartite model have received empirical support. Self-report studies have reported a correlation of high NA (Hollon & Kendall, 1980; Hollon, Kendall, & Lumry, 1986) as well as low PA (Ingram & Wisnicki,
1988) with depressive disorders. Decreases in PA were correlated with the severity of depression since depressed subjects reported fewer positive thoughts than mildly depressed subjects, who in turn reported fewer positive thoughts than nondepressed controls (Ingram & Wisnicki, 1988). Watson et al. (1988) found that NA was related to both anxious and depressive symptoms and diagnoses, while low PA was related specifically to depression. This finding confirmed the theory's prediction that low PA (i.e., anhedonia) distinguishes depressive disorders from anxiety disorders. Anxiety disorders were most strongly dissociated from depressive disorders when physiological symptoms were included in the self-report (Clark & Watson, 1991), thus lending support to the more specific tripartite model.

Much of the research related to the positive-negative affect model and the tripartite model has used self-report measures such as Positive and Negative Affect Schedule-Expanded Form (PANAS-X; Watson & Clark, 1990), the Multidimensional Personality Questionnaire (MPQ; e.g., Watson et al., 1988), and the Mood and Anxiety Symptom Questionnaire (MASQ; e.g., Watson, Clark, Weber, Assenheimer, Strauss, & McCormick, 1995; Watson, Weber, Assenheimer, Clark, Strauss, & McCormick, 1995). In addition, the Automatic Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980) and the ATQ-Positive (ATQ-P, Ingram & Wisnicki, 1988) are self-report questionnaires which have been used to assess dysfunctional cognitions related to NA and PA. The ATQ and ATQ-P contain either negative or positive self-statements, respectively, and require subjects to rate the frequency that these or similar statements occur in their thoughts over a week-long period (Hollon & Kendall, 1980; Ingram & Wisnicki, 1988). Depressed patients had higher scores than other
psychiatric patients (e.g., substance abuse disorder, schizophrenia) on the ATQ (Hollon et al., 1986). Other studies found that socially anxious subjects had higher scores on the ATQ than healthy controls, but lower scores than depressed patients; however, generally anxious subjects had scores which were higher than those of the controls and also comparable to the scores of depressed patients (Kendall & Ingram, 1989). Using the ATQ-P in addition to the ATQ helped further differentiate the anxious and depressed subject groups (e.g., Ingram, 1989).

Because these automatic thoughts questionnaires are self-report measures, subjects' responses may be affected by demand or expectancy effects, and may not supply evidence about pre-conscious processes (Eysenck, 1992). Additionally, because of the nature of automatic thoughts, individuals may not be consciously aware of having such thoughts. Automatic processes take place without conscious awareness, do not interfere with ongoing mental activity, and occur without subject intention or control (Hartlage et al., 1993). However, the products of such automatic processes (i.e., the thoughts themselves) can be consciously processed and interfere with ongoing effortful processing (Hartlage et al., 1993). Since the respondent is not always consciously aware that certain automatic thoughts have occurred, such unconscious processes may not be reported on self-report questionnaires.

**Theories: Contradictory or Complementary?**

These four theories of anxiety and depression discussed above have generally been studied separately without comparing and contrasting hypotheses which would result from the various models. However, more recently, researchers have been comparing predictions of pairs of these theories simultaneously. Beck's (1976) cognitive content-specificity model
yields hypotheses that need not contradict the positive-negative affect model (Watson & Tellegen, 1985) or the tripartite model (Clark & Watson, 1991) of emotional disorders. In fact, when hypotheses drawn from these models are studied simultaneously, these theories seem to be supported by the data from studies of both adults (Clark et al., 1990) and children (Laurent & Stark, 1993). The valence of the cognitions of anxious and depressed subjects seems consistent with the positive-negative affect model (Watson & Tellegen, 1985), whereas the content of the cognitions is not inconsistent with Beck's (1976) cognitive theory (Clark et al., 1990; Laurent & Stark, 1993). A factor analysis of the items from the revised Beck Depression Inventory (BDI; Beck & Steer, 1987) and Beck Anxiety Inventory (BAI; Beck & Steer, 1990) revealed that specific depression and anxiety dimensions were apparent even after partialing out NA (Clark, Steer, & Beck, 1994; Steer, Clark, Beck, & Ranieri, 1995). These findings were consistent with the predictions of both the tripartite and cognitive content-specificity models.

The J. M. G. Williams et al. (1988) model of emotional disorders and the positive-negative affect model (Watson & Tellegen, 1985) also need not yield contradictory predictions. Combining hypotheses from these two theories may in fact circumvent some of the weaknesses of each theory on its own. As mentioned earlier, the J. M. G. Williams et al. (1988) theory is more descriptive than explanatory. In contrast, the positive-negative affect model discusses a causal link. Genetic studies have shown a significant heritability for the personality trait of NA (e.g., Kendler, Heath, Martin, & Eaves, 1987; Tellegen, Lykken, Bouchard, Wilcox, Segal, & Rich, 1988; see Clark & Watson, 1991 for discussion). Also PA, but not NA, has been found to vary seasonally and diurnally, which is well documented
for depression but not for anxiety (e.g., Healy & Williams, 1988; Kasper & Rosenthal, 1989; see Clark & Watson, 1991 for discussion). Combining the ideas related to PA and NA with the J. M. G. Williams et al. (1988) theory could therefore help resolve some of the criticisms discussed earlier.

**Cognitive Processing in Emotional Disorders**

An essential component of several of the theories of anxiety and depressive disorders discussed above is the importance of cognition in the etiology and maintenance of these disorders. Although combining ideas from several of these theories could help strengthen the predictive validity of the theories on their own, other researchers such as Hartlage et al. (1993) have tried to account for the cognitive findings in a different manner.

**Alternative Account of Findings Related to Cognition and Depression**

Hartlage et al. (1993) attempt to account for many of the findings related to cognition in depressive disorders. These researchers suggest that depression may be maintained by automatically processed self-relevant negative information as well as by the use of available cognitive resources to focus mainly on negative information. Thus, depression-prone individuals who are not currently depressed would be expected to show an enduring automatic bias for negative information, but not a strategic bias. However, when stress occurs, Hartlage et al. propose that it interferes with consciously-controlled processing and may only allow automatic processing of information. The content of the automatic processes is negative. The depressed individuals should then show both an automatic and a consciously-controlled bias for negative stimuli.

As mentioned earlier, although much of the research has indicated that only a bias in
effortful processing exists in depression, several researchers (Bradley et al., 1994; Bradley et al., 1995; Elliott & Greene; 1992; Ruiz-Caballero & Gonzalez, 1994; Watkins et al., 1996) demonstrated that there are differences in automatic as well as strategic processing between non-depressed and depressed participants. Hartlage et al. (1993) argue that the studies which failed to demonstrate such an automatic bias used word stimuli that appeared more anxiety relevant than depression-related and thus were not self-relevant to the depressed individuals. The words used in these studies which found automatic MCM biases in depressed participants did appear to use word stimuli which were rated as relevant to depression (Bradley et al., 1994; Bradley et al., 1995; Elliott & Greene; 1992; Ruiz-Caballero & Gonzalez, 1994; Watkins et al., 1996).

In contrast, several researchers did not find evidence of automatic MCM biases in depressed participants. These researchers used various types of word stimuli in their studies. For example, Danion, Kauffmann-Muller, Grange, Zimmermann, and Greth (1995) used words which were negative in content, but specifically not directly related to depression. Similarly, Bazin, Perruchet, De Bonis, and Feline (1994) did not find evidence for MCM biases in an implicit memory task used word stimuli which were only generally negative but were not required to be related to depression (e.g., TERROR, MURDER). These words indeed appear to be more relevant to anxiety disordered patients than to depressed patients. In addition, Denny and Hunt (1992) also used words which were affectively negative, but not necessarily relevant to depression (e.g., JEALOUS, UNLUCKY, BITTERNESS). However, Watkins, Mathews, Williamson, and Fuller (1992) did include words which were "related to the depressed condition" (p. 582) and also found no bias for these words in the depressed
patients in the implicit memory task. Because there are differences in the word stimuli used in these studies as well as differences in the results (especially regarding biases in automatic processing), further careful research needs to be done examining memory for specific types of negative word stimuli.

**Implications for Affect and Cognition**

In addition to the issue of the categories of word stimuli used in these memory studies, the specific tasks which measure memory differences also tend to vary greatly between studies. Most of the implicit tasks used in studies exploring automatic MCM biases in depression have used perceptual, not conceptual, tasks. Perceptual implicit memory tests involve processes which are affected by the perceptual display of the stimuli; whereas, conceptual implicit tests are meaning-based tasks (Roediger et al., 1994). Examples of perceptual implicit memory tasks are word fragment and word stem completion and lexical decision tests. Conceptual implicit memory tests include tests of general knowledge and free associations to related concepts. Roediger & McDermott (1992) predicted that MCM biases would be found in conceptual, but not perceptual, implicit memory tests in depressed participants since conceptual implicit tests reflect meaning-bases processes. The one study which included a conceptual free association implicit memory test did find an automatic MCM bias in clinically depressed participants (Watkins et al., 1996). However, it is important to note that the other studies which also found automatic MCM biases in depressed participants used perceptual implicit memory tests, specifically, lexical decision tasks (Bradley et al., 1994; Bradley et al., 1995) and a word stem completion test (Ruiz-Caballero & Gonzalez, 1994).
As discussed above, MCM biases for generally negative information seem to operate in explicit tests of memory, and not in implicit memory tests, in depressed patients (e.g., Bazin et al., 1994; Danion et al., 1995; Denny & Hunt, 1992). However, automatic MCM biases have been found in depressed patients when more specific depression-related words were used. Perhaps biases in automatic processing are related to words which are congruent with an individual’s specific thoughts rather than their general mood. This type of cognition-congruent effect can be seen in anxiety disorder patients. For example, patients with panic disorder have been shown to have an automatic memory bias for threatening words which relate to the thoughts of the patients (Amir, McNally, Riemann, & Clements, 1996; Cloitre et al., 1994). Similarly, according to Hartlage et al. (1993), the automatic processing biases in patients with depressive disorders should relate to the self-referent content of their negative automatic thoughts. Thus, the biases in automatic processing in depression and anxiety appear to be cognition-congruent biases since they are related to the thoughts of, not the general mood of, the individuals.

This discussion highlights the importance of the choice of word stimuli for studies of cognitive processes involved in anxiety and depression. It is important to differentiate between word stimuli which are congruent with a person’s general mood and words which are congruent with his or her thoughts in order to more accurately assess any MCM biases.

The positive-negative affect model (Watson & Tellegen, 1985) provides a way to assess memory biases for words which are directly related to the mood of anxious and/or depressed individuals. Words which are descriptive of low NA, high NA, low PA, and high PA are identified by the model while also ensuring that the NA and PA dimensions are
independent. Watson and Tellegen's model could therefore provide a structure with which to categorize many of the mood-based words related to these disorders. Therefore memory for words which are specifically related to anxious and depressed mood can be assessed rather than memory for words which are generally emotionally negative or positive. Using words derived from Watson and Tellegen's positive-negative affect model could help differentiate between specific "mood-congruent" and specific "cognition-congruent" word stimuli so that biases in cognitive processing of individuals with emotional disorders could be assessed more accurately.

Individuals with emotional disorders tend to interpret experiences in terms of their own personal meanings and lose the ability to view these events objectively (Beck, 1976). Beck referred to this narrow mode of interpretation as "self-reference". As noted earlier, Beck proposed that the cognitive content involved in anxiety and depressive disorders differs. An anxious patient may relate all experiences to danger, whereas a depressed patient would overinterpret events in terms of a negative viewpoint. These self-referent thoughts are important to assess when examining cognition-congruent biases. Thus, words which relate to anxiety and depressive disorders in terms of self-reference should be used to assess cognition-congruent biases in these disorders. As discussed above, mood-congruent effortful, but not automatic, memory bias may occur in depressed patients; in contrast, a cognition-congruent bias (i.e., related to the content of automatic self-referent thoughts), similar to that found in anxious patients, may be evident in their automatic processing.

Using cognitive methods such as tests of automatic and consciously-controlled memory, we could test these hypotheses regarding self-referent cognitions. The Automatic
Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980) includes statements such as "I'm worthless", "I'm a failure", and "Why can't I ever succeed?" These negative self-referent statements appear to be directly related to words that are often included in stimuli called "social threat words" in studies which use cognitive methods to test for biases in anxious and/or depressed participants. Words included in the category of social threat include: foolish, inept, stupid, failure, pathetic, inadequate (Mathews & MacLeod, 1985). Such word stimuli are often used to test hypotheses regarding memory or attentional biases in anxious patients (e.g., MacLeod et al., 1986; MacLeod & McLaughlin, 1995; Mathews & MacLeod, 1985; Mathews et al., 1989). However, a portion of these word stimuli are related to, and could tap into, negative self-referent automatic thoughts related to depression. In other words, an automatic memory bias for this subgroup of social threat word stimuli (i.e., negative self-referent (NSR) words) may relate to the cognitive processes of depressed individuals. These NSR words could therefore be used to assess cognition-congruent biases in the memory of depressed individuals.

This distinction between mood- and cognition-congruent word stimuli could indicate another reason why some studies which used depression-related words to assess cognitive processing in depression did not find MCM biases in tests of automatic memory. These studies may have used word stimuli which are congruent with a depressed individual's mood, not thoughts. For example, Watkins et al. (1992) found a conscious MCM bias for depression-related words but no automatic bias in a sample of clinically depressed participants. The "depression words" were defined as those which are "associated with unpleasantness and sad or depressed mood" (Watkins et al., p. 582). These investigators may
have found an automatic MCM bias if words which are associated with the thoughts, not mood, of depressed individuals were used. This possibility needs to be assessed further in future studies.

In sum, there may be many benefits to combining parts of two or more of these theories of anxiety and depression when assessing the similarities and differences in the cognitive processes of individuals with these emotional disorders. Combining the hypotheses and methods generated by these theories may prove helpful in strengthening the predictions related to cognitive processing in these emotional disorders. Using cognitive tasks which assess automatic and consciously-controlled processing, word stimuli such as NSR and physical threat words could be used to assess cognition-congruent biases in depressed and anxious participants, respectively; whereas NA and PA word stimuli could be used to assess conscious mood-congruent biases.

Further research is needed to clarify the conditions under which automatic MCM biases are found in depressed and anxious participants. Important variables include the word stimuli and specific implicit tasks (e.g., perceptual versus conceptual) used to assess these biases. We need to continue this line of research to determine whether an automatic memory bias contributes to the depressed individual’s negative view of her world, self, and future (Beck, 1976) as well as the anxious patient’s increased vigilance for threatening stimuli in the environment (Mathews, 1990).

Sex Differences in Mood Congruent Memory

Major depressive disorder is reported to be twice as common in women as in men (American Psychiatric Association, 1994; Pajer, 1995; Seeman, 1995). Seasonal affective
disorder has an even higher female to male ratio: 3.5 to 1 (Seeman, 1995). In addition to being more prone to depression than men, women also often take longer to recover from their depressive episode in absence of treatment (Dunn & Skuse, 1981; Pajer, 1995), tend to have more recurrent depressive episodes than men (Pajer, 1995; Seeman, 1995), and have an earlier age of onset than men (Pajer, 1995). In addition, women with depressive syndromes tend to internalize and blame themselves more than depressed men (Pajer, 1995). These data indicate that the cognitive processes of depressed men and women could differ. Specifically, the accessibility of mood congruent information may not be equivalent in male and female depressed patients.

Little work on sex differences in MCM biases has been done. Clark and Teasdale (1985) demonstrated differences in MCM between men and women in a study which involved mood induction in healthy volunteers. Female participants recalled more emotionally positive than negative words when in a happy mood, and more negative than positive words when in a depressed mood. In contrast, the male participants did not show this differential effect and recalled similar numbers of positive and negative words in both happy and unhappy moods. Thus, a MCM bias was only demonstrated in the female participants.

Similar results were found by Rothkopf and Blaney (1991). These investigators found that dysphoric female participants exhibited a MCM bias since these women reported more negative autobiographical thoughts and memories than nondysphoric females. The dysphoric male participants did not differ from the nondysphoric male participants in the number of positive or negative memories reported. The dysphoric men only displayed a
MCM bias if they had completed a depression questionnaire just prior to completing the memory task. Completing the depression questionnaire before the memory task also enhanced the MCM bias in the dysphoric women. The investigators interpreted these findings to indicate that completing a depression questionnaire increased the participants’ awareness of their current affective experience. The women appeared to not need this external focusing of their attention on their mood in order to demonstrate a MCM bias, whereas the men did. The results therefore revealed important differences in cognitive processing of men and women in depressed mood states.

The increased MCM biases found in women with depressed mood suggests that negative concepts are more accessible to these women when compared to men who are in a similar mood. These findings may help explain why women are more likely to become depressed than men and why they also take longer to recover (Dunn & Skuse, 1981; Pajer, 1995). However, since little research has been done in the area of sex differences in MCM biases, more studies need to be performed to further explore this phenomenon.

**Depression and Panic Disorder**

**Major Depressive Disorder**

Major depressive disorder is a mood disorder which is characterized by one or more major depressive episodes (American Psychiatric Association, 1994) which are at least two weeks in duration. DSM-IV criteria for a major depressive episode require that at least five symptoms are present during this two week time period, of which at least one of the symptoms is depressed mood or loss of interest or pleasure (i.e., anhedonia). Other symptoms include: weight loss, fatigue, insomnia or hypersomnia, difficulties in
concentration, feelings of worthlessness or guilt, and recurrent thoughts of death or suicide (American Psychiatric Association, 1994). A major depressive episode may be labelled "with atypical features" if the following features predominate during the most recent two weeks of the episode: (1) mood reactivity and (2) two or more of: weight gain or increase in appetite, hypersomnia, leaden paralysis, and/or long-standing rejection sensitivity (American Psychiatric Association, 1994).

The DSM-IV further specifies that major depressive disorder may have a seasonal pattern, usually beginning in the fall or winter and remitting in the spring, and thus distinguishes between major depressive disorder with and without a seasonal pattern. The seasonal pattern specifier is applied to major depressive disorder if (1) there is a regular temporal relationship between the onset of the disorder and a time of year; (2) remissions also occur at a particular time of year; (3) two major depressive episodes linked to the time of year have occurred in the past two years; and (4) these seasonal major depressive episodes outnumber any nonseasonal major depressive episodes throughout the person's lifetime (American Psychiatric Association, 1994). Major depressive disorder with a seasonal pattern is often characterised by atypical symptoms such as increased appetite, overeating, carbohydrate craving, (Kasper & Rosenthal, 1989; Rosenthal et al., 1984; Tam, Lam, Robertson, Stewart, Yatham, & Zis, 1997; Thalén, Kjellman, Mørkrid, & Wetterberg, 1995) and hypersomnia (Kasper & Rosenthal, 1989; Rosenthal et al., 1984; Tam et al., 1997).

Panic Disorder

One specific example of an anxiety disorder is panic disorder. Panic disorder is marked by recurrent unexpected panic attacks where at least one of the attacks has been
followed by one month or more of persistent concern about having another attack, worry about the implications or consequences of the attack, and/or a significant change in behavior related to the attacks (American Psychiatric Association, 1994). A panic attack can be described as a sudden burst of emotion which includes somatic symptoms, such as palpitations or dizziness, and feeling of dying or losing control (Barlow, 1988).

Klein (1964) argued that panic disorder is qualitatively different than generalized chronic anxiety because of the response of these disorders to treatment. Imipramine appeared to successfully treat the patients who were experiencing panic attacks but had little effect on more chronic anticipatory anxiety (Klein, 1964). However, determining the nature of a disorder from its treatment (pharmacological dissection) is a weak experimental approach (Barlow, 1988). In addition to this weakness, later researchers have found that imipramine does appear to have a general anxiolytic effect in the absence of panic attacks (see Mavissakalian, 1990 for review). Presently, experimental evidence for considering panic disorder as qualitatively different from generalized anxiety disorder is mixed (see Barlow, 1988 for review) and no definitive conclusions can be made.

As described earlier, there is substantial comorbidity of panic disorder and major depressive disorder. Patients suffering from combined panic disorder and major depression tend to be more severely impaired than patients with uncomplicated panic disorder or major depression (Lydiard, 1991), especially when the patients have experienced recurrent major depressive episodes (Maddock et al., 1993). Generally, regardless of the type of treatment, if the panic disorder improves, it is likely that the depressive symptoms will also improve (Lesser, 1990).
In a longitudinal study, the majority of participants suffering from panic disorder developed a syndrome of mixed anxiety-depression or of pure depression seven to nine years later (Angst, Vollrath, Merikangas, & Ernst, 1990; Angst & Vollrath, 1991). This same study found that only a small number of subjects who were initially diagnosed with depressive disorder later developed pure anxiety disorders or mixed anxiety-depressive conditions. Participants originally diagnosed with pure depression tended to have a better outcome at follow-up than those suffering from anxiety disorders, although those with a mixed diagnosis of anxiety and depressive disorders generally have a poorer outcome than those with pure diagnoses.

This difference in course and outcome of panic disorder and depressive disorders further supports the qualitative difference between these disorders. These findings also stress the need to determine why anxiety and depression appear so different in several aspects even though there is great overlap of symptomatology and self-report scales.

Because of the substantial overlap between panic disorder and major depression, it would be interesting to compare the cognitive processes of individuals with these disorders. This could help clarify the role of cognition in the similarities and differences in the symptoms and course of these disorders.

**The Process Dissociation Procedure**

In order to assess cognition in these emotional disorders, we need to use a method which will allow us to examine conceptual conscious and automatic cognitive processes. Implicit memory tests may not be pure tests of the automatic aspects of memory since one cannot be completely confident that conscious influences did not contaminate the measures.
In addition, tests involving cued recall tend to overestimate the probability of consciously-controlled recollection since informed guessing as well as recollection could result in making the correct response (Jacoby, Toth, & Yonelinas, 1993). Finally, shared memory processes which operate in implicit and explicit memory tasks cannot be specified since the tasks are assumed to be dissociable (Wagner, Gabrieli, & Verfaellie, 1997).

Recently developed methods are now available to test automatic and consciously controlled memory which do not involve the drawbacks of the implicit/explicit paradigm. For example, Amir et al. (1996) used a white noise paradigm to tap conceptual automatic processes in panic disorder patients. This task reveals an automatic memory for words or sentences when a lower rating of accompanying background noise is reported. The study phase of the white noise task in Amir et al. (1996) involved the auditory presentation of sentences with varying content which the participants said aloud. During the test phase, these sentences were presented intermixed with a new set of sentences (which had not been heard earlier) against a background of white noise. Participants had to repeat these sentences and judge the loudness of the background noise. Generally, the noise accompanying sentences which have been presented during the study phase has been found to be rated as less loud than noise accompanying sentences which have not been presented earlier. Implicit memory for previously presented sentences increases the clarity of these sentences and thus makes them appear to sound louder than sentences that were not remembered by the participant; that is, the contrast of the sentence and the background noise is greater due to implicit memory. Thus, an implicit memory for sentences presented in the study phase can be demonstrated by the lower judgement of background noise due to the greater subjective loudness of the
sentences. Through this method, an automatic bias for threat-related sentences was revealed in panic disorder patients. This novel paradigm avoided the problems associated with traditional implicit memory tests.

In a discussion of cognitive biases in panic disorder, McNally (1994) suggested that the process dissociation procedure (PDP, Jacoby, 1991) would be an excellent framework to apply to the study of automatic and consciously-controlled processes in the anxiety disorders. The PDP is another method that circumvents the limitations of implicit and explicit memory tasks. The PDP can be used to assess both automatic and conscious memory biases by separating "the contributions of automatic and intentional processing to performance of a task" (Jacoby, 1991; p. 537). This procedure avoids the limitations of other cognitive tasks which assume that tasks are process pure. The PDP directly measures the contributions of conscious and automatic aspects of memory within a task and allows one to calculate the contributions of these processes across tasks (Wagner et al., 1997).

Two test conditions are used in the PDP in which test cues are held constant but instructions differ. These tests are called "inclusion" and "exclusion" tests. In the inclusion test, participants are instructed, for example, to respond to test cues with a previously presented word, or if they cannot remember the word, they are asked to write down the first word that comes to mind. The "exclusion" test consists of the same test cues, but the participants are asked to respond with a word that has not been presented previously in the study phase of the experiment. In the inclusion test, automatic and conscious processes work in concert, but in the exclusion test, these processes work against each other. Thus, conscious recollection is the difference in performance when an individual is trying to in
contrast with *trying not to use* past experience to remember a word (Jacoby et al., 1993). In contrast, "automatic influences of memory are unintentional in that they remain the same regardless of whether those influences facilitate or interfere with performance of a task" (Jacoby, 1991: p. 532). If the individual is as likely to recollect a word when he or she is trying not to as when trying to, then he or she obviously has no control and has recollected the word through automatic processes.

A PDP procedure which involves presenting two word lists in the study phase of the experiment is known as the list discrimination paradigm (Yonelinas & Jacoby, 1996) or the two-study-list procedure (Gruppuso, Lindsay, & Kelley, 1997). In this list discrimination paradigm, participants study two different lists of words during the encoding portion of the experiment. The two lists of words are differentiated such that the participants can discriminate between the lists. For example, one list (List 1) may be presented visually, and the other list (List 2) may involve an auditory presentation. During the test phase, the participants are presented with a list of items which contains words from both lists (List 1 and List 2) randomly intermixed with words that were not presented (i.e., distractor items.) In this paradigm, the inclusion task requires participants to indicate items which had been on either studied list (List 1 or List 2). During the exclusion task, participants are asked to exclude items from List 1 and only respond positively to items from List 2. If participants recognize a word as old (i.e., presented during encoding) but mistakenly classify a List 1 word as a List 2 word, then the exclusion score will rise indicating familiarity but not recollection. Thus, participants will only mistakenly respond positively to words from List 1 if the words are familiar but not recollected (Gruppuso et al., 1997).
The list discrimination paradigm of the PDP defines recollection in terms of the participants’ ability to use the memory of some criterial feature, such as the source of an item or context in which an item was presented (e.g., visual versus auditory presentation), as the basis for their response (Yonelinas & Jacoby, 1996). Only criterial recollection will be measured as conscious recollection. In contrast, automatic aspects of memory may include not only recognition judgements based on feelings of familiarity, but also recollection of information that is noncriterial for the task being performed. Conscious recollection involves the retrieval and use of memory information to accomplish the task at hand (i.e., correctly identifying the test item); whereas, automatic memory processes involve the retrieval of other information which gives rise to feelings of recognition without allowing the individual to successfully accomplish the task (Gruppuso et al., 1997). Automatic and consciously-controlled memory in the PDP have sometimes been called nondiagnostic (i.e., non-source-specifying) and diagnostic recollection (i.e., source-specifying), respectively, to reflect the importance of source discrimination in the memory processes involved in the inclusion and exclusion tasks (Mulligan & Hirshman, 1997).

An important assumption of the PDP is that automatic and consciously-controlled memory processes are independent (Jacoby, 1991). Factors (e.g., divided attention) have been identified that influence one memory process but leave the other process unaffected (Jacoby et al., 1993). Because of this independence assumption, the basic premises of the PDP can be translated into simple mathematical equations (Jacoby et al., 1993). The probability of completing a word stem with a previously studied word in the inclusion test is the probability of the word being consciously recollected (R) plus the probability of the word
automatically coming to mind (A) when consciously controlled memory fails (1 - R):

\[ \text{Inclusion} = R + A(1 - R) \]

The probability of incorrectly completing a word stem with a studied word in the exclusion test is the probability of this word automatically coming to mind when the person fails to consciously remember that this word has been previously studied: \( \text{Exclusion} = A(1 - R) \).

Combining these two equations allows us to calculate the conscious (R) and automatic (A) influences of memory, such that: \( R = \text{Inclusion} - \text{Exclusion} \) and \( A = \frac{\text{Exclusion}}{(1 - R)} \).

This equation for the automatic influences of memory includes the probability that a word will automatically come to mind plus the baseline (B) probability of completing a word stem with a particular word simply by chance. Thus, the automatic influences of memory are: \( A' = A - B \).

**Applications of the PDP to the Study of Mood and Memory**

Although there have been many studies of mood and memory using implicit/explicit paradigms, little work has been done in this area with the newer PDP paradigm. Robinson-Riegler and Winton (1996) recently used the PDP to study the roles of automatic and consciously controlled memory processes in the recognition of emotional words. This study revealed that recognition of affectively positive words involves less conscious recollection (R) than recognition of negative words. However, this research was performed with healthy participants and did not examine any mood-congruent biases.

Hertel and Milan (1994) applied the PDP to the examination of automatic and consciously-controlled aspects of memory in dysphoric and nondysphoric students. The investigators found no evidence for mood-congruent biases in automatic or consciously controlled memory of the dysphoric participants when compared to the non-dysphoric
students. However, the dysphoric participants recollected significantly fewer words (lower overall R) than the non-dysphoric participants. There was no difference between the groups in terms of automatic memory. This lack of finding of an automatic MCM bias in depressed individuals is important since Hertel and Milan used a conceptual test of automatic memory. As noted earlier, an automatic bias in depression would be expected in meaning-based automatic memory tasks.

The Hertel and Milan (1994) study was an interesting application of the PDP paradigm to the area of mood and memory. Unfortunately, this study included several limitations. First, the word stimuli were not equated in terms of emotionality. Thus, any differences in memory for the word categories could have been due to emotionality rather than word type. Second, the presentation rate used in the auditory encoding task was 1.5 seconds. The very brief presentation time really did not allow participants to do anything. This is a very short pause between words which would make it difficult for the participants to remember words in this encoding session. Third, the participants were given instructions to "judge the degree of semantic relatedness" (p.738, Hertel & Milan, 1994) of word pairs during the visual encoding task. However, during the auditory encoding session, the participants were merely told to "listen carefully" to the list of words "in anticipation of a later memory test" (p.738, Hertel & Milan, 1994). No specific task instructions were assigned during the auditory encoding session so we cannot be sure what the participants were doing in order to remember the words. It is not possible to know whether the participants were paying attention to the semantic or the perceptual qualities of the words. Fourth, the investigators admit that the task instructions were difficult to understand. Nine
participants of the final sample of 64 participants (i.e., 14%) misunderstood the task instructions for the inclusion and exclusion tests. Thus, it appears that the instructions were too confusing for even university students who are not impaired by clinical depression. Fifth, there was little separation between dysphoric and non-dysphoric participants on BDI. Students with BDI scores greater than 9 were labelled "dysphoric", and participants with BDI scores less than or equal to 7 were called "non-dysphoric". It is possible that the results of this study would have been different if there had been a greater difference between the groups in terms of level of depressive symptoms. These weaknesses may limit the validity and reliability of the study findings.

In addition to these criticisms, no one has yet used the PDP to assess these processes in clinically diagnosed patients, nor in anxious participants. Thus, much research still needs to be done to assess memory biases and performance in anxious and depressed individuals using the PDP.

Summary of General Predictions

From the combination of the theories and research related to cognitive processes in anxiety and depression discussed above, several hypotheses can be developed. Generally we can conclude the following:

Individuals suffering from anxiety disorders appear to have automatic thoughts which are threat-related in content, although they have no specific bias in effortful processing. Thus, they are quickly and automatically alerted to potentially dangerous cues in the environment. In contrast, both the automatic and effortful, conscious cognitive resources of depressed patients are allocated to processing types of negative information. Thus, they are
constantly biased toward processing negative information.

Patients with anxiety disorders would therefore be expected to have no consciously-controlled processing biases. However, they should demonstrate biases in automatic processing. Each specific type of anxiety disorder will involve biases for disorder-relevant threatening stimuli. For example, panic disorder appears to be associated with catastrophic misinterpretations of bodily symptoms (Clark, 1986). Thus, stimuli related to internal body sensations (i.e., physical threat-related stimuli) would be disorder-relevant for patients with panic disorder. Thus, individuals with panic disorder would be expected to have automatic cognition-congruent biases for physical threat word stimuli. After successful treatment for panic disorder, these individuals should no longer demonstrate a bias for physical threat stimuli (since these stimuli would no longer be threatening.)

Depressed patients should demonstrate both consciously-controlled and automatic biases for negative stimuli when they are suffering from the disorder. The conscious biases would be for mood-congruent stimuli. The automatic negative biases would be directly related to the content of their negative automatic thoughts and would thus be cognition-congruent biases (i.e., for negative self-referent information). After successful treatment for the depressive episode, these patients should no longer demonstrate mood-congruent biases (since they are no longer experiencing depressed mood), but should still show cognition-congruent negative biases in automatic processing since this is related to their automatic negative thoughts which operate even when they are not in a depressed mood. However, if this automatic bias for negative self-relevant information were altered, for example by cognitive behavioral treatment, the treated individual should no longer have an increased
vulnerability to developing these disorders.

Finally, the positive-negative affect and tripartite models predict that anxious patients will demonstrate high levels of NA with varying levels of PA. In contrast, depressed patients should have high levels of NA combined with low levels of PA. Thus, these groups of patients should be differentiable on questionnaires which assess NA and PA, as well as differ in their biases in cognitive processing.

**Dissertation Studies**

This thesis aimed to examine these predictions related specifically to panic disorder and major depressive disorder. In addition to studying the cognitive processes of clinically diagnosed patients, undergraduate students with a range of anxiety and depression levels were also examined. As mentioned earlier, several studies have used university students to assess differences between mildly depressed and nondepressed subjects or high versus low trait anxiety subjects. Although the results were not always identical to those obtained with patient populations, differences were often found between the high and low trait anxiety and high and low depression level groups. Richards and Millwood (1989) conclude that these positive results confirm the usefulness of carrying out such research with nonclinical groups.

Unfortunately, it is difficult to find a large population of nonclinical panickers to use as a group that would be analogous to panic disorder patients. However, as discussed earlier, anxiety sensitivity, the fear of anxiety symptoms, appears to be a cognitive risk factor for the development of spontaneous panic attacks and possibly panic disorder (Maller & Reiss, 1992; Reiss & McNally, 1985; Schmidt et al., 1997). In addition, measures of anxiety sensitivity appear to be higher in patients with panic disorder when compared to healthy
controls and patients with other anxiety disorders (Taylor, 1995; Taylor, Koch, & Crockett, 1991). Thus, anxiety sensitivity is an important measure to examine in the nonclinical population of participants so this data can be compared to that of panic disorder patients. To this end, students with high levels of fear of anxiety symptoms, as measured on the Anxiety Sensitivity Index (ASI; Peterson & Reiss, 1993), were compared to those with low scores on the ASI.

Similarly, students with high levels on the Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) were compared to those with low scores on the BDI. The data from this study enabled us to examine the effects of high versus low depression levels in a nonclinical group of participants.

Thus, mood-congruent and cognition-congruent biases were examined using the PDP paradigm. Automatic and consciously-controlled biases were assessed in (1) students with high (HAS) versus low (LAS) ASI scores; (2) students with high (HBD) versus low (LBD) BDI scores; (3) patients with major depressive disorder; and (4) a portion of the depressed patients after treatment for the disorder. We were unfortunately not able to recruit any patients with panic disorder to participate in this study; therefore, this group of patients was not tested using this paradigm.

**Specific Hypotheses**

The following specific hypotheses were developed out of the general predictions discussed above. Each hypothesis will be discussed in more detail in the introduction of each study.

1. Anxious participants should have high levels of NA with varying levels of PA. In contrast, depressed participants should have high levels of NA combined with low levels of
PA. Thus, HAS participants should demonstrate higher levels of NA than the LAS participants, but there should be no difference between these groups in terms of PA levels. The HBD participants should show both higher levels of NA and lower levels of PA than the LBD participants. Similarly, the patients with major depressive disorder should have higher levels of NA and lower levels of PA than the healthy control participants.

2. HAS participants would be expected to have an automatic bias for physical threat words when compared to LAS participants. No conscious MCM biases were expected in the HAS group.

3. HBD participants should demonstrate a higher conscious recollection for high NA words and a lower conscious recollection of high PA words than the LBD participants. No biases in automatic memory of the HBD participants were expected.

4. Before treatment, the patients with major depressive disorder should show a higher conscious recollection for high NA words and a lower conscious recollection of high PA words than the healthy control participants. In addition, they would be expected to demonstrate an automatic memory bias for negative self-relevant words when compared to the controls.

5. After treatment with antidepressant medication, those patients who responded to the treatment should no longer demonstrate any conscious memory biases since their mood would have returned to normal. However, they would still be expected to have an automatic memory bias for negative self-relevant words since medication should not directly modify cognitive structures involved in automatic processing of affective information. In contrast, there should be no changes in the conscious or automatic memory biases of those patients
who do not respond to treatment.

6. Female participants (both clinical and non-clinical) should have stronger MCM biases than the male participants. Therefore, the (clinically and non-clinically) depressed females should demonstrate a higher conscious memory for negative word stimuli than the depressed males. Similarly, the non-depressed females should show a higher conscious memory for positive words than the non-depressed male participants.
Study 1: Automatic and Consciously-Controlled Memory Biases in Students with High versus Low Anxiety Sensitivity

LAS versus HAS Participants

The first study involved a test of automatic and consciously-controlled memory in a population of undergraduate students. Automatic and conscious memory biases for mood-congruent and cognition-congruent word stimuli were examined using the PDP (Jacoby, 1991). For the inclusion test, participants were instructed to identify words which were presented either visually or auditorily. The exclusion test consisted of a similar task, but participants were asked to identify only words which had been presented auditorily. Results from the exclusion and inclusion tests were used to assess automatic and consciously-controlled biases by applying the mathematical equations taken from Jacoby et al. (1993) as discussed earlier.

Evidence suggests that the ASI and the trait version of the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) are correlated (Taylor et al., 1991) and that anxiety sensitivity may be a subfactor of trait anxiety (Taylor, 1995). It was therefore predicted that HAS participants (females scoring 30 or above and males scoring 23 or above) would report higher overall anxiety levels as measured on the STAI - trait than LAS participants (females scoring 10 or below and males scoring 7 or below). Anxiety is predicted to involve a state of high NA; thus, the HAS group should have a higher mean NA score than the LAS group. However, since PA is related to symptoms of depression, not anxiety, there should be no difference in PA scores on the PANAS-X
between the HAS and LAS groups.

The general hypotheses state that there should be no biases in conscious, effortful processing in anxious individuals. Unlike individuals with high depression levels, HAS participants should display no deficit in conscious memory (R) of high PA words when compared to LAS participants. In addition, since anxiety sensitivity is proposed to be a cognitive risk factor for the development of panic disorder (Maller & Reiss, 1992; Reiss & McNally, 1985), HAS participants should have higher automatic memory (A') for physical threat words than LAS participants.

**Methods**

**Participants**

Students were recruited from undergraduate psychology classes. All participants were required to speak English as their native language. Potential participants were screened with the ASI (Peterson & Reiss, 1993) before participating. Female subjects who scored 30 or above (HAS), or 10 or below (LAS), on the ASI and males who scored 23 or above (HAS), or 7 or below (LAS), on the ASI were invited to participate in the study (Holloway & McNally, 1987; Reiss, Peterson, Gursky, & McNally, 1986). Only those students who also scored within these limits when they returned to participate in the study were included in the results. Data of participants who reported a present diagnosis of an anxiety or depressive disorder were excluded from the analyses.

A total of 93 students were screened with the ASI and participated in this study. During participation in the study, 27 of these students met the criteria for the LAS group; 36 met the criteria for the HAS group; and 36 participants did not meet the criteria for either
HAS or LAS groups. The data from 6 students who did meet the ASI criteria were not included in the analyses: 2 participants did not speak English as their native language (1 LAS participant and 1 HAS participant); and 4 participants reported present diagnoses of anxiety and/or depressive disorders (4 HAS participants).

An additional group of participants were not screened initially with the ASI but met the requirements during the test session when participating for inclusion in Study 2. This included 2 students who met the criteria for LAS and 1 student who met the criteria for HAS. In addition, several students who participated in Study 3 but did not meet the criteria for inclusion of their data in that study did meet the inclusion criteria for Study 1. This group of participants included 7 students who met the criteria for HAS.

Several of the participants included in Study 1 also met the criteria for Study 2. Thus, there was overlap in the participants included in these studies (see Table 2.1). Twenty five HAS students and three LAS students also met the criteria for high BDI (HBD). One HAS student and 20 LAS students also met the criteria for low BDI (LBD). Thirteen HAS students and five LAS students did not meet criteria for Study 2. Thus, the data of 18 participants were included in Study 1 and not in Study 2.
Table 2.1. Overlap between Study 1 and Study 2 participants

<table>
<thead>
<tr>
<th>ASI</th>
<th>BDI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High (HAS)</strong></td>
<td><strong>High (HBD)</strong></td>
</tr>
<tr>
<td>High (HAS)</td>
<td>25</td>
</tr>
<tr>
<td>Low (LAS)</td>
<td>3</td>
</tr>
<tr>
<td>[Neither]</td>
<td>(14)</td>
</tr>
</tbody>
</table>

The final sample of participants in Study 1 included 67 participants: 28 LAS students (3 males and 25 females) and 39 HAS students (15 males and 24 females). Participation was voluntary and no payment was given to the subjects. The participants were given one credit toward their undergraduate psychology course for participating. Each subject signed a consent form before beginning the experiment.

Materials

Words: Word stimuli consisted of high PA (HPA; e.g., DELIGHTED, FORGIVING, TRUSTING), high NA (HNA; e.g., TENSE, DISGUSTED, SUSPICIOUS), physical threat (PT; e.g., DISEASED, HURT, MUTILATED), negative self-referent (NSR; e.g., DESPISED, WORTHLESS, HATED), categorized neutral (CN; e.g., CASUAL, INFORMAL, SELECTIVE), and uncategorized neutral (UN; e.g., ABSTRACT, GRADUAL, MODERATE) adjectives and descriptive words. The complete word list is presented in Appendix A.

The HNA and HPA words were taken from Watson and Tellegen (1985). The PT words were derived from the following studies: Hope, Rapee, Heimberg, & Dombeck (1990); MacLeod et al. (1986); Mathews et al. (1989); Rappe (1994); and Richards & French (1991).
The NSR words were taken from the studies of: Hope et al. (1990); MacLeod & McLaughlin (1995); MacLeod et al. (1986); and Mathews et al. (1989). The CN words were selected by the experimenter from the list of "neutral terms designating possible personality traits" from Allport and Odbert's (1936) study of trait names. The UN words were chosen by the experimenter from Webster's New Collegiate Dictionary (Woolf (Ed.), 1977).

Low PA and low NA words were not be used since there are many more descriptors of HPA and HNA, and HPA words seem to be purer markers of the underlying mood factor (Watson et al., 1988; Watson & Kendall, 1989a). Thus, memory for low PA and low NA adjectives can be inferred from the absence of remembering HPA and HNA adjectives, respectively.

Each word was rated for emotionality by ten judges (4 males, 6 females). The judges were students in an undergraduate psychology course. Their participation in the judging of words was voluntary. The judges signed declarations of informed consent and received one credit toward their undergraduate psychology course for their participation. The judges were instructed to rate the list of words for emotional tone using a seven point scale. The scale ranged from -3 (highly negative in emotional tone) to +3 (highly positive in emotional tone). A rating of 0 meant that the word was neutral in emotional tone. If they did not know the meaning of a word, they were instructed to put a question mark next to the word instead of a number.

From this original list of words, a final word list was composed (see Appendix A). The word list consisted of equal numbers of words from each of the word groups (i.e., HPA, HNA, PT, NSR, CN, UN) with the following constraints: Each word group was statistically
analysed so that there were no statistically significant differences among the word groups (i.e., HPA, HNA, PT, NSR, CN, UN) in terms of word length or word frequency. (All analyses were performed using a significance level of p < .1.) The emotional word groups (i.e., HPA, HNA, PT, NSR) did not differ significantly in terms of the absolute value of the mean emotionality ratings (as rated by the judges). There was also no significant difference in the mean judge emotionality rating of the neutral word groups (i.e., CN, UN). There was, however, a significant difference in the mean absolute value of the emotionality ratings of the emotional word groups (i.e., HPA, HNA, PT, NSR) when compared to the neutral word groups (i.e., CN, UN), p < .001. The mean emotionality ratings, word length, and word frequency (plus standard deviations) for each word group are presented in Table 2.2.

**Table 2.2.** Means (plus standard deviations) for all groups of words

<table>
<thead>
<tr>
<th>Word Category</th>
<th>Emotionality Rating</th>
<th>Word Length</th>
<th>Word Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPA</td>
<td>2.0 (.3)</td>
<td>8.1 (2.2)</td>
<td>15.1 (14.9)</td>
</tr>
<tr>
<td>HNA</td>
<td>-1.7 (.4)</td>
<td>7.5 (1.7)</td>
<td>10.6 (13.0)</td>
</tr>
<tr>
<td>PT</td>
<td>-1.9 (.7)</td>
<td>7.0 (2.1)</td>
<td>10.25 (12.1)</td>
</tr>
<tr>
<td>NSR</td>
<td>-2.0 (.5)</td>
<td>8.1 (1.9)</td>
<td>8.8 (8.5)</td>
</tr>
<tr>
<td>CN</td>
<td>.2 (.7)</td>
<td>8.3 (1.9)</td>
<td>14.3 (13.2)</td>
</tr>
<tr>
<td>UN</td>
<td>.2 (.6)</td>
<td>8.3 (1.43)</td>
<td>16.6 (9.9)</td>
</tr>
</tbody>
</table>

Three neutral buffer words were presented at the beginning and end of both the auditory and visual word lists to reduce primacy and recency effects. These words were taken from the original list of neutral (CN and UN) words that were rated by the judges. These buffer words had a mean emotionality rating of .4 (range: 0 - .8).

The final word list consisted of 24 words from each word type (i.e., HPA, HNA, PT,
NSR, CN, UN) for a total of 144 words (not including the 12 buffer words). Three sets (A, B, and C) of words were compiled (see Appendix B). Each set was comprised of 8 words from each of the six word types. The three sets were matched for word length, frequency and emotionality. Thus, there were three parallel sets of words (A, B, and C), each set containing 8 HPA, 8 HNA, 8 PT, 8 NSR, 8 CN, and 8 UN descriptive words. The lists of words were presented visually, auditorily, or not presented. The words lists (i.e., A, B, and C) were randomly assigned to each of these conditions for each participant.

**Memory Tests:** Two versions of the memory tests were prepared using the three parallel sets of words (see Appendix G). Both of these tests included words from each of the word lists (i.e., A, B, and C). One sheet (version 1) for the memory test contained half of the words from each list, and the other sheet (version 2) contained the other half of these words. Version 1 and version 2 were equated for word length, frequency, and emotionality. The words were presented in random order on both sheets, except that no more than two of any word type was presented consecutively. The two sheets were used for the exclusion and inclusion memory tests. Subjects randomly received one of the versions (e.g., version 1) for the inclusion test and the other version (e.g., version 2) for the exclusion test.

**Questionnaires:** Subjects completed the BDI (Beck et al., 1961), the state and trait versions of the STAI (Spielberger et al., 1983), the ASI (Peterson & Reiss, 1993), the Positive and Negative Affect Schedule-Expanded Form (PANAS-X; Watson & Clark, 1990), a short form of the Neuroticism scale of the NEO Five-Factor Inventory (NEO short form; Costa & McCrae, 1992), and a demographic information sheet (see Appendix C). The BDI was used to assess the level of depression in this non-clinical sample. The STAI measures
state and trait anxiety levels, while the ASI assesses whether one believes that the experience of anxiety has harmful consequences. The PANAS-X assessed what positive and negative feelings and emotions (i.e., PA and NA) the person was experiencing at that moment. The Neuroticism scale assessed the level of neuroticism of the subjects (e.g., amount the subject worries.) The demographic information sheet included general questions about age, years of education, native language spoken, and past history of depressive and/or anxiety disorders to assess possible vulnerability factors and their effects on automatic and effortful processes.

Procedure

Participants were tested individually in the laboratory after reading and signing a declaration of informed consent. Each person first participated in the memory portion of the study before completing the questionnaires. See Appendix D for the complete instructions as read to all participants.

The 54 word stimuli for the visual presentation portion of the study phase were presented on an IBM-compatible 486 microcomputer. Each stimulus word appeared one at a time in capital letters in the center of the screen. The stimulus word remained on the screen for 7 seconds. The next word appeared 1 second later. Each participant was first presented with a series of words comprising the 48 items of one of the word sets (i.e., A, B or C) plus 6 buffer words (3 at the beginning and 3 at the end of the presentation). Words were presented in a new random order for each subject, but no more than two consecutive items were of the same word type. Participants were asked to say each word aloud and rate the emotionality of the word on a seven-point scale. The participants were instructed to rate the emotionality according to the meaning of the word. They were informed that there were no right or wrong
answers in this task. Participants were instructed to record their emotionality ratings on a sheet of paper containing numbered spaces for this task (see Appendix E for Visual Rating Sheet.) Before viewing the words for the study, participants were shown four example words (WOODEN, UGLY, PEACEFUL, TRIANGULAR) to say aloud and rate for emotionality. These examples were used as a check to ensure that the participants understood the instructions. If the emotionality ratings were unexpected (e.g., a rating of -3 for PEACEFUL), the experimenter asked why the word had been rated this way and repeated the instructions if necessary. Before the actual words for the study were presented, participants were reminded that their memory for these words would be tested later in the session.

Words were presented on an audiotape recorder during the second part of the study phase. Each stimulus word was presented on the tape recorder at a rate of one word every 6 seconds. Two versions of each word list (i.e., A, B, and C) were made using the same voice. Words were presented in random order with no more than two of the same word type presented consecutively. Each participant listened to one of the versions of the tape which consisted of a series of 48 words from one of the word sets (i.e., A, B or C) plus 6 buffer words (3 at the beginning and 3 at the end of the presentation). Participants were asked to rate the emotionality of each word on a seven-point scale. They recorded their emotionality ratings on a paper identical to that used in the visual encoding task (see Appendix F for Auditory Rating Sheet.) Again, the participants were told that their memory for these words would be tested later in the study.

Following the study phase, participants performed a brief distraction task. They were asked to count backwards from 400 by two's for 2 minutes. Participants then performed the
inclusion and exclusion tests (in a randomized order for each participant.)

Both the inclusion and the exclusion tests included half of the words presented during the visual encoding condition, half of the words presented during the auditory encoding condition and half of the unseen words. The two tests included an equivalent, but different, set of 72 words. Before both memory tests, the experimenter explained that the list of words included some words which were presented on the computer, some which were presented on the tape recorder, and some that they had not seen or heard during the experiment. The participants were also told that these words were all mixed up on the list.

For the inclusion test, participants were told to put a checkmark next to the words that they thought were presented either on the computer or on the tape recorder. If they thought the word was one that was not presented during the experiment, then they were told to put an "X" next to the word. The instructions were repeated until the participants understood the task. Participants were instructed to complete the task in the order in which the words were listed. They were given a blank sheet of paper to cover the test sheet so that they only looked at one word at a time. The participants were told to move the paper down only after making a mark next to the word that was exposed.

For the exclusion test, participants were told to put a checkmark only next to the words that they thought were presented on the tape recorder. If they thought the word was one that was presented on the computer or one that was not presented during the experiment, then they were told to put an "X" next to the word. Again, the instructions were repeated until the participants understood the task. Participants were instructed to complete the task in the order in which the words were listed. Again, they were given a blank sheet of paper to
cover the test sheet so that they only looked at one word at a time. The participants were told to move the paper down only after making a mark next to the word that was exposed.

After completion of the memory tests, the questionnaires were administered. Before the participants were given the questionnaires, they were reminded that the information collected in this study would remain confidential. At the end of the session, all participants were fully debriefed.

Results from the exclusion and inclusion tests were used to assess automatic and consciously-controlled biases by applying the mathematical equations taken from Jacoby et al. (1993):

1. Inclusion = R + A(1 - R)
2. Exclusion = A(1 - R)
3. R = Inclusion - Exclusion
4. A = [Exclusion/(1 - R)]
5. A' = A - B

Where R = the probability of recollection of a studied word; A = the probability of the word automatically coming to mind; A' = automatic influences of memory; and B = baseline probability of putting a checkmark next to a critical word that has not been previously studied.

The same general methodology was used for all studies. The methods will not be repeated, but any exceptions will be noted in the description of each individual study.

Results and Discussion

A significance level of .05 was used for these and all subsequent analyses.
Preliminary Analyses

Characteristics. Analyses revealed that the HAS and LAS groups did not differ significantly in terms of age, \( t(65) = .21 \); marital status, \( t(65) = 1.10 \); or level of education, \( t(65) = .14 \). These analyses indicated that the two groups were comparable in terms of demographic characteristics.

Questionnaires. T-tests were performed to compare the two groups on the ASI, BDI, STAI (state and trait), and the NEO short form. The HAS group scored significantly higher than the LAS group on the ASI, \( t(65) = 22.74, p < .001 \); BDI, \( t(65) = 7.37, p < .001 \); STAI - state, \( t(65) = 6.02, p < .001 \); STAI - trait, \( t(65) = 9.11, p < .001 \); and NEO short form, \( t(63) = 8.39, p < .001 \). Note that, as predicted, the STAI - trait scores of the HAS group were significantly higher than the scores of the LAS group. See Table 10.1 in Appendix H for summary of questionnaire scores for LAS and HAS participants.

Primary Analyses

Comparison of PANAS-X scores. As predicted, the mean NA score on the PANAS-X of the HAS group was significantly higher than that of the LAS group, \( t(65) = 3.20, p < .002 \). Contrary to the predicted outcome, there was a significant difference in the PA score on the PANAS-X between the HAS and LAS groups, \( t(65) = 3.03, p < .004 \), with the HAS group reporting lower PA scores than the LAS group.

The difference in PA scores on the PANAS-X was not predicted; however, it is important to note that there was a significant difference between the HAS and LAS groups on the BDI. This difference in level of depressed mood as measured by the BDI may have led to this difference in PA scores.
Estimates of Conscious and Automatic Recollection. The proportions of words checked under the inclusion and exclusion instructions were converted to estimates of R and A' using the equations in Jacoby et al. (1993). These estimates were separately analysed using ASI score (HAS vs low LAS) as a between-subjects factor and word category (HPA, HNA, PT, NSR, CN, and UN) as a within-subjects factor. See Table 10.5 in Appendix J for inclusion, exclusion, R, A and A' means for the LAS and HAS groups.

R results: The interaction between ASI group (HAS vs LAS) and R for the word categories was statistically significant, F(5, 325) = 2.73, p < .02. The graph of the interaction shows that the high ASI group had greater R values for HPA, PT, CN, and UN words but slightly lower R values for HNA and NSR words compared to the LAS group (see Figure 2.1). As predicted, a planned comparison revealed that the difference between the HAS group and the LAS group in R for HPA words was not significant, F(1,65) = 3.41. However, post hoc comparisons using the Least Significant Difference (LSD) Test revealed a significant difference in the R for CN words at the p < .003 level.

A' Results: An analysis of variance revealed no significant effects. Contrary to the prediction, a planned comparison revealed no significant difference between the HAS group and the LAS group in A' for PT words, F(1,65) = .15.

Mixed HAS/HBD Group Versus HAS Only Group

Because there was a significant difference in terms of BDI scores as well as ASI scores when the HAS and LAS groups were compared, one cannot be sure that any differences between the groups were due to differences in anxiety sensitivity. Alternatively,
Figure 2.1 Conscious memory for word categories in high versus low anxiety sensitive (HAS versus LAS) participants (p < .02). HPA = high positive affect; HNA = high negative affect; PT = physical threat; NSR = negative self-referent; CN = categorized neutral; UN = uncategorized neutral.
these differences could be due to differences in depression levels or to the combination of high anxiety sensitivity and higher levels of depressive symptoms. Because of this issue, the memory data of two groups of participants were compared: a group of participants with both high ASI scores and high BDI scores (mixed HAS/HBD group) was contrasted with a group with high ASI scores and BDI scores less than 16 (i.e., lower than the high BDI scorers) (HAS only group).

The mixed HAS/HBD group should score significantly higher on the BDI and significantly lower on the PA portion of the PANAS-X when compared to the HAS only group. The groups should not differ in their scores on the ASI. The only expected difference in memory biases between the group of mixed HAS/HBD participants and HAS only participants would be in conscious memory for HPA words. The mixed HAS/HBD group should have a lower R for HPA words (mood congruent bias) than the HAS only group since they have higher levels of depressive symptoms. There should be no other differences in memorial performance.

**Results and Discussion**

**Preliminary Analyses**

*Characteristics.* The mixed HAS/HBD group consisted of 25 participants and the HAS only group included 14 participants. Analyses revealed that the mixed HAS/HBD and HAS only groups did not differ significantly in terms of age, $t(37) = .40$; marital status, $t(37) = .42$; or level of education, $t(37) = .18$. These analyses indicated that the two groups were comparable in terms of demographic characteristics.

*Questionnaires.* T-tests were performed to compare the two groups on the ASI, BDI,
STAI (state and trait), and the NEO short form. The mixed HAS/HBD group scored significantly higher than the HAS only group on the BDI, t(37) = 7.29, p < .001; STAI-state, t(37) = 3.01, p < .005; STAI-trait, t(37) = 5.18, p < .001; and NEO short form, t(36) = 5.06, p < .001. The difference in BDI scores was predicted; however, the differences in scores on the STAI (state and trait) and NEO short form were not expected. As predicted, there was no significant difference between the groups on the ASI, t(37) = .05.

*Primary Analyses*

*Comparison of PANAS-X scores.* Contrary to the predicted outcome, there was no significant difference in the PA score on the PANAS-X between the mixed HAS/HBD and HAS only groups, t(37) = .71. There was a significant difference between the groups in terms of their score on the NA portion of the PANAS-X, t(37) = 2.82, p < .008, such that the mixed HAS/HBD group scored higher on this questionnaire than the HAS only group.

*Estimates of Conscious and Automatic Recollection.* The proportions of words checked under the inclusion and exclusion instructions were converted to estimates of R and A’ using the equations in Jacoby et al. (1993). These estimates were separately analysed using group (mixed HAS/HBD vs HAS only) as a between-subjects factor and word category (HPA, HNA, PT, NSR, CN, and UN) as a within-subjects factor. See Table 10.7 in Appendix J for inclusion, exclusion, R, A and A’ means for the mixed HAS/HBD and HAS only groups.

*R results:* There was a significant main effect of word, F(5, 185) = 2.87, p < .02. Generally, R for HPA, PT, CN, and UN words was greater than the R for HNA and NSR words (see Figure 2.2). The interaction was not significant and the planned comparison
Figure 2.2 Main effect of word category (collapsed over mixed high anxiety sensitive/high depression [mixed HAS/HBD] and high anxiety sensitive only [HAS only] groups) in conscious recollection (p < .02). HPA = high positive affect; HNA = high negative affect; PT = physical threat; NSR = negative self-referent; CN = categorized neutral; UN = uncategorized neutral.
revealed no significant difference in R of HPA words between the groups, F(1, 37) = .28.

A’ Results: An analysis of variance revealed no significant effects.

Summary

As predicted, the mean NA score on the PANAS-X of the HAS group was significantly higher than that of the LAS group. Contrary to the predicted outcome, the HAS group reported significantly lower PA scores than the low ASI group.

As predicted, a planned comparison revealed no significant difference between the HAS group and the LAS group in R for HPA words (although it was not expected that the HAS group did have a higher R for CN words.) However, contrary to prediction, there was no significant difference between the HAS group and the LAS group in A’ for PT words.

Contrary to the predicted outcome, there were no significant differences in memory biases between the mixed HAS/HBD group and the HAS only group. The difference between the groups in terms of conscious memory for HPA words was not significantly different. The lack of significant differences may be due to the small sample sizes included in this analysis.
Study 2: Automatic and Consciously-Controlled Memory Biases in Students with High versus Low Levels of Depressive Symptoms

LBD versus HBD Participants

The second study involved a comparison of conscious and automatic memory in students with low (LBD) versus high (HBD) levels of depressive symptoms as measured by the BDI. The general hypotheses predict that individuals in a depressed mood should have low state PA and high state NA. Thus, HBD participants should have lower PA scores and higher NA scores on the PANAS-X than the LBD participants. The HBD participants should consciously recollect fewer HPA words and more HNA compared to LBD participants (due to mood-congruent memory.) Thus the R of HPA words should be significantly lower for the HBD group than for the LBD group, and the R of HNA words should be significantly higher. There should be no differences in A' for any of the word categories since the participants with higher levels of depressive symptoms are not suffering from clinical depression.

Methods

The second study used the same methodology and included the same questionnaires as Study 1 but with different criteria requirements for participation.

Participants

Students were recruited from undergraduate psychology classes. All participants were required to speak English as their native language. Undergraduate students were included in this study if they scored 16 or above (HBD), or 8 or below (LBD), on the BDI on the day of participation in this study. Data of participants who reported a present diagnosis
of an anxiety or depressive disorder were excluded from the analyses.

A total of 73 students were screened with the ASI during Study 1 and met the criteria for Study 2: 38 of these students met the criteria for the LBD group; 35 met the criteria for the HBD group. In addition, 25 students were recruited to participate in Study 2 without prior screening with the ASI. Of these participants, 5 students met the criteria for the LBD group, and 8 students met the criteria for the HBD group. Twelve of the participants (who were not screened) scored between 9 and 15 on the BDI and therefore their data were excluded from this study. In addition, the data from one participant (who was not screened) who met the criteria for the HBD group was excluded because she reported a present diagnosis of an anxiety disorder.

Several of the participants included in Study 2 also met the criteria for Study 1. Thus, there was overlap in the participants included in these studies (see Table 2.1). Twenty five HBD students and one LBD student also met the criteria for HAS. Three HBD students and 20 LBD students also met the criteria for LAS. Fourteen HBD students and 22 LBD students did not meet criteria for Study 1. Thus, the data of 36 participants in Study 2 were not included in Study 1.

The total sample included 85 students: 43 LBD participants (15 males and 28 females) and 42 HBD participants (12 male and 30 females). Participation was voluntary and no payment was given to the participants. The students were given one credit toward their undergraduate psychology course for participating. Each participant signed a consent form before beginning the experiment.
Results and Discussion

Preliminary Analyses

Characteristics. Analyses revealed that the HBD and LBD groups did not differ significantly in terms of age, $t(83) = .74$; marital status: $t(83) = 1.43$ or level of education, $t(83) = .52$. These analyses indicated that the two groups were comparable in terms of demographic characteristics.

Questionnaires. T-tests were performed to compare the two groups on the BDI, ASI, STAI (state and trait), and the NEO short form. The HBD group scored significantly higher than the LBD group on the BDI, $t(83) = 17.78, p < .001$; ASI, $t(83) = 8.32, p < .001$; STAI-state, $t(83) = 8.67, p < .001$; STAI-trait, $t(83) = 12.36, p < .001$; and NEO short form, $t(80) = 11.91, p < .001$. See Table 10.2 in Appendix H for summary of questionnaire scores for LBD and HBD participants.

Primary Analyses

Comparison of PANAS-X scores. As predicted, the mean NA score on the PANAS-X of the HBD group was significantly higher than that of the LBD group, $t(83) = 6.01, p < .001$. In addition, the mean PA score on the PANAS-X was significantly lower for the HBD group than the LBD group, $t(83) = 3.44, p < .001$.

Estimates of Conscious and Automatic Recollection. The proportions of words checked under the inclusion and exclusion instructions were converted to estimates of $R$ and $A'$ using the equations in Jacoby et al. (1993). These estimates were separately analysed using BDI score (HBD vs LBD) as a between-subjects factor and word category (HPA, HNA, PT, NSR, CN, and UN) as a within-subjects factor. See Table 10.6 in Appendix J for
inclusion, exclusion, R, A and A' means for the LBD and HBD groups.

**R results:** The ANOVA of BDI group (HBD vs LBD) and R of the word categories revealed a significant main effect of group, $F(1,83) = 4.03, p < .05$ and a significant main effect of word category, $F(5, 415) = 2.41, p < .04$. The overall conscious recollection (collapsed across word categories) was greater for the HBD group than the LBD group (see Figure 3.1). This result was in contrast with that found by Hertel and Milan (1994) who showed that dysphoric participants had decreased overall conscious recollection compared to the non-dysphoric participants. The main effect of word generally showed that the R of PT, CN, and UN words was higher than the R of HPA, HNA, and NSR words (see Figure 3.2).

Contrary to the predicted outcome, the R of HPA words was actually greater, not less, for the HBD group than for the LBD group. A LSD post hoc test revealed that this difference in R of the HPA words was significant at the $p < .01$ level. In addition, contrary to the prediction, a planned comparison showed that there was no difference in R of HNA words between the HBD and LBD groups, $F(1,83) = .71$.

**A' Results:** An analysis of variance revealed a significant main effect of word, $F(5, 415) = 3.31, p < .007$. Generally, A' was higher for the emotional words than for the neutral words (see Figure 3.3). As predicted, a series of planned contrasts revealed no significant difference between the HBD group and the LBD group in A' for any of the word categories.

**Mixed HAS/HBD Group Versus HBD Only Group**

Again, because there was a significant difference in terms of ASI scores as well as BDI scores when the HBD and LBD groups were compared, one cannot be sure that any
Figure 3.1 Main effect of group (low depression [LBD] versus high depression [HBD] students) in conscious recollection (p < .05).
Figure 3.2 Main effect of word category (collapsed over high depression [HBD] and low depression [LBD] student groups) in conscious recollection (p < .04). HPA = high positive affect; HNA = high negative affect; PT = physical threat; NSR = negative self-referent; CN = categorized neutral; UN = unclassified neutral.
Figure 3.3 Main effect of word category (collapsed over high depression [HBD] and low depression [LBD] student groups) in automatic memory ($p < .007$). HPA = high positive affect; HNA = high negative affect; PT = physical threat; NSR = negative self-referent; CN = categorized neutral; UN = uncategorized neutral.
differences between the groups were due to differences in level of depressive symptoms. It is possible that these differences could be due to differences in anxiety sensitivity or to the combination of high levels of depressive symptoms and high anxiety sensitivity. Because of this issue, the memory data of two groups of participants were compared: a group of participants with both high BDI scores and high ASI scores (mixed HAS/HBD group) was contrasted with a group with high BDI scores and ASI scores less than 30 for the females and less than 23 for the males (HBD only group).

The mixed HAS/HBD group should score higher on the ASI and STAI - trait when compared to the HBD only group. There should be no differences, however, between the groups on the BDI or in terms of their mean NA or PA score on the PANAS-X. The only expected difference in memory biases between the group of mixed HAS/HBD participants and HBD only participants would be in automatic memory for PT words. The mixed HAS/HBD group should have a higher A' for PT words than the HBD only group since they have higher levels of anxiety sensitivity. There should be no other differences in memorial performance.

Results and Discussion

Preliminary Analyses

Characteristics. The mixed HAS/HBD group contained 25 participants and the HBD only group contained 17 participants. Analyses revealed that the mixed HAS/HBD and HBD only groups did not differ significantly in terms of age, \( t(40) = .21 \); marital status, \( t(40) = .82 \); or level of education, \( t(40) = 1.03 \). These analyses indicated that the two groups were comparable in terms of demographic characteristics.
Questionnaires. T-tests were performed to compare the two groups on the ASI, BDI, STAI (state and trait), and the NEO short form. The mixed HAS/HBD group scored significantly higher than the HBD only group on the ASI, t(40) = 8.85, p < .001; STAI - trait, t(40) = 2.11, p < .05; and NEO short form, t(40) = 2.31, p < .03. As predicted, the mixed HAS/HBD group had significantly higher mean scores on the ASI and STAI - trait than the HBD only group; however, it was not anticipated that the mixed group would also have higher scores on the NEO short form. In line with the predictions, there was no significant difference between the groups on the BDI.

Primary Analyses

Comparison of PANAS-X scores. As predicted, there were no significant differences between the mixed HAS/HBD group and the HBD only group in terms of their NA and PA scores on the PANAS-X, t(40) = .97 and t(40) = .58, respectively.

Estimates of Conscious and Automatic Recollection. The proportions of words checked under the inclusion and exclusion instructions were converted to estimates of R and A’ using the equations in Jacoby et al. (1993). These estimates were separately analysed using group (mixed HAS/HBD vs HBD only) as a between-subjects factor and word category (HPA, HNA, PT, NSR, CN, and UN) as a within-subjects factor. See Table 10.7 in Appendix J for inclusion, exclusion, R, A and A’ means for the mixed HAS/HBD and HBD only groups.

R results: An analysis of variance revealed no significant effects.

A’ Results: An analysis of variance revealed no significant effects. The A’ for PT words was higher for the mixed HAS/HBD group when compared to the HBD only group;
however, a planned comparison revealed that this difference was not significant, $F(1, 40) = .67$.

**Summary**

As predicted, the mean NA score on the PANAS-X of the HBD group was significantly higher than the LBD group, and the mean PA score on the PANAS-X was significantly lower for the HBD group than the LBD group.

As predicted, there was a significant difference in conscious recollection of HPA words between the HBD and LBD groups. However, the difference was in the opposite direction; that is, the HBD group remembered more HPA words than the LBD group. In addition, contrary to the prediction, there was no difference in conscious recollection of HNA words between the HBD and LBD groups. However, as predicted, there was no significant difference between the HBD group and the LBD group in $A'$ for any of the word categories.

Contrary to the predicted outcome, there were no significant differences in memorial performance between the mixed HAS/HBD group and the HBD only group. The lack of significant differences may be due to the small sample sizes included in this analysis.
Sex Differences: Male versus Female Differences in Memorial Performance

Male versus Female Differences

In order to investigate differences in memorial performance in male versus female student participants, the data from students included in Study 1 and Study 2 were combined. This enabled us to examine a larger population of participants instead of analysing the data from Study 1 and Study 2 separately. A total of 103 students (32 males and 71 females) participated in Study 1 and Study 2 and were included in these analyses.

The inclusion criteria for males and females were very similar in Study 1 (high vs low ASI scores) and identical for males and females for Study 2 (high vs low BDI scores). Thus, there should be no differences overall between males and females in terms of any of the questionnaire measures. However, differences in memorial performance were expected under specific circumstances. Clark and Teasdale (1985) and Rothkopf and Blaney (1991) demonstrated differences in MCM between men and women in a study which involved mood induction in healthy volunteers. Female participants recalled more negative than positive words when in a depressed mood. In contrast, the male participants did not show this differential MCM effect. Thus, it appears that negative concepts are more accessible to women who are in a depressed mood than men who are in a similar mood.

One would therefore expect the female HBD participants to demonstrate a higher conscious recollection for negative words than the male HBD participants since females tend to show stronger MCM biases than males. Similarly, the female LBD participants should have a higher conscious recollection for positive words than male LBD participants. These
predictions were tested in a group of participants whose moods were naturally occurring and were not induced by the experimenter.

Results and Discussion

Preliminary Analyses

Characteristics, Questionnaires, and PANAS-X Scores. Analyses revealed that the males and females did not differ significantly in terms of any demographic characteristics, questionnaire or PANAS-X scores.

Primary Analyses

Estimates of Conscious and Automatic Recollection. The proportions of words checked under the inclusion and exclusion instructions were converted to estimates of R and A’ using the equations in Jacoby et al. (1993). These estimates were separately analysed using group (males vs females) as a between-subjects factor and word category (positive vs negative) as a within-subjects factor. Analyses were performed with only the emotional word categories (leaving the neutral words out of the analyses.) The HNA, PT, and NSR words were collapsed into one category (negative words) and compared to the positive (HPA) words. In this way, memory for words that were generally categorized as emotionally negative could be compared to that for words which were positive in emotionality. For inclusion, exclusion, R, A and A’ means see Table 10.8 in Appendix J for all male and female student participants; see Table 10.9 in Appendix J for HBD male and female student participants; and see Table 10.10 in Appendix J for LBD male and female student participants.

R results:
All participants:

An analysis of variance using these positive and negative word categories revealed no significant effects when all participants were grouped together.

HBD only:

However, when only the HBD participants were included in the analysis, there was a significant interaction effect, $F(1,40) = 6.30$, $p < .02$ (see Figure 4.1). The HBD females consciously remembered more negative words (i.e., higher $R$ for negative words) than the HBD males, but a planned contrast revealed that this difference was not statistically significant, $F(1, 40) = 1.57$. The HBD females also had a lower $R$ for positive words than the HBD males; however, a planned contrast again showed that this difference was not statistically significant, $F(1, 40) = 2.39$. The planned contrasts did not reveal any significant differences in memory for positive or negative words when the HBD females and HBD males were compared. Significant differences may have been found if larger sample sizes had been used.

LBD only:

Contrary to the prediction, when LBD males were compared to LBD females, no significant interaction was found. Although LBD females did have a higher $R$ for positive words than the males, this difference was not found to be significant when a planned contrast was performed, $F(1, 41) = 2.48$. However, there was a significant main effect of group, $F(1, 41) = 4.64$, $p < .04$, such that the LBD females had a higher overall $R$ than the LBD males when $R$ was collapsed across word category. Thus, the LBD females actually had a higher (although not significantly) $R$ for both positive and negative words when compared to the
Figure 4.1 Conscious recollection of male high depression [HBD] students versus female HBD students for positive and grouped negative words (p < .02).
LBD males.

**A' Results:** An analysis of variance revealed no significant effects when all participants were grouped together, when the HBD males and HBD females were contrasted, nor when the LBD males and LBD females were contrasted.

**Summary**

As predicted, there were no differences between the males and females in terms of demographic characteristics or any questionnaire measures. The only statistically significant interaction effect was found when conscious memory of HBD males and HBD females for positive and negative words were compared. Although the differences in conscious recollection for the positive and negative words were not significant when planned contrasts were used to compare the performance of HBD female and male participants, the overall pattern showed that the HBD females consciously recollected fewer positive words and more negative words than the HBD male participants. These HBD females were expected to consciously remember significantly more negative words than the HBD males. Perhaps if more participants had been included in the study, this difference in memory for negative words may have been statistically significant. Finally, the group of LBD females remembered significantly more words overall (positive and negative words) than the group of LBD males.
**Study 3: Automatic and Consciously-Controlled Memory Biases in Students versus Patients with Major Depressive Disorder**

Patients with Major Depressive Disorder versus Healthy Volunteers

Unfortunately, we were unable to access a group of panic disorder patients; therefore, only patients with major depressive disorder were examined in Study 3 in addition to healthy control participants. This study was done in order to assess the cognitive processes of individuals who were clinically depressed at the time of testing. Automatic and consciously-controlled memory for the same words as used in Study 1 and Study 2 were contrasted between patients with major depressive disorder and healthy controls using the PDP paradigm.

When compared to healthy participants, the depressed patients should show higher NA and lower PA scores on the PANAS-X. These differences are similar to those predicted for the HBD group when compared to the LBD group.

The clinically depressed patients should show a conscious recollection bias for HNA (higher R for HNA words) and against HPA words (lower R for HPA words) when compared to healthy controls due to mood congruent memory. The patients should also demonstrate an automatic memory bias for negative self-relevant words (higher A’ for NSR words) when compared to healthy volunteers. Thus, the patients with major depressive disorder would be biased toward remembering negative information both consciously and automatically while they are in a depressed state. The conscious memory biases were predicted for mood-congruent information, whereas the automatic memory bias was hypothesized to occur for
Methods

The third study included clinical populations of participants but involved the same methodology except for the following differences in screening procedures and questionnaires.

Participants

Patients with major depressive disorder and healthy control participants were recruited to participate in this study. The group of depressed patients included outpatients who fulfilled DSM-IV (American Psychiatric Association, 1994) criteria for major depressive disorder both with and without a seasonal pattern, as determined by the Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 1995). These participants were only invited to participate if they did not meet DSM-IV criteria for any other current psychiatric disorders. All participants were required to speak English as their native language and had to be free of psychoactive drugs at the time of testing. A total of 30 patients with major depressive disorder were included in this study: 16 patients without a seasonal pattern (MDD) (12 males and 4 females)\(^1\) and 14 patients with a seasonal pattern (SAD) (5 males and 9 females). The data from one male MDD patient was not included because his native language was Spanish, and he did not speak fluent English. The final sample therefore included a total of 29 patients with major depressive disorder. Participation was voluntary and each patient signed a consent form before beginning the experiment. The

\(^1\)The ratio of males to females in this sample of MDD patients is unusually high. As noted earlier, major depressive disorder is reported to be twice as common in women as in men (American Psychiatric Association, 1994). However, male MDD patients were being actively recruited by a medication study to which this study of memorial performance was attached. This resulted in a larger number of male than female MDD participants.
SAD patients did not receive payment for their participation. Because of difficulties in recruitment, the MDD patients were paid $15 for their participation in this study.

The group of healthy volunteers consisted of a group of undergraduate students who scored 8 or less on the BDI at the time of the study. No screening tool was used while recruiting participants. However, all participants were required to speak English as their native language. The data of participants who reported any present or past diagnosis of an anxiety or depressive disorder were excluded from this study. A total of 52 students completed the study. Thirty students met the inclusion criteria, thus their data was included in the study analysis. Nineteen students had BDI scores above 8, and 3 students had BDI scores below 8 but had a past history of depressive disorder. The final sample of 30 students included 16 males and 14 females. Participation was voluntary and no payment was given to the subjects. The participants were given one credit toward their undergraduate psychology course for participating in this study. Each student signed a consent form before beginning the experiment.

Materials

**Questionnaires:** The participants completed the BDI, ASI, and PANAS-X. In addition, the Structured Interview Guide for the Hamilton Depression Rating Scale-Seasonal Affective Disorders Version (SIGH-SAD; J. B. W. Williams, Link, Rosenthal, & Terman, 1988) was administered by the experimenter or a trained research assistant. The SIGH-SAD consists of the 21-item Hamilton Rating Scale for Depression (HAM-21; Hamilton, 1960) plus an additional 8 items (HAM-SAD) included to assess the severity of seasonal patterns of major depressive disorder (Rosenthal & Hefferman, 1986).
Results and Discussion

Preliminary Analyses

Characteristics. Analyses revealed that the patients did not differ from the students in terms of marital status, t(56) = .84; or level of education, t(56) = .53. However, the patients were significantly older than the students, t(56) = 5.51, p > .001. The mean age (and standard deviation) of the patient and student groups were 32.7 (1.3) years and 23.4 (1.1) years respectively.

Questionnaires. T-tests were performed to compare the patients to the students on the BDI, ASI, 17-item Hamilton Rating Scale for Depression (HAM-17), HAM-21, and HAM-SAD. The patients scored significantly higher than the students on the BDI, t(57) = 10.65, p < .001; ASI, t(55) = 2.84, p < .007; HAM-17, t(56) = 11.73, p < .001; HAM-21, t(56) = 11.90, p < .001; and HAM-SAD, t(56) = 10.68, p < .001. See Table 10.3 in Appendix I for summary of questionnaire scores for the patients and control participants.

Primary Analyses

Comparison of PANAS-X scores. As predicted, the mean NA score on the PANAS-X was significantly higher for the patients when compared to the students, t(57) = 2.55, p < .02. In addition, the mean PA score on the PANAS-X was significantly lower for the patients than the students, t(57) = 3.92, p < .001.

Estimates of Conscious and Automatic Recollection. The proportions of words checked under the inclusion and exclusion instructions were converted to estimates of R and A' using the equations in Jacoby et al. (1993). These estimates were separately submitted to analyses of variance using group (patient vs student) as a between-subjects factor and word
category (HPA, HNA, PT, NSR, CN, and UN) as a within-subjects factor. See Table 10.11 in Appendix J for inclusion, exclusion, R, A and A' means for the patient and control (student) groups.

**R results:** The ANOVA revealed a significant main effect of group for R (collapsed across all word categories), $F(1, 57) = 4.65, p < .04$. The R for the patients was significantly lower than the R for the students (see Figure 5.1). This result is consistent with the findings of several other studies which have demonstrated a deficit in effort-demanding memory in clinically depressed patients (e.g., Bazin et al., 1994; Deijen, Orlebeke, & Rijsdijk, 1993; Roy-Byrne, Weingartner, Bierer, Thompson, & Post, 1986).

Planned contrasts demonstrated that there was no difference in R for HPA words ($F(1, 57) = .003$) or R for HNA words ($F(1, 57) = .18$) when the patient and student groups were compared. Thus, neither prediction related to R for the word categories was confirmed.

**A' Results:** The ANOVA of group (patient vs student) and A' of the word categories revealed no significant effects. A planned comparison showed no significant difference between the patients and students for A' of NSR words, $F(1, 57) = .41$.

**Depressed Patients With vs Without High ASI Scores**

Parallel to the analyses performed on the student data, the data for patients with versus without high ASI scores were compared. ASI scores have been shown to be elevated in patients with major depressive disorder even in absence of a diagnosis of an anxiety disorder (Otto, Pollack, Fava, Uccello, & Rosenbaum, 1995; Taylor, Koch, Woody, & McLean, 1996). Although the ASI scores of these depressed patients were lower than those
Figure 5.1 Main effect of group (healthy students versus patients with major depressive disorder) in conscious recollection (p < .04).
of patients with panic disorder, Otto et al. (1995) demonstrated that the mean ASI score of patients with major depressive disorder is approximately one standard deviation above the mean of a healthy population. Therefore, depressed patients with ASI scores of greater than one standard deviation above the normal mean (ASI score of 28) would be considered high scorers on the ASI (McNally, personal communication). Thus, depressed patients with an ASI score less than 28 were compared to those with ASI scores above 28. In this way, the memory biases for patients with vs without high ASI scores were compared.

Although the depressed patients with high ASI scores should score significantly higher on the ASI when compared to the group of patients without high ASI scores, the groups should not differ in their scores on the BDI, HAM-17, HAM-21, HAM-SAD, NA or PA portion of the PANAS-X. The only expected difference in memory biases between the groups would be in automatic memory for PT words. Similar to the healthy students with high anxiety sensitivity, the depressed patients with high ASI scores should have a greater automatic memory for PT words than the patients without high ASI scores. There should be no other differences in memorial performance.

Results and Discussion

Preliminary Analyses

Characteristics. The group of depressed patients with high ASI scores consisted of 12 participants and the group of depressed patients without high ASI scores included 15 participants. The data of two SAD patients (one male and one female) were not included because these participants did not complete the ASI. Analyses revealed that the patients with high ASI scores and the patients without high ASI scores did not differ significantly in terms
of age, $t(24) = 1.93$; marital status, $t(24) = .17$; or level of education, $t(24) = .35$. These analyses indicated that the two groups were comparable in terms of demographic characteristics.

*Questionnaires.* T-tests were performed to compare the two groups on the ASI, BDI, HAM-17, HAM-21, and HAM-SAD. The patients with high ASI scored significantly higher on the ASI, $t(25) = 7.34$, $p < .001$; and BDI, $t(25) = 2.63$, $p < .02$ when compared to the patients without high ASI scores. The difference in ASI scores was predicted; however, the difference in scores on the BDI was not expected. As predicted, there was no significant difference between the groups on the HAM-17, $t(24) = 1.22$; HAM-21, $t(24) = 1.43$; and HAM-SAD, $t(24) = .69$.

*Primary Analyses*

*Comparison of PANAS-X scores.* As predicted, there was no difference in PA scores on the PANAS-X between the depressed patients with versus without high ASI scores. Contrary to the predicted outcome, there was a significant difference in the NA score on the PANAS-X between the group with high ASI scores when compared to the group without high ASI scores, $t(25) = 3.29$. This difference in NA scores may indicate that the depressed patients with high ASI scores were more distressed than those without high ASI scores.

*Estimates of Conscious and Automatic Recollection.* The proportions of words checked under the inclusion and exclusion instructions were converted to estimates of $R$ and $A'$ using the equations in Jacoby et al. (1993). These estimates were separately analysed using group (depressed patients with vs without high ASI scores) as a between-subjects factor and word category (HPA, HNA, PT, NSR, CN, and UN) as a within-subjects factor.
See Table 10.12 in Appendix J for inclusion, exclusion. R, A and A’ means for the patients with and without high ASI scores.

R results: There was a significant main effect of word, F(5, 125) = 2.70, p < .03. Generally, R for HPA, HNA, and PT words was greater than the R for NSR, CN, and UN words (see Figure 5.2). The interaction between group and word category was not significant.

A’ Results: An analysis of variance revealed no significant effects. The planned contrast revealed no significant difference in A’ of PT words between the groups, F(1, 25) = 1.01.

**MDD versus SAD Patients**

Because two groups of patients with major depressive disorder (i.e., SAD and MDD) were included in this study, we wanted to determine whether there were any differences between these groups of patients. It was assumed that the groups would be equivalent on all measures, except for the BDI, HAM-17, HAM-21, and HAM-SAD scores. The SAD patients were predicted to score higher on the HAM-SAD portion of the SIGH-SAD than the MDD patients (Rosenthal & Hefferman, 1986). The MDD patients were expected to score higher on the BDI, HAM-17 and HAM-21 than the SAD patients. As discussed earlier, SAD patients tend to report atypical symptoms such as weight gain and increased sleep time (Kasper & Rosenthal, 1989; Rosenthal et al., 1984; Tam et al., 1997) and thus would have lower scores on questionnaires which ask questions related to more typical symptoms (e.g., BDI, HAM-17 and HAM-21.) The patient groups should be equivalent in terms of their
Figure 5.2 Main effect of word category (collapsed over patients with high anxiety sensitivity [mixed] and patients without high anxiety sensitivity [pure]) in conscious recollection ($p < .03$). HPA = high positive affect; HNA = high negative affect; PT = physical threat; NSR = negative self-referent; CN = categorized neutral; UN = uncategorized neutral.
overall scores on the entire 29 questions of the SIGH-SAD (HAM-29). The HAM-29 contains questions related to both typical and atypical symptoms, so no differences on this measure would be anticipated. No differences in memorial performance between the SAD and MDD groups were expected.

Results and Discussion

Preliminary Analyses

Characteristics. The MDD patients did not differ from the SAD patients in terms of age, t(26) = .44; marital status, t(26) = 1.73; or level of education, t(26) = .73. These analyses indicated that the two patient groups were comparable in terms of demographic characteristics.

Questionnaires. T-tests were performed to compare the MDD patients to the SAD patients on the ASI, BDI, HAM-17, HAM-21, HAM-SAD, and PANAS-X (PA and NA). The differences on the questionnaires were as predicted. The MDD patients scored significantly higher than the SAD patients on the BDI, t(27) = 2.35, p < .03; HAM-17, t(26) = 6.38, p < .001; and HAM-21, t(26) = 6.59, p < .001. There was, however, no statistically significant difference in severity of depressive symptoms when the patient groups were compared on the HAM-29, t(26) = 2.00. However, there was still a trend (p = .06) for the MDD patients to have slightly (but not significantly) higher scores on the HAM-29. The mean HAM-29 score for the MDD patients was 33.6, compared to 28.6 for the SAD patients. In addition, the SAD patients had significantly higher scores on the HAM-SAD than the MDD group, t(26) = 2.78, p < .02. There was no significant difference between the scores of the two patient groups on the ASI, t(25) = 1.14. See Table 10.3 in Appendix I for summary
of questionnaire scores for the MDD and SAD patients.

Primary Analyses

Comparison of PANAS-X scores. As predicted, the mean NA score on the PANAS-X for the MDD patients was not significantly different from the SAD group, t(27) = .94. Similarly, there was no significant difference in PA score on the PANAS-X between the two patient groups, t(27) = 1.00.

Estimates of Conscious and Automatic Recollection. The proportions of words checked under the inclusion and exclusion instructions were converted to estimates of R and A' using the equations in Jacoby et al. (1993). These estimates were separately submitted to analyses of variance using group of patients (MDD vs SAD) as a between-subjects factor and word category (HPA, HNA, PT, NSR, CN, and UN) as a within-subjects factor. See Table 10.11 in Appendix J for inclusion, exclusion, R, A and A' means for the MDD and SAD patient groups.

R results: The ANOVA revealed a significant main effect of word category for the R data, F(5, 135) = 2.61, p < .03, but no significant main effect of group and no significant interaction between group and word category. The R for HPA, HNA, PT, and UN was greater than the R for NSR and CN words (see Figure 5.3).

A' Results: The ANOVA again revealed a significant main effect of word category for the A' data, F(5, 135) = 2.53, p < .04. The A' for PT, NSR, and CN words was greater than the A' for HPA, HNA, and UN words (see Figure 5.4). In addition, a significant main effect of group was found when A' was collapsed over all word categories, F(1, 27) = 6.58, p < .02. This revealed a higher A' for the SAD patients when compared to the MDD patients.
Figure 5.3 Main effect of word category (collapsed over depressed patients without [MDD] and with [SAD] a seasonal pattern) in conscious recollection (p < .03). HPA = high positive affect; HNA = high negative affect; PT = physical threat; NSR = negative self-referent; CN = categorized neutral; UN = uncategorized neutral.
Figure 5.4 Main effect of word category (collapsed over depressed patients without [MDD] and with [SAD] a seasonal pattern) in automatic memory (p < .04). HPA = high positive affect; HNA = high negative affect; PT = physical threat; NSR = negative self-referent; CN = categorized neutral; UN = uncategorized neutral.
(see Figure 5.5). The difference in A' for the two patient groups was not anticipated.

Sex Differences: Male versus Female Differences in Memorial Performance

In order to parallel the analyses comparing the performance of males and females in the non-clinical participants, similar comparisons were done with the patients. In addition, Blaney (1986) notes that investigators need to explore whether MCM effects occur in men as well as women.

Similar to the predictions made for the student participants, it was expected that the female depressed patients should demonstrate a higher conscious recollection (R) for negative words than the male patients since females showed stronger MCM biases than males in the Clark and Teasdale (1985) study. It is possible that no MCM biases were found because the male and female patients were grouped together. Thus, it is also important to examine the data of the male and female participants separately.

Because there were more males than females in the MDD group and more females than males in the SAD group, the female patients were expected to have higher HAM-SAD scores and lower BDI, HAM-17, and HAM-21 scores than the male patients. No difference was expected in terms of demographic characteristics or scores on the ASI, HAM-29, or PANAS-X (NA or PA). Because of the unequal numbers of males and females in the MDD (4 women and 11 men) and SAD (9 women and 5 men) groups, any differences in female versus male performance need to be examined more closely to determine whether the finding is specific to the type of depression (i.e., MDD or SAD) or whether the finding is more general and relevant to both MDD and SAD.
Figure 5.5 Main effect of group (depressed patients without [MDD] versus with [SAD] a seasonal pattern) in automatic memory (collapsed over word categories) (p < .02).
Results and Discussion

Male versus Female Patients:

Preliminary Analyses

Characteristics, Questionnaires, and PANAS-X Scores. The female patients did not differ from the male patients in terms of age, \( t(26) = .13 \) or level of education, \( t(26) = .85 \). However, significantly more female patients were married than male patients, \( t(26) = 3.03, p < .006 \). These analyses indicated that the two patient groups were comparable in terms of age and level of education, but not marital status.

T-tests were performed to compare the female patients to the male patients on the ASI, BDI, HAM-17, HAM-21, HAM-SAD, and PANAS-X (PA and NA). The differences on most of the questionnaires were as predicted. The females scored significantly higher than the males on the HAM-SAD, \( t(26) = 5.31, p < .001 \). The males scored significantly higher than the females on the HAM-17, \( t(26) = 2.20, p < .04 \); however, contrary to the prediction, there was no significant differences between the males and females on the BDI, \( t(27) = .57 \), and the HAM-21, \( t(26) = 2.06 \). As predicted, there was no significant difference between the males and females on the ASI, \( t(25) = 1.94 \); HAM-29, \( t(26) = .90 \); and NA, \( t(27) = .02 \), and PA, \( t(27) = 1.35 \), of the PANAS-X.

Primary Analyses

Estimates of Conscious and Automatic Recollection. The proportions of words checked under the inclusion and exclusion instructions were converted to estimates of \( R \) and \( A' \) using the equations in Jacoby et al. (1993). These estimates were separately analysed using group (males vs females) as a between-subjects factor and word category (positive vs
negative) as a within-subjects factor. Analyses were performed with only the emotional word categories (leaving the neutral words out of the analyses.) The HNA, PT, and NSR words were collapsed into one category (negative words) and compared to the positive (HPA) words. In this way, memory for words that were generally categorized as emotionally negative could be compared to that for words which were positive in emotionality. For inclusion, exclusion, R, A and A' means see Table 10.13 in Appendix J for all male and female patients; see Table 10.14 in Appendix J for male and female MDD patients; and see Table 10.15 in Appendix J for male and female SAD patients.

R results:

*All patients (MDD and SAD), MDD only, SAD only:*

An analysis of variance using these positive and negative word categories revealed no significant effects when R data of the male and female patients were compared. This was the case when all patients (MDD and SAD), MDD patients only, and SAD patients only were included in the analyses.

A' Results:

*All participants (MDD and SAD):*

An analysis of variance using these positive and negative word categories revealed no significant effects when all participants were grouped together to compare males versus females.

*MDD only:*

An analysis of variance revealed no significant effects when only the data of the male and female MDD participants were examined. This lack of difference may be due to the
small number of women (N = 4) in the MDD sample.

**SAD only:**

An analysis of variance revealed a significant interaction effect, $F(1, 12) = 15.8$, $p < .002$ (see Figure 5.6). A planned contrast revealed a trend such that the females automatically remembered more positive words than the males, $F(1, 12) = 3.29$, $p < .10$, but there was no difference in the $A'$ of negative words remembered, $F(1, 12) = .46$. No differences in $A'$ were predicted between the men and women. In addition, the depressed women were predicted to remember more negative words, not more positive words than the men.

**Students vs Patients:**

Because of this significant interaction between male and female patients in the SAD group, a further examination of the male and female patient groups compared to the male and female participants in the control group was performed. It is possible that significant MCM effects could not be recognized when the male and female participants were combined. Thus, the males and females were examined separately to see if MCM effects were evident when the female patients and controls were compared, but not the males.

*Estimates of Conscious and Automatic Recollection.* The proportions of words checked under the inclusion and exclusion instructions were converted to estimates of $R$ and $A'$ using the equations in Jacoby et al. (1993). These estimates were separately analysed using group (patients vs controls) as a between-subjects factor and word category (positive vs negative) as a within-subjects factor. Analyses were performed with only the emotional word categories (leaving the neutral words out of the analyses.) The HNA, PT, and NSR words
Figure 5.6 Interaction of male versus female patients with a seasonal pattern [SAD] for positive and grouped negative words in automatic memory (p < .002).
were collapsed into one category (negative words) and compared to the positive (HPA) words. In this way, memory for words that were generally categorized as emotionally negative could be compared to that for words which were positive in emotionality.

**Females Only:**

**R and A’ results:** For inclusion, exclusion, R, A and A’ means see Table 10.16 in Appendix J for all female patients and female controls; see Table 10.17 in Appendix J for female MDD patients and female controls; and see Table 10.18 in Appendix J for female SAD patients and female controls.

*All patients (MDD and SAD), MDD only, SAD only:*

Analyses of variance using the positive and negative word categories revealed no significant effects when the female patients and female students were compared. This was the case when all patients (MDD and SAD), MDD patients only, and SAD patients only were included in the analyses. This was unexpected since Clark and Teasdale (1985) found MCM biases in the female participants but not the males. In addition, the HBD females from the non-clinical studies (Study 1 and Study 2) showed a decrease in conscious memory for positive words, whereas the HBD male participants did not. Although the female participants who were not diagnosed with clinical depression demonstrated this bias, the female patients with major depressive disorder did not.

**Males Only:**

For inclusion, exclusion, R, A and A’ means see Table 10.19 in Appendix J for all male patients and male controls; see Table 10.20 in Appendix J for male MDD patients and male controls; and see Table 10.21 in Appendix J for male SAD patients and male controls.
R results:

All patients (MDD and SAD), MDD only, SAD only:

Analyses of variance using the positive and negative word categories revealed no significant effects when the male patients and male students were compared. This was the case when all patients (MDD and SAD), MDD patients only, and SAD patients only were included in the analyses.

A' Results:

All participants (MDD and SAD):

An analysis of variance using these positive and negative word categories revealed a significant interaction effect when all participants were grouped together to compare the A' data of the male patients to male students, F(1, 30) = 10.20, p < .004 (see Figure 5.7). Post hoc LSD tests revealed that the male students had a higher A' for both positive (p < .001) and negative (p < .03) words. However, there was also a main effect of group, such that the male students had a higher A' overall when compared to the male patients, F (1,30) = 10.14, p < .004.

MDD only:

An analysis of variance revealed a significant interaction effect, F(1, 25) = 5.25, p < .04 (see Figure 5.8). Post hoc Tukey's honest significant difference (HSD) tests for unequal N showed a significant difference in the A' of both positive (p < .001) and negative (p < .03) words when the male MDD patients and male students were compared. The male students automatically remembered more positive and negative words than the male MDD patients. However, the interaction demonstrated that the male students remembered more positive than
Figure 5.7 Interaction of male students versus male patients (without [MDD] and with [SAD] a seasonal pattern) for positive and grouped negative words in automatic memory (p < .004).
Figure 5.8 Interaction of male students versus male patients without a seasonal pattern [MDD Pts] for positive and grouped negative words in automatic memory (p < .04).
negative words; whereas, the male MDD patients automatically remembered equal numbers of positive and negative words. This is similar to the findings of Clark and Teasdale (1985) in their group of male participants since the depressed men showed no MCM biases but the non-depressed men had a conscious MCM bias for positive words.

The analysis also revealed a significant main effect of group, $F(1, 25) = 11.88, p < .003$ and a significant main effect of word, $F(1, 25) = 5.47, p < .03$. Generally, the male students had a higher automatic memory than the male patients when the words were collapsed over the positive and negative categories. The positive words were generally automatically remembered by both groups of male participants better than the negative words.

*SAD only:*

An analysis of variance revealed a significant interaction effect, $F(1, 19) = 15.42, p < .001$ (see Figure 5.9). Tukey's HSD tests for unequal N revealed a significant difference in A' for positive words ($p < .002$) such that the male students automatically remembered more positive words than the male SAD patients; however, no significant difference in A' of negative words was found. Thus, again, the male depressed patients had a lower automatic memory for positive words than the male control participants.

**Summary**

As predicted, the mean NA score on the PANAS-X was significantly higher for the patients when compared to the students, and the mean PA score on the PANAS-X was significantly lower for the patients than the students.
Figure 5.9 Interaction of male students versus male patients with a seasonal pattern (SAD Pts) for positive and grouped negative words in automatic memory (p < .001).
Contrary to the prediction, there was no difference in R for HPA or HNA words when the patient and student groups were compared. However, as demonstrated in several studies in the literature, the overall R for the patients was significantly lower than the overall R for the students. In addition, contrary to the prediction, there was no significant difference between the patients and students for A’ of NSR words.

There were no significant differences between the group of depressed patients with high ASI scores when compared to the patients without high ASI scores in terms of memorial performance. As with the analyses involving the student data, the lack of any differences may be due to the small samples which were compared.

As predicted, the MDD patients and SAD patients did not differ in terms of R for any of the words. However, contrary to the prediction that the two groups would preform equivalently on the memory tasks, the SAD patients demonstrated higher overall A’ when compared to the MDD group.

The comparison of male and female patients revealed that a trend (p < .10) for the female SAD patients to have a higher automatic memory for positive words than the male SAD patients. This is the opposite of what was anticipated since the female participants who were induced into a negative mood in the Clark and Teasdale (1985) study consciously remembered more negative words than the male participants. The female participants who were in the positive mood induction condition consciously remembered more positive words. Thus, not only did the type of bias (i.e., positive instead of negative) differ from the predicted outcome, but the memory process involved (i.e., automatic instead of conscious) also differed.
A further exploration of the memory data revealed that the female depressed patients did not differ from the data of the healthy female students. Interestingly, the male patients did differ from the healthy male students in their automatic memory biases. Overall, the male students remembered significantly more positive words than the male depressed patients. Thus, the non-depressed male participants demonstrated an automatic MCM bias for positive word stimuli, but the male depressed patients did not demonstrate this positive bias (although they also did not demonstrate a negative bias.)
**Study 4: Automatic and Consciously-Controlled Memory Biases in Students versus Patients with Major Depressive Disorder after Treatment**

**Patients After Treatment versus Healthy Controls**

The fourth study involved a subgroup of the outpatients and students included in Study 3 who were tested a second time approximately six weeks after the first experimental session. Only MDD patients participated in this study. Unfortunately, the SAD patients were not available to be retested after they had been treated. The MDD patients were treated with an antidepressant (paroxetine) for six weeks before returning for the second experimental session. In addition, a subgroup of students from Study 3 also returned for a second experimental session after approximately six weeks. This study was performed in order to assess any changes in cognitive processing in those patients who responded to the treatment. The students were included as a comparison group so any effects of practice on the cognitive tasks could be assessed.

After treatment, the results of Study 4 should show differences for those patients who did respond to treatment when compared to those who did not respond. The patients who responded to treatment (i.e., responders) should not differ from the healthy volunteers in their PA scores on the PANAS-X.

The automatic and consciously-controlled memory biases for those depressed patients who were non-responders (and at the second session for the healthy control subjects) should not change. However, the responders should no longer have any biases on these memory tasks, except for an automatic bias for NSR words (since this would represent a cognitive
vulnerability factor.) However, if the treatment (e.g., cognitive-behavioral treatment) successfully modifies the cognitive structures involved in the vulnerability factor, we should no longer find an automatic memory bias for NSR words (Dalgleish & Watts, 1990). An antidepressant would not directly target these cognitive structures. Thus, patients successfully treated with an antidepressant should still demonstrate an automatic bias for NSR words (higher A' for NSR words when compared to the healthy volunteers). There should be no differences in responders when compared to the healthy participants in their conscious recollection (R) for any of the word categories since they would no longer be in a depressed mood state.

Methods

Study 4 involved the same methodology as Study 3, except for the following minor differences.

Participants

Only patients with major depressive disorder without a seasonal pattern returned for a second testing session to participate in this study. A total of 13 patients (11 males and 2 females) with major depressive disorder returned to participate in Study 4. All patients had received paroxetine (Paxil) for six weeks before participating in this study. The mean time between Study 3 and Study 4 was 43.0 days (SD = 2.8). The patients began taking the medication immediately after their participation in Study 3. Participation was voluntary and each patient had signed a consent form in Study 3 for this portion of the experiment. The patients were again paid $15 for their participation in this study.

A total of 22 students were included in Study 4. The data from the student
participants was included only if their BDI score was 8 or less on the day of participation for this study. Thus, they were required to have a BDI score of 8 or less at the time they participated in Study 3 and Study 4. Of the participants from Study 3, three participants scored above 8 on the BDI when they returned for their second session, and five participants were unable to return for the second session. Thus, 22 participants (12 males and 10 females) returned to participate in Study 4 and also met the inclusion criteria. The mean time between Study 3 and Study 4 for the students was 43.1 days (SD = 2.7). Participation was voluntary and each student had signed a consent form in Study 3 for this portion of the experiment. The students were given one credit toward their undergraduate psychology course for participating in Study 4.

**Materials**

*Questionnaires:* The patients and students completed the BDI, ASI, and PANAS-X. In addition, the SIGH-SAD was administered to the participants. The SIGH-SAD was administered to the patients by a trained research assistant and to the students by the experimenter.

**Procedure**

The same procedure and words were used in this study. However, since this was the second time that all participants were performing the memory task, an attempt was made to make the second cognitive task as different from the first as possible. This was done by using the Unseen words from the test at Time 1 (i.e., Study 3) as the Visual words in the memory test at Time 2 (i.e., Study 4). Similarly, the Visual words from Time 1 were used as the Auditory words at Time 2, and the Auditory words at Time 1 were used as the Unseen
words at Time 2. The Visual words were most important since they are the words which are used to calculate R and A'. Thus, the words which were not displayed during the encoding portion of Study 3 were used as the Visual words in Study 4.

In addition, if the participant had been given Version 1 of the memory test with the inclusion instructions and Version 2 of the test with the exclusion instructions at Time 1, this participant would be given Version 1 of the memory test with the exclusion instructions and Version 2 with the inclusion instructions at Time 2. The order of the memory tests was also reversed; for example, if the exclusion task had been given first at Time 1, the inclusion task would have been presented first at Time 2.

Unfortunately, the number of words in each of the word categories was limited so it was not possible to develop completely new stimuli for the memory tests. The changes discussed above maximized the difference between the memory tests at Time 1 and Time 2 even though the word stimuli were not changed.

Results and Discussion

Preliminary Analyses

Characteristics. Analyses revealed that this group of patients did not differ from the group of students in terms of marital status, t(33) = 1.90; or level of education, t(33) = .57. However, the patients were significantly older than the students, t(33) = 3.41, p < .002. The mean age (and standard deviation) of the patients who responded to treatment and the students were 31.4 (2.1) years and 24.1 (1.4) years respectively.

Questionnaires. Responders to treatment were defined as those patients who scored 0 - 7 on the HAM-17 after six weeks of treatment. Eight patients (6 males and 2 females) met
this criteria as responders. Non-responders were defined as patients who scored 16 or above on the HAM-17 after six weeks of treatment. Four patients (all male) met this criteria as non-responders. Partial responders were defined as patients who scored between 8 and 15 on the HAM-17 after six weeks of treatment. Only one patient (male) met this criteria for partial responder. The data for this partial responder was not included in the following analyses.

Because the majority of the patients responded to the treatment, the non-responder group only consists of four patients. It would be difficult to draw any conclusions based on such a small sample size in the non-responders group. Thus, only results related to the responders and healthy control participants are reported in the following analyses.

T-tests were performed to compare the patients who were responders to the treatment to the students on the ASI, BDI, HAM-17, HAM-21, and HAM-SAD. After treatment there were no significant differences between the responders and the students in scores on these questionnaires: ASI, \( t(28) = 1.06 \); BDI, \( t(28) = .42 \); HAM-17, \( t(28) = .63 \); HAM-21, \( t(28) = .55 \); and HAM-SAD, \( t(28) = .37 \). [Note: The group of responders did score significantly higher than the students on the BDI, \( t(28) = 10.82, p < .001 \); HAM-17, \( t(28) = 19.40, p < .001 \); HAM-21, \( t(28) = 18.80, p < .001 \); and HAM-SAD, \( t(28) = 7.55, p < .001 \) before they received treatment. However, there was no significant difference in ASI scores between the students and responders before treatment, \( t(28) = 1.74 \).] See Table 10.4 in Appendix I for summary of questionnaire scores for the responders and control participants.

**Primary Analyses**

*Comparison of PANAS-X scores.* As predicted, the mean PA score on the PANAS-X did not differ when responders were compared to the healthy controls, \( t(28) = .72 \). There was
also no significant difference between the groups in mean NA score on the PANAS-X, \( t(28) = .45 \). [Note: Before treatment, the responders had significantly lower scores on PA on the PANAS-X, \( t(28) = 2.89, p < .008 \), and significantly higher scores on NA on the PANAS-X, \( t(28) = 2.91, p < .008 \), than the students.]

*Estimates of Conscious and Automatic Recollection.* The proportions of words checked under the inclusion and exclusion instructions were converted to estimates of \( R \) and \( A' \) using the equations in Jacoby et al. (1993). These estimates were separately submitted to analyses of variance using group (responders vs students) as a between-subjects factor and word category (HPA, HNA, PT, NSR, CN, and UN) as a within-subjects factor. See Table 10.22 in Appendix J for inclusion, exclusion, \( R \), \( A \) and \( A' \) means for the responder and control groups at Time 2.

**R results:** The ANOVA for the \( R \) data collected during Study 4 revealed no significant effects. This result was as predicted since no differences in \( R \) for any word categories were expected after the patients were successfully treated.

No overall difference in \( R \) between the responders and the control participants is consistent with the findings of Bazin et al. (1994). The patients in the Bazin et al. study did show a deficit in explicit memory for words before treatment. After treatment for clinical depression, the patients in the same study did not differ from the control participants in terms of explicit memory for words. However, in the study presented here, it is important to note that an ANOVA performed on the \( R \) data collected during Study 3 for the group of responders (i.e., before these patients were treated) revealed no significant effects. Thus, there were no significant differences between the group of patients who responded to
treatment and the healthy students in R for any of the word categories before or after treatment.

**A’ Results:** The ANOVA of group (responders vs students) and A’ of the word categories revealed no significant effects. This is interesting since a similar ANOVA using data for the same groups from Study 3 (i.e., before the patients were tested) showed a significant main effect of group, $F(1, 28) = 20.62, p < .001$. Before they were treated, the responders had a significantly lower A’ (collapsed over all words) compared to the students, but this effect was not evident after the patients had positively responded to the treatment. There was a trend for a time (Time1 vs Time2) by group (students vs responders) interaction effect (see Figure 6.1); however, this interaction did not quite reach significance, $F(1, 28) = 3.45, p < .08$. This interaction may have been significant if a larger group of responders had been included.

A planned contrast revealed no significant difference in A’ for NSR words between the responders and students after the patients had been treated, $F(1, 28) = .20$. Again, it is important to note that a similar planned contrast using Study 3 data (i.e., data from the study performed before the patients were treated) also showed no significant difference in A’ for NSR words between the group of responders and the students before the patients had been treated, $F(1, 28) = .27$.

In summary, the only change evident from the analyses in the comparison of patients and healthy participants before and after the patients responded to treatment was the lack of a difference in overall A’ after the patients had been treated.
Figure 6.1 Trend for an interaction (p < .08) of students versus patients who responded to treatment (responders) at Time 1 (before treatment) and Time 2 (after six weeks of treatment).
Summary

There were no differences between the patients who responded to treatment and the healthy volunteers on any of the questionnaire measures. These results were as predicted.

Also as predicted, there were no differences between the responders and healthy volunteers in R for any of the word categories. There was also no difference between the groups in terms of overall R. There were no differences between the groups in A' for any of the word categories. This was against the prediction that the responders would demonstrate a higher A' for NSR words than the healthy volunteers.
Summary of Results

The following is a summary of the results of these studies related to the specific hypotheses which were described in the introduction:

1. Anxious participants should have high levels of NA with varying levels of PA. In contrast, depressed participants should have high levels of NA combined with low levels of PA.

Results:

High anxiety sensitive participants did demonstrate higher levels of NA than the low anxiety sensitive participants, however there was also a difference between these groups in terms of PA levels. The HAS group had significantly lower PA scores than the LAS group; however, the HAS group also reported significantly higher levels of depression than the LAS group. As predicted, the HBD participants showed both higher levels of NA and lower levels of PA than the LBD participants. Similarly, the patients with major depressive disorder also had higher levels of NA and lower levels of PA than the healthy control participants before, but not after, responding to treatment. There were no differences in PA or NA scores when the patients who responded to treatment were compared to the healthy controls.

2. HAS participants were expected to have an automatic bias for PT words when compared to LAS participants. No conscious MCM biases were expected in the HAS group.

Results:

No difference in automatic memory for PT words was found between the HAS and LAS groups. However, there was a significant interaction between these groups and the word categories in conscious memory. A Least Significant Difference (LSD) post hoc test demonstrated that the HAS group had a significantly higher conscious recollection than the
LAS group for the categorized neutral words only.

3. **HBD participants should demonstrate a higher conscious recollection for HNA words and a lower conscious recollection of HPA words than the LBD participants. No biases in automatic memory of the HBD participants were expected.**

**Results:**

Contrary to the prediction, no difference in conscious recollection of HNA words was found between the HBD and LBD groups. In addition, the conscious recollection of the HBD participants for HPA words was actually higher, not lower, than that of the LBD participants. There were no significant differences between the HBD and LBD groups in automatic memory for any of the word categories.

4. **Before treatment, the patients with major depressive disorder should show a higher conscious recollection for HNA words and a lower conscious recollection of HPA words than the healthy control participants. In addition, they were predicted to demonstrate an automatic memory bias for NSR words when compared to the controls.**

**Results:**

There were no significant differences between the depressed patients and the healthy control participants in terms of conscious recollection for HNA or HPA words or automatic memory for NSR words.

5. **Patients who responded to treatment for their disorder should no longer demonstrate any conscious memory biases when compared to the control participants. However, they would still be expected to have an automatic memory bias for NSR words. In contrast, there should be no changes in the conscious or automatic memory biases of those patients who do not**
respond to treatment.

Results:

There were no differences in conscious or automatic memory for any of the word categories (including NSR words) when the responders were compared to the healthy control participants. The sample size of the non-responder group was too small to accurately examine their memory data.

6. Female participants in both the clinical and non-clinical groups were expected to have stronger MCM biases than the male participants. Therefore, the (clinically and non-clinically) depressed women should demonstrate a higher conscious memory for negative word stimuli than the depressed men. Similarly, the non-depressed women should show a higher conscious memory for positive words than the non-depressed male participants.

Results:

There was no significant difference between the LBD men and women in their memory for the negative and positive words. A significant interaction effect revealed that the non-clinically depressed (HBD) female participants consciously remembered fewer positive words and more negative words than the HBD men. In contrast, the female SAD patients showed a trend for higher automatic memory for positive words than the male SAD patients. No differences were found between the male and female MDD patients for automatic or conscious memory of positive or negative words.
General Discussion

The following is a discussion of the predictions and implications of the results found in these studies.

Methodological Improvements

This thesis addressed several weaknesses of Hertel and Milan's (1994) methodology which were identified earlier in the introduction. First, the word stimuli of the present studies were rated for emotionality by ten independent judges. This allowed us to equate the words in terms of word length and word frequency as well as control for the emotionality of the word stimuli. The various categories of emotional word stimuli were equated for the absolute value of emotionality so any differences in memory could not be attributed to differences in emotionality of the words. Instead, differences would have to be attributed to differences in word meaning. Second, the presentation rate used in the auditory encoding task was six seconds instead of 1.5 seconds. This allowed the participants sufficient time to process and try to remember words in the auditory encoding session. Third, the participants were given specific processing instructions during both the visual and auditory encoding tasks. Participants were asked to rate the emotionality of words on a seven-point scale. Thus, we knew that participants had to think about the meaning of all words presented. Fourth, an important improvement was in the simplicity of the instructions used in these studies. No participants appeared to misunderstand the study instructions. These participants included both university students and clinically depressed patients. Depressed patients often have difficulties in concentration and would therefore be more likely to have difficulties with complicated instructions. The task instructions used in these studies were comprehensible to
even the depressed patients. Fifth, the students who were compared in terms of their level of depressive symptoms as measured on the BDI were separated by a larger difference in scores in the present studies than in the Hertel & Milan (1994) study. This allowed us to compare participants who differed more significantly in terms of depressive symptoms.

In addition, the words in these dissertation studies were divided into mood-congruent and cognition-congruent stimuli. This distinction helped make more clear differentiations between the types of word which cause MCM biases to be evident in depressed and anxious individuals. All of these methodological improvements helped us determine the variables which affect mood-congruent biases using the PDP methodology.

**Anxiety-Related Findings**

Individuals with anxiety disorders were predicted to have no biases in consciously-controlled, effortful processing. However, it was hypothesized that they would have automatic processing biases for threat-related stimuli. This would enable these individuals to be quickly and automatically alerted to dangerous cues in the environment.

Memory biases were not studied in a population of clinically anxious patients in this series of studies, so no definitive conclusions related to cognitive biases in anxiety disorders can be drawn. However, Study 1 involved healthy participants with high (HAS) versus low (LAS) levels of anxiety sensitivity. This allowed us to tentatively examine a few of the predictions related to anxiety levels in a non-clinical population.

Because the ASI has been shown to be a subfactor of trait anxiety (Taylor, 1995) and is correlated to STAI - trait scores (Taylor et al., 1991), it was predicted that participants with high ASI scores would score higher on the STAI - trait than participants with low ASI scores.
This prediction was verified in Study 1. The students with higher ASI levels also had higher NA levels as measured on the PANAS-X. This is consistent with the predictions since anxious individuals should demonstrate high levels of NA. However, anxiety should not involve any particular level of PA. This was not the case in Study 1 since HAS participants had significantly lower PA levels (as well as elevated NA scores) when compared to the LAS participants. This pattern of NA and PA is more consistent with what would be expected for depressed individuals. It is important to note, however, that the HAS participants also had significantly higher BDI scores than the LAS participants. Thus, this finding is not inconsistent with the hypotheses since the lower PA scores may have been due to their higher level of depressive symptoms. However, when the HAS participants were divided into those with vs without high BDI scores, there was no significant difference in PA scores between these two groups.

The examination of conscious recollection allowed us to explore the hypothesis that anxious individuals do not have any biases in conscious, effortful processing. In Study 1 there was a significant interaction effect between ASI group (HAS vs LAS) and R for the word categories, \( p < .02 \). Overall, the HAS group consciously remembered a slightly greater number of positive, physical threat, and neutral words (i.e., HPA, PT, CN, and UN words), but similar numbers of HNA and NSR words than the LAS group. It should be noted, however, that the only significant difference between the groups for R for the word categories revealed by LSD post hoc tests was in R for CN words, \( p < .003 \). This conscious memory bias for neutral words was not predicted. However, as predicted, the R for the HPA words was not significantly lower for the HAS group when compared to the LAS group.
Patients with panic disorder would be expected to have an automatic memory bias for physical threat-related stimuli since these stimuli are directly related to the patients’ concerns. Since anxiety sensitivity is proposed to be a cognitive risk factor for the development of panic disorder (Maller & Reiss, 1992; Reiss & McNally, 1985), HAS participants were predicted to have higher automatic memory (A’) for PT words than the LAS participants. Contrary to this prediction, no significant difference was found between the HAS group and the LAS group in A’ for PT words. It is possible that an automatic memory bias for PT words would only be evident in individuals with clinical levels of panic symptoms. The HAS individuals were included in this study only if they did not report a present diagnosis of an anxiety disorder. Thus, the HAS participants may be at risk for development of panic disorder without showing any present cognitive biases. An automatic memory bias for PT words may develop after the development of panic disorder, not before.

There is some evidence in the literature for an automatic memory bias for panic-related words in panic disorder patients. Cloitre et al. (1994) found that patients with panic disorder had an implicit memory bias for catastrophic associations to bodily sensation words when compared to clinician and normal control participants. Similarly, Amir et al. (1996) found that panic disorder was associated with an implicit bias for panic-related sentences. However, explicit memory biases have been found more often than implicit biases for panic-related words in panic disorder patients (Becker, Rinck, & Margraf, 1994; Cloitre et al., 1996; Lundh, Czyzykow, & Öst, 1997). These mixed findings may indicate that both implicit and explicit memory biases for threat-related words emerge after the development of panic disorder. These memory biases may develop due to both highly elaborated and easily
activated cognitive structures related to catastrophic associations in panic disorder (Cloitre et al., 1994). The results of past studies, including one which showed no explicit or implicit memory biases in panic disorder (Rapee, 1994), demonstrate that much remains to be learned about cognitive biases in panic disorder.

A variety of findings related to memory biases in high anxiety sensitive participants have also been reported in the literature. Similar results to those of Study 1 involving high and low anxiety sensitive participants were found by Kim (1993). Kim also examined consciously-controlled and automatic memory for words (threat, positive-related, positive-unrelated, and neutral) in high and low anxiety sensitive participants. This researcher used an implicit word stem completion task and an explicit cued recall test and found no difference in implicit or explicit memory for any word types (including the threat category) between the two groups. This additional evidence again suggests that individuals with high anxiety sensitivity do not appear to have any cognitive biases.

However, McCabe (in press) performed similar implicit and explicit memory tests with participants who were high or low on the ASI. McCabe found that high anxiety sensitive participants demonstrated an explicit memory bias for threat words (i.e., events with disastrous consequences), although not for words related to anxiety (i.e., fear and bodily sensation words) when compared to LAS participants. The HAS participants in the McCabe study did not demonstrate any implicit memory biases. Although McCabe used very similar tasks and word categories to that of the Kim (1993) study, the results were not the same. It is difficult to understand why McCabe found an explicit bias for threat words in high anxiety sensitive individuals but Kim did not.
To lend further confusion to the evidence regarding memory biases and anxiety sensitivity, Lang and Craske (1997) found an implicit memory bias for physically threatening words in participants with high anxiety sensitivity. These investigators presented the words paired with sentences which either did or did not make sense with the words during the encoding phase. Lang and Craske used an implicit word completion task and an explicit cued recall test to assess memory biases equivalent to the tasks used by Kim (1993) and McCabe (in press). Although both the Lang and Craske and the McCabe study found memory biases for threat words in high anxiety sensitive individuals when compared to low anxiety sensitive participants, they found the biases in different cognitive processes. Lang and Craske found the memory bias in implicit memory, whereas McCabe found the bias for threat in explicit memory.

The findings related to memory biases and anxiety sensitivity are obviously unclear. Although McCabe (in press) and Lang and Craske (1997) did find memory biases in high anxiety sensitive participants, they used implicit and explicit tests of memory. As discussed earlier, it is not possible to determine whether participants are using only conscious processing in the explicit test and only automatic processes in the implicit task. Further research is needed to examine anxiety sensitivity and memory biases with cognitive techniques which do not assume that the tasks used are process pure.

**Mixed Depression and High Anxiety Sensitivity**

There were no significant differences in memorial performance between depressed patients with versus without high anxiety sensitivity. Although these patient groups differed significantly in terms of ASI scores, none of the patients met the criteria for a DSM-IV
anxiety disorder (as required by the inclusion criteria.) Finding no significant difference in automatic memory for PT words between the patients with versus without high ASI scores confirms the similar findings in the study of healthy students (Study 1 and Study 2.) There was no significant difference in A’ for PT words in HAS participants when compared to the LAS participants in Study 1. There was also no significant difference in A’ for PT words for students with high BDI scores who also had high anxiety sensitivity when compared to those with low anxiety sensitivity.

These results are similar to those of Lang and Craske (1997) who found no difference in the implicit or explicit memory biases for physical threat (or any other) word categories when participants with high ASI scores and low BDI scores were compared to those with high ASI scores and high BDI scores. Thus, the null results in the present studies may not be due to the small sample size. Instead, the addition of depressive symptoms to high anxiety sensitivity does not appear to cause further changes in cognitive processing. However, further research with larger sample sizes are necessary to confirm these results since the samples examined in both the present study and in Lang and Craske (1997) were relatively small (n < 20).

**Depression-Related Findings**

The depressed participants were expected to demonstrate high NA and low PA. As predicted, the mean NA score on the PANAS-X was significantly higher and the mean PA score on the PANAS-X was significantly lower for the participants with more depressive symptoms, that is, for the depressed patients when compared to the healthy controls and for the HBD group when compared to the LBD group. Thus, this pattern was shown to hold for
the studies including both the clinical and non-clinical participants.

Memory Results for Non-Clinical Depressed Participants

In the study involving non-clinical participants, the HBD participants were hypothesized to consciously recollect fewer HPA words and more HNA words compared to the LBD participants (due to mood-congruent memory.) Thus the R of HPA words should be significantly lower for the HBD group than for the LBD group, and the R of HNA words should be significantly higher. Contrary to the predicted outcome, there was no difference in conscious recollection of HNA words between the HBD and LBD groups. Also, contrary to the prediction, the conscious recollection of HPA words was actually significantly higher, not lower, for the HBD participants when compared to the LBD participants.

One possible explanation for this finding is that the words were antonyms for words which are directly related to depressed mood. McNally, Riemann, Louro, Lukach, & Kim (1992) demonstrated that panic disorder patients were slower to name the color of positive words as well as emotionally negative words which were related to panic in a Stroop color-naming task. The investigators suggested that these positive words were salient to the patients because they may have associated the words with their antonyms.² In the present studies, because these HPA words are also related to antonyms of depression-related stimuli, they may have been consciously remembered better by the participants who had more depressive symptoms. For example, an individual who is experiencing higher levels of depressive symptoms may remember a HPA word such as "concentration" because he is

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²However, caution is necessary when discussing these findings related to slower color-naming of positive words by panic disorder patients because they were not replicated in a more recent study (McNally, Amir, Louro, Lukach, Riemann, & Calamari, 1994).
having difficulty concentrating. This could explain why these HPA words are related to
depression and thus would be remembered better by participants who have higher scores on
the BDI. Positive affect is most specifically relevant to depression, and therefore the HPA
words could be more relevant for depressed patients (and thus better remembered) than the
HNA words.

An alternative explanation for the higher conscious memory for HPA words in the
students with higher depression levels is that this memory bias is truly mood incongruent.
Hartlage et al. (1993) hypothesize that individuals who are prone to clinical depression use
consciously controlled processes to overcome negative automatic processes which make
them vulnerable to relapsing. Similarly, Blaney (1986) proposed that a bias for positive
stimuli in conscious memory processes may occur in presently depressed individuals who are
trying to improve their moods. This conscious memory bias could represent a technique for
overcoming depression. That is, consciously trying to remember positive information could
help a person overcome the depressed mood.

Several past studies have provided evidence for mood incongruent conscious memory
biases in individuals with depressed mood. Parrott and Sabini (1990) found that healthy
participants who were sad tended to remember positive past events in their own lives more
than those who were happy. The authors interpreted these results to suggest that mood
incongruent recall is a means of preventing or alleviating depressed mood. In another study,
Bradley et al. (1994) found an automatic bias for depression-relevant words but not a
conscious depression-congruent bias in their non-clinical depressed participants. Bradley et
al. (1995) suggest that these results may reflect the operation of effortful processes which act
to counteract the effects of automatic negative memory biases. They also hypothesize that this may protect against further deterioration in mood. Most recently, Boden and Baumeister (1997) found that a particular group of participants demonstrated mood incongruent biases after the induction of negative mood. These individuals were categorized as repressors who were defined as being averse to the experience of negative affect and the exposure to unpleasant stimuli. These repressors tended to produce more positive thoughts and memories and generate them faster than nonrepressors after viewing an unpleasant videotape. The authors concluded that these repressors focussed on positive thoughts to avoid the experience of the negative mood induction. Thus, these studies together suggest that at least some individuals who are in a depressed mood (although not suffering from clinical depression) tend to focus on positive information, possibly in order to counteract their negative mood state and prevent themselves from becoming more depressed. This tendency to focus on positive information may have occurred in this study, thereby being expressed as an increased conscious recollection of HPA words in the students with more depressive symptoms.

No differences in A' for any of the word categories were predicted between the HBD and LBD groups since the participants were expected to differ in their present state (not trait) depressive level. Thus, no automatic biases would be evident. The results were as predicted: there was no significant difference between the HBD group and the LBD group in A' for any of the word categories.

Memory Results for Clinically Depressed Patients

Before Treatment:
The hypotheses predicted that both the effortful, conscious cognitive resources and
the automatic processes of patients who are presently suffering from major depressive
disorder would be biased toward processing negative information. The conscious biases
should be for mood-congruent stimuli (i.e., HPA and HNA words). The automatic negative
biases would be directly related to the negative automatic thoughts and would thus be
cognition-congruent biases (i.e., for NSR words). Contrary to the prediction, there was no
difference in consciously-controlled memory for HPA or HNA words when the patient and
healthy control groups were compared. However, as demonstrated in several studies in the
literature (e.g., Bazin et al., 1994; Deijen et al., 1993; Roy-Byrne et al., 1986), the overall R
for the patients was significantly lower than the overall R for the students. Contrary to the
prediction, there was no significant difference between the patients and students for A' of
NSR words. In sum, there was no evidence for mood-congruent biases (higher recollection
of HNA words and lower recollection of HPA words) in consciously-controlled measures,
nor was there evidence for cognition-congruent biases for NSR words in automatic memory
in the depressed patients.

There was no decrease in conscious memory for the HPA words in this group of
clinically depressed participants when compared with the controls. Thus, although the
patients' conscious memory for these positive words was not less than that of the controls, it
also was not greater. This was in contrast with the results of the study of non-clinically
depressed students. These findings suggest that the reason for the increased conscious
memory for HPA words in the students with higher levels of depressive symptoms was
unlikely to be due to the fact that the words could have been viewed as antonyms for
depression-related words. If that had been the case, one would expect that the patients would show a similar increase in R for HPA words when compared to the control participants.

Alternatively, the data appears more consistent with the hypothesis that the students who were in a depressed mood but were not clinically depressed may have been using a type of mood-corrective strategy by consciously remembering more positive words. It appears that the patients with clinical depression were unable to use such an effortful strategy to alleviate their depression. Once in a major depressive episode, the patients would appear unable to recover by simply focusing on positive thoughts and memories.

Although the depressed patients did not have a better conscious memory for positive words than the healthy controls, the patients also did not consciously or automatically remember more negative words than the controls. However, when this group of patients was examined more closely by separately analysing the data of the male and female patients, several interesting findings surfaced. The male depressed patients demonstrated a decrease in automatic memory for positive words, but the female depressed patients did not demonstrate any MCM biases. This again yields evidence that increased conscious recollection for HPA words in the non-clinically depressed group of students was not because the HPA word stimuli were antonyms for depression-related words. Rather, it is more likely that a mood-incongruent corrective bias was functioning in the students with more depressive symptoms.

It appears that, at least in the male patients, clinical depression results in a decrease in automatic memory for positive information without an increase in conscious recollection for positive information. This decrease in automatic memory for positive stimuli was not found in the female patients; however, similar to the male patients, there was no increase in
conscious recollection for positive words compared to the healthy controls. Thus, the clinically depressed patients may be unable to use corrective strategies to get out of their depressive state.

After Treatment:

After responding to treatment for their depressive disorder, the patients were not expected to report low PA or high NA since they would no longer be in a depressed mood. The results of the studies showed that there were no differences between the patients who responded to treatment when compared to the healthy volunteers on any of the questionnaire measures. Thus, there indeed was no difference between the groups in terms of PA or NA scores as predicted.

The hypotheses stated that the recovered patients’ conscious cognitive resources would no longer be allocated to processing negative information. Thus, these patients should no longer demonstrate mood-congruent biases in consciously-controlled memory since they are no longer experiencing depressed mood. However, they would be vulnerable to developing depression again since they would still have biases to automatically process negative self-referent information. If treated with an antidepressant, this automatic processing bias should still be evident since antidepressants do not directly target automatic cognitive biases. Since the patients involved in these studies were treated with antidepressant medication, they were expected to still have an automatic bias for processing negative self-referent information.

As predicted, there were no differences between the responders and healthy volunteers in conscious recollection for any of the word categories. However, there were
also no differences between the groups in automatic memory biases. This was against the prediction that the responders would demonstrate a higher A’ for NSR words than the healthy volunteers. Thus, there was no evidence in this group of patients for an automatic processing bias for negative self-relevant word stimuli.

**Sex Differences in Memorial Performance**

Because females are more likely to develop major depressive disorder and tend to take longer to recover from a depressive episode (Dunn & Skuse, 1981; Pajer, 1993), the female participants were hypothesized to have stronger MCM biases for negative information than the male participants. Evidence supporting this hypothesis was found by Clark and Teasdale (1985) and Rothkopf and Blaney (1991) as discussed earlier.

**Students**

The data from the two studies involving student participants were combined so that any sex differences could be examined. Although the male and female students did not differ in terms of demographic characteristics or any questionnaire measures, the male students did differ from the female students in their memorial performance.

When all of the male student participants were compared to all of the female students, no differences in memory biases for the words were found. However, when the students with higher levels of depressive symptoms alone were examined, a significant interaction effect revealed that the female HBD students consciously remembered more negative words and fewer positive words than the male HBD students. Planned contrasts did not reveal any statistically significant differences in conscious memory for positive or negative words when the HBD men and women were compared; however, these results may have reached
significance if larger samples of male HBD participants had been included in the study. Only 12 male and 30 female participants met the criteria for inclusion in this HBD group. The pattern of results suggests therefore that positive concepts are less accessible and negative concepts are more accessible to women who are in a depressed mood than men who are in a similar mood. This sex difference in MCM biases was only found in the students with higher depression levels. In other words, no differing memory biases for the word categories were demonstrated by the male and female students with low depression levels. However, the LBD females remembered more words overall (both positive and negative words) than the LBD males.

In summary, the HBD female participants showed a stronger conscious MCM bias than the HBD males. This memory bias was similar to that found by Clark and Teasdale (1985) and Rothkopf and Blaney (1991). However, these past studies demonstrated that the female participants only remembered more negative material, not more negative and less positive material as was found here. In addition, Clark and Teasdale found that the female participants who were induced into a positive mood had a bias for remembering more positive words than the males who were in a happy mood. The LBD female students in the present studies did not demonstrate this bias for positive word stimuli when compared to the LBD male students. However, no mood induction techniques were used in the present studies. Thus, although the students reported few depressive symptoms on the BDI, we cannot assume that the students felt happy or elated during the experimental session. This may explain why no MCM bias differences were found here between the male and female LBD participants but were between the male and female HBD participants.
Patients

The data from the male and female depressed patients before treatment were also compared to assess whether the female patients would have stronger MCM biases than the male patients, as predicted and as seen in the HBD female students. The female patients were hypothesized to have a better conscious memory for negative words than the male patients; however, a very different result was found. When the male and female patients were directly compared, the only apparent difference was found in the SAD patients. The female SAD patients had a trend (p < .10) for higher automatic memory for the positive words, but no difference in automatic memory for the grouped negative words when compared to the male SAD patients. These findings were unexpected since the female HBD students had a higher conscious memory for negative words than the male HBD students; whereas, the female SAD patients had a higher automatic memory for positive words than the male SAD patients. These differences in MCM biases may have only been found in the SAD group and not the MDD group because the number of women in the MDD group was so small (N = 4). However, it is difficult to understand why the female SAD patients performed in this unanticipated manner when the female HBD students showed biases in the expected direction.

Because of these unexpected results with the male and female SAD patients, we further examined the data of the male and female patients when compared to the males and females in the control group. The lack of significant automatic MCM biases when the entire patient group was compared to the control group may have been partially due to the odd MCM biases in the female SAD patient group.
When only the male participants were examined in Study 3, the male patients (MDD and SAD) had a significantly lower automatic recollection for positive words than the healthy male controls but the same level of automatic memory for the negative word stimuli (when all of the negative words were grouped together.) In contrast, there were no significant differences in memory for these word types when the female patients were compared to the female controls. Thus, the male depressed patients demonstrated a mood-congruent automatic memory bias (i.e., a decrease in A' for positive words), but the female depressed patients did not. In the male patients, clinical depression appeared to result in a decrease in automatic memory for positive information. This decrease in automatic memory for positive stimuli was not found in the female patients.

Again, it is difficult to explain why this MCM bias in automatic memory was found when the male patients and controls were contrasted but not when the female patients and controls were compared. In addition, the sex differences in MCM biases were predicted to occur in conscious, not automatic memory. It is possible, however, that clinical levels of depression are maintained by an automatic MCM bias for remembering less positive information. If an individual automatically remembers less positive information, then this could certainly exacerbate the depressive state.

**Summary of Sex Difference Results**

There is no obvious reason why the male patients showed an automatic mood congruent bias and the female patients did not, especially since the female students with high BDI scores did demonstrate a MCM bias. The female students with high levels of depressive symptoms generally performed as expected (although they remembered fewer positive words
as well as more negative words); however, the female patients did not. The male patients actually demonstrated biases similar to those that were expected to be seen in the female patients with major depression. Further research on sex differences in automatic and conscious memory biases for emotional words is needed with larger samples of participants before any definitive conclusions can be drawn.

Cognitive Impairment in Depressed Patients

Conscious Memory Deficits

The overall conscious recollection for the clinically depressed patients was decreased compared to the healthy control group. This finding is consistent with the results of several past studies (e.g., Bazin et al., 1994; Deijen et al., 1993; Roy-Byrne et al., 1986). Interestingly, overall conscious recollection for non-clinically depressed (HBD) participants was increased when compared to the LBD group. This finding with the non-clinical HBD participants was not expected. Hertel and Milan (1994) found an opposite effect such that an overall impairment in conscious memory was demonstrated in dysphoric students.

Hertel (1998) recently replicated the findings of Hertel and Milan (1994) with a PDP paradigm using non-emotional words in a word-stem completion task. This study found that conscious recollection was impaired when compared to control participants only if dysphoric participants either performed a self-focus task or if the time between study and test was unstructured. If, however, the dysphoric participants were given a self-irrelevant task to perform between study and test, then no impairment was evident in conscious recollection. Hertel (1998) hypothesized that the impairment in conscious recollection found in the first two groups of dysphoric participants was due to self-focussed rumination. Because the
participants in the studies in this thesis were given a self-irrelevant distraction task between study and test, they were not given the opportunity to perseverate on self-relevant thoughts. In view of the recent findings of Hertel (1998), it is therefore not surprising that the HBD participants were not impaired in their overall conscious recollection of the words. They performed more similarly to the dysphoric participants in Hertel’s (1998) study who performed the self-irrelevant task between study and test.

Although the lack of impairment of the HBD group in this thesis can be understood in light of Hertel’s (1998) recent findings regarding rumination, it is still unclear why the HBD group had an increased conscious recollection when compared to the LBD group. Other hypotheses will need to be considered in order to explain this result.

Overall, the data from the studies in this thesis appear to demonstrate that the conscious memory of depressed individuals is in the shape of an inverted U. The students with more moderate levels of depressive symptoms had a better conscious recollection for words than the students with very few depressive symptoms. These findings are contrasted with the data of the depressed patients who seem to be impaired in their conscious recollection of words when compared to the healthy control participants. In summary, the students with low BDI scores performed less well on the measure of conscious memory than the students with high BDI scores, but the patients with major depressive disorder did not perform as well as the student participants with high BDI scores. The patients’ overall conscious memory performance was actually very similar to that of the low BDI group of students.

These overall results related to the performance of the participants on the measure of
conscious memory appears similar to the pattern found by Yerkes and Dodson (1908).

Yerkes and Dodson (1908) found that an intermediate level of shock improved the performance of mice on a difficult task when compared to low levels or stronger levels of shock. Thus, an inverted U shaped curve was used to describe the relation between strength of the shock and the speed of learning a task. This curvilinear relationship is known as the Yerkes-Dodson law.

The Yerkes-Dodson law has been related to concepts such as arousal, motivation, and anxiety (see Teigen, 1994 for review). Thus, this law may be relevant to the present studies with participants who varied in their levels of anxious and depressive symptoms. Participants with very low levels of depressive symptoms may be less motivated to perform well on the memory task, whereas the participants with higher (but non-clinical) levels of depressive symptoms may be more motivated. The depressed patients may have an even higher level of motivation. This very-high level of motivation combined with symptoms of clinical depression such as difficulties in concentration and sleep may cause their performance to be impaired. Thus, the performance of the participants with low BDI scores, participants with high BDI scores, and the patients with major depressive disorder could be affected by level of motivation and result in the inverted U curve demonstrated in these studies.

This hypothesis related to motivation and depression seems to help explain the data of the present studies. However, one must ask why the level of depression would effect the motivation of the participants. It is important to note that the students with more depressive symptoms also had higher scores on questionnaires related to anxiety levels and fear of
anxiety symptoms. This combination of anxiety and depression at these non-clinical levels may actually increase arousal and also the individuals' incentive to try to remember the words presented. These participants who report anxious and depressive symptoms may want to try hard at this task and not want to fail. They could be focusing on negative outcomes such as failure and the possibility of poor performance so they would increase their efforts in order to not fail. This increased effort could be protective such that a positive experience could help the individual recover from her depressive mood. The patients, on the other hand, may be so severely depressed that their cognitive capabilities are actually impaired due to symptoms such as those discussed above.

Evidence for this role of anxiety in the non-clinical participants comes from a comparison of the data for the LBD students from Study 2 and those of the healthy control participants for Study 3. The inclusion and exclusion criteria for both of these groups of participants was equivalent except that the controls for Study 3 were excluded from the experiment if they had any past history of anxiety and/or depressive disorders, whereas participants in Study 2 could have had such a history. Although the inclusion criteria were identical, a difference in R (collapsed over all word categories) is evident when the data for these two groups are compared (see Figure 3.1 and Figure 5.1.) An analysis of variance reveals that the overall conscious recollection of the LBD students in Study 2 is significantly lower than that of the healthy controls in Study 3, F(1, 71) = 6.66, p < .02. It must be noted that there were no significant differences between these groups in any of the demographic characteristics or questionnaire scores except for ASI score, t(71) = 3.93, p < .001, and STAI-trait, t(71) = 2.16, p < .04. The LBD students in Study 2 had significantly lower scores on
both of these anxiety-related measures than the control participants in Study 3. It therefore appears that the level of trait anxiety and fear of anxiety symptoms in these non-clinical participants somehow motivated the individuals to increase their effort. Again, this appears to relate to the inverted U-shaped curve of arousal.

A direct test of the Yerkes-Dodson law relating anxiety and level of performance has been done by Deshpande and Kawane (1982). These researchers examined the effects of differing levels of anxiety on a task of verbal learning. This study found an inverted U relationship between level of anxiety and learning such that the best performance was found in participants with a moderate level of anxiety. These results support the application of the Yerkes-Dodson law to the results of the present study related to conscious memory. The level of anxiety may be an important factor mediating increased conscious memory in the non-clinical participants. However, the anxiety level of the patient group did not differ significantly from that of the students with high BDI scores. Therefore, this hypothesis does not explain why the clinically depressed patients did not perform as well as the non-clinical participants with high BDI scores. Again, we need to come back to the symptoms of clinical depression. Perhaps the difficulties in concentration and sleep could affect the ability to consciously remember information. These symptoms could disrupt cognitive processing regardless of the level of anxiety or motivation of the individuals.

These results suggest that the level of anxiety and fear of anxiety symptoms could play a large role in conscious memory in healthy individuals. It is interesting, however, that there were no differences in overall R between the high anxiety sensitive and low anxiety sensitive participants in Study 1. There was also no significant difference in overall
conscious memory between the participants with mixed depression/high anxiety sensitivity versus pure depression. However, almost all of the participants with high BDI scores and with clinical depression had ASI scores over what was defined as "low" in this dissertation. Therefore, very low levels of ASI and trait anxiety appear to decrease motivation in individuals faced with this difficult memory task. Higher levels of ASI and trait anxiety may increase motivation and thus increase overall conscious memory for words. However, when combined with clinical levels of depression, a deficit in conscious memory is evident.

Easterbrook (1959) proposed that increasing arousal tends to decrease the number of cues (both relevant and irrelevant) that are processed. Thus, as arousal or anxiety increases, irrelevant cues may be excluded, but with further increases in arousal, even task-relevant cues may be lost. Applied to the results of the present studies, the participants with low BDI scores may not be aroused enough to filter out irrelevant cues. Those with higher BDI scores appear to be able to exclude irrelevant cues while focusing on relevant cues. However, the depressed patients may actually exclude relevant cues. In addition, difficulties in concentration could cause an intrusion of irrelevant cues as well, thereby leading to the decrease in overall conscious memory in the depressed patients.

In conclusion, the depressed patients appear to be impaired in their overall conscious memory when compared to the healthy participants who have moderate levels of anxiety sensitivity and trait anxiety, but not when compared to healthy participants who have low levels of anxiety sensitivity and trait anxiety. These findings may be related to the level of motivation and arousal of the participants and their ability to filter cues which are relevant or irrelevant to the memory task.
Automatic Memory Deficits

Both overall conscious memory and automatic memory were decreased for MDD depressed patients. In contrast, only overall conscious memory was impaired in the SAD patients. It is possible that these differences in automatic memory performance are due to the severity of depressive symptoms experienced by the MDD versus SAD patients. Although there was no significant difference in HAM-29 scores between the two patient groups, there was a significant difference in HAM-21 scores. The MDD patients had a mean HAM-21 score of 23.6, whereas the SAD patients had a mean HAM-21 score of 13.4. Possibly symptoms experienced by MDD patients such as difficulties in sleeping cause greater cognitive impairment than the more atypical symptoms common in SAD patients.

Elliott and Greene (1992) examined patients with a mean HAM-21 score of 27.3 and found an impairment in conscious (cued recall and free recall) and automatic (implicit homophone test) memory in these depressed patients when compared to healthy controls. The mean HAM-21 score in the Elliott and Greene study was almost identical to the mean HAM-21 score found in our sample of MDD patients. As noted, the SAD patients in our study had a significantly lower HAM-21 score. Thus, the impairment in automatic memory may be related to the higher HAM-21 scores, and thus higher levels of typical symptoms of the MDD patients.

It is unfortunately difficult to compare the severity of typical and atypical symptoms of participants involved in past studies of automatic and effortful memory deficits in depression. Different studies do not use the same questionnaires to assess the level of depressive symptoms. For example, Roy-Byrne et al. (1986) and Bazin et al. (1994) do not
include the HAM-21 so the severity of depressive symptoms of the participants included in their studies cannot be directly compared to those of the patients who participated in this study. However, Deijen et al. (1993) did use the HAM-21 to assess the level of depression in their participants. The mean HAM-21 score of their patients was 20.5. This mean score is just slightly lower than that found in our sample of MDD patients (i.e., 23.6). Deijen et al. did find an impairment in effortful memory (as measured by a recognition memory task) but not on tasks that they labelled effortless. They stated that these effortless tasks measure automatic processes. However, these effortless tasks were perceptual-motor tasks, not tests of automatic memory processing. Because the difference in mean HAM-21 scores was so slight, it seems more likely that the incongruity in the findings between the Deijen et al. study and the present studies was due to the use of different tasks, not level of depressive symptoms.

A few studies have recently examined cognitive deficits in patients with major depressive disorder with a seasonal pattern (Drake, Schwartz, Turner, & Rosenthal, 1996; Michalon, Eskes, & Mate-Kole, 1997; O’Brien, Sahakian, & Checkley, 1993). Two of these studies found that these patients did have deficits on tests of cognitive failures, visual memory, visual-construction skills (Michalon et al., 1996), and spatial memory and learning (O’Brien et al., 1993). However, depressed patients with a seasonal pattern did not show deficits in attention, language, perception, pattern recognition, or verbal memory when compared to healthy controls (Drake et al., 1996; Michalon et al., 1997; O’Brien et al., 1993). Although the seasonally depressed patients were shown to have some cognitive deficits, these deficits appear to differ from those of non-seasonally depressed patients who tend to have
both attention and memory deficits (Michalon et al., 1997). Unfortunately, no past studies directly compared the performance on cognitive tasks of depressed patients with versus without seasonal patterns. Thus, although individuals with major depressive disorder with a seasonal pattern do appear to have cognitive deficits, the extent and scope of these deficits when compared to those without a seasonal pattern is not known. The present study which did directly compare these two patient groups indicates that there are differences in the extent of memorial deficits between these two patient groups such that the non-seasonally depressed group had deficits in both conscious and automatic memory, whereas the seasonally depressed group only showed deficits in consciously controlled memory.

Although no direct comparisons of cognitive performance of depressed patients with versus without a seasonal pattern can be found in the literature, there have been past comparisons of these patient groups in terms of personality characteristics. Seasonally depressed patients appear to be less sensitive to rejection (Tam et al., 1997), score lower on measures of self-criticism and dependency (Schuller, Bagby, Levitt, & Joffe, 1993), and appear to be more imaginative, more emotionally and aesthetically sensitive, and more likely to hold unconventional ideas (Bagby, Schuller, Levitt, Joffe, & Harkness, 1996) when compared to non-seasonally depressed patients. Thus, the depressed patients with a seasonal pattern may be more likely to attribute the symptoms of depression to external causes (e.g., decreased sunlight) rather than internal factors (e.g., low self-worth) (Bagby et al., 1996; Schuller et al., 1993).

Because seasonally depressed patients appear to be less self-punitive, they may have lower levels of negative cognition than non-seasonally depressed patients. Although no
differences in conscious or automatic memory for emotional words were found between the depressed patients with versus without a seasonal pattern in the present study, we cannot rule out differences in the processing of negative information between these two patient groups since only one methodology (i.e., PDP) was used. Further research with larger samples of patients and a variety of cognitive tasks is needed before any definitive conclusions regarding the differences in cognitive processing and cognitive impairment in MDD and SAD patients can be drawn.

One further note regarding any differences in cognitive processing between the seasonally and non-seasonally depressed patients relates to differences in incentive. The non-seasonally depressed patients were paid $15 for their participation, but the seasonally depressed patients were not. The seasonally depressed patients received treatment only, which was not dependent on their participation in this study. Although there were differences in incentive, it is doubtful that this resulted in the demonstrated differences in automatic memory. The payment of the non-seasonally depressed patients should have resulted in higher incentive in these patients since they received monetary payment and the seasonally depressed patients did not. However, the patients without a seasonal pattern actually demonstrated decreased automatic memory when compared to the patients with a seasonal pattern.

Finally, the MDD patients who responded to treatment did not differ from the control participants in overall automatic memory. Thus, the memory impairments of these patients who responded to treatment appeared to lessen after their depressive symptoms had decreased. This decreased impairment may be a reflection of the responders' increased
ability to concentrate and focus on relevant information while filtering out irrelevant stimuli.
Conclusions

The implications of these findings and future directions for research will be discussed in this final section. Although several predictions were not confirmed, these studies have produced interesting results which impact the theories which were discussed in the introduction.

Implications of the Findings

Beck's (1976) Cognitive Content-Specificity Hypothesis:

Beck (1976) predicted that anxious and depressed individuals have disorders in thinking which are pervasive throughout all cognitive processes. Beck differentiated between the cognitive processes of anxious and depressed patients by focussing on the content of their thoughts: the cognitive structures of depressed individuals are focussed on processing information related to loss and defeat; whereas those of anxious patients involve information related to threat and danger.

Generally, the results of the present studies do not seem to support Beck's cognitive content-specificity hypothesis. Related to the hypotheses about anxiety, the students with high anxiety sensitivity did not demonstrate any biases in either automatic or conscious memory for information related to danger (i.e., physical threat words) when compared to those with low anxiety sensitivity. In fact, the only cognitive bias found in the students with high ASI scores was a higher conscious recollection of categorized neutral words. However, these students were not diagnosed with any clinical disorder, and unfortunately we were unable to test patients with panic disorder. Although high anxiety sensitivity may be a risk factor for the development of panic disorder, the cognitive processes of those with an anxiety
disorder may differ greatly from those with high levels of anxiety sensitivity.

The data from the students with high levels of depressive symptoms also did not support Beck’s (1976) model. The students with high BDI scores actually consciously recollected more positive (HPA), not negative, words than those with low BDI scores. The students with more depressive symptoms therefore seemed to have cognitive biases for positive information, not negative information. No memory biases were found in automatic memory for any of the word stimuli when the two groups were compared. Not only did the participants with higher levels of depressive symptoms not have biases which were pervasive throughout both conscious and automatic processing, the content of the bias found did not match that predicted by Beck. Again, because these participants did not have clinical diagnoses of depression, this could explain why the results were not as predicted by Beck. Cognitive processing in non-clinically depressed individuals could greatly differ from that of patients with major depressive disorder. The data of the depressed patients therefore must be examined.

Overall, the patients with major depressive disorder did not demonstrate any MCM biases for either mood-congruent or cognition-congruent word stimuli in conscious or automatic memory. The depressed patients therefore did not appear to focus on information related to loss and defeat (i.e., negative self-relevant information.) However, when only the male patients with major depressive disorder were compared to the male control participants, there was some support for Beck’s (1976) model. The male patients demonstrated an automatic memory bias such that they automatically remembered fewer positive words than the non-depressed male participants. Thus, the cognitive processes of these male depressed
patients appeared to be focussed away from positive information. Although a cognitive bias away from positive information is not equivalent to a cognitive bias toward negative information, these findings help explain why cognitive distortions such as the cognitive triad may be experienced by depressed patients. A focus away from positive information leaves the depressed individual mainly negative information on which to concentrate.

Even the memory biases demonstrated by the male depressed patients were only present in automatic memory, not consciously-controlled memory. This is further evidence that the cognitive biases are not as pervasive as those predicted by Beck (1976). This leads us to examine the implications of the present results on J. M. G. Williams et al.'s (1988) model of cognition and the emotional disorders.

*J. M. G. Williams et al.'s (1988) Model of Cognition and Emotional Disorders:*

J. M. G. Williams et al. (1988) proposed that anxiety affects the automatic aspects of cognitive processing, whereas depression affects the consciously-controlled aspects. If this model is correct, we would expect to find biases in automatic memory in the anxious participants and biases in conscious recollection in depressed participants. Again, the present studies gave little support to this proposal.

As discussed above, the students with high anxiety sensitivity did not have any biases in automatic memory when compared to those with low anxiety sensitivity. Thus, anxiety did not affect the automatic aspects of cognitive processing as measured by the PDP.

In the non-clinically depressed participants, there was a conscious memory bias as predicted, but this bias was for positive, not negative, information. J. M. G. Williams et al. (1988) suggested that depressed individuals would consciously focus on negative,
positive information. Thus, although this model predicted that the students would have a conscious memory bias, the bias was anticipated to be for negative word stimuli relevant to the participants.

The data of the patients with major depressive disorder also did not match the predictions of J. M. G. Williams et al. (1988). As discussed above, the patients with major depression did not demonstrate any MCM biases for either mood-congruent or cognition-congruent word stimuli in conscious or automatic memory when the patients were grouped together. When only the male patients with major depressive disorder were compared to the male controls, the male patients demonstrated an automatic (not conscious) memory bias for remembering fewer positive words. Again, these results with only the male depressed patients do not support the J. M. G. Williams et al. model since the patients were expected to have biases in conscious recollection, not automatic memory.

Since the biases in the male depressed patients were in automatic aspects of memory, it is important to examine the general predictions of Hartlage et al. (1993). These researchers did anticipate biases in automatic processing of depressed individuals.

Hartlage et al.'s (1993) Account of Cognition in Depressive Disorders:

Hartlage et al. (1993) proposed that clinically depressed patients should have biases for negative information in both automatic and consciously-controlled cognitive processes. Although the depressed patients did not show any conscious memory biases, the male patients did have a decrease in automatic memory for positive (i.e., HPA) words when compared to the male controls. Even though the content of the automatic memory bias was not explicitly negative, it was against remembering positive information. As discussed
above, a focus away from positive information could result in the depressed individual concentrating mainly on negative information.

Another important prediction of Hartlage et al. (1993) was that depression-prone individuals who are not currently depressed should show an enduring automatic bias for negative information, although they would not have any conscious biases. This prediction was not supported since the depressed patients who responded to treatment showed no biases in either automatic or consciously-controlled memory.

Although there was partial support of Hartlage et al.'s (1993) hypothesis regarding the cognitive biases of clinically depressed patients, most of their predictions were not confirmed by the results of the present studies.

Positive-Negative Affect and Tripartite Models:

Finally, there was support for the positive-negative affect and tripartite models. These models predict that anxious patients will demonstrate high levels of NA with varying levels of PA, while depressed patients will have high levels of NA combined with low levels of PA. The students with high BDI scores had higher NA scores and lower PA scores on the PANAS-X than did students with low BDI scores. Similarly, the patients with major depressive disorder had higher levels of NA and lower levels of PA than the healthy, non-depressed control participants. In addition, those depressed patients who responded to treatment did not differ significantly from the healthy controls in their NA and PA levels.

The version of the PANAS-X given to the participants of these studies only assessed state (i.e., how they felt at that moment) NA and PA. Thus, it was not possible to differentiate between state and trait NA and PA with this questionnaire. Therefore, no conclusions about
differences in trait NA and PA between the non-clinically depressed students and the clinically depressed patients could be drawn.

The students with high anxiety sensitivity were expected to have higher NA scores than those with low anxiety sensitivity, but no difference in their mean PA scores since anxiety sensitivity is correlated with trait anxiety. The high anxiety sensitive group did in fact have a significantly higher mean STAI - trait score than the low anxiety sensitive group. Since high NA and varying levels of PA should be related to high anxiety levels, this was expected for this group of high anxiety sensitive individuals. The high anxiety sensitive group did indeed have higher NA levels than the low anxiety sensitive group; however, the high anxiety sensitive group also had significantly lower PA levels. The positive-negative affect and tripartite models predicted that this pattern of mood states would be seen in depressed, not anxious individuals. However, the high anxiety sensitive group also had a higher mean score on the BDI, indicating that this group was more anxious and more depressed than the low anxiety sensitive group. Thus, the presence of higher levels of depressive symptoms could have caused this drop in PA. In conclusion, the results of these studies do indeed support the predictions of positive-negative affect model and the tripartite model.

**Concluding Remarks**

In summary, none of the models discussed above predicted all of the results of the present studies. However, some models did present hypotheses which are consistent with at least part of the data from these studies. As discussed in the introduction, simply because one of these models is supported, does not necessarily mean that the others are not correct.
The positive-negative affect model and the tripartite model accurately predicted the mood states of the participants in each study. Although the high anxiety sensitive students showed a low level of PA in addition to high NA when compared to the low anxiety sensitive group, this could be accounted for by the higher levels of depressive symptoms in the HAS group.

Little support was given to the hypotheses of Beck (1976) and J. M. G. Williams et al. (1988). In contrast, partial support was given to the account of Hartlage et al. (1993) regarding their prediction of automatic cognitive biases in depression. However, these automatic memory biases were only found in the male depressed patients, not in the female patients.

The results of these present studies add to the wealth of data regarding cognitive processing in anxiety and depression. As discussed earlier, the results of such studies appear to differ greatly depending on the specific tasks and word stimuli which are used and even the characteristics of the individuals who participate. Further research is necessary to decipher why different empirical studies which appear similar, although not identical, can result in such vastly different findings. Before closing, I will discuss a few general considerations which may impact the results of such cognitive studies.

Clinical versus Non-clinical Levels of Depression

In psychological studies it is often assumed that cognitive function of university students is on a continuum with that of psychiatric patients. This assumption is convenient to hold since it is relatively easy to access a large number of university students, while it is difficult and time consuming to get a similar number of patients who meet specific inclusion
and exclusion criteria for a particular psychiatric disorder. Although this assumption is convenient, it is necessary to examine whether it is valid.

Because this thesis included two identical cognitive studies using patients with a diagnosis of major depression as well as students with high scores on a depression inventory, we can examine this assumption that cognitive function in patients is isomorphic to that of the university students. The results of Study 2 which included students with high scores on the BDI were clearly not the same as the results of Study 3 which included patients who were presently diagnosed with major depressive disorder. The students with high BDI scores consciously remembered more words overall and, specifically, more positive (HPA) words than the students with low BDI scores. These results are in contrast with those of the depressed patients who had a significantly lower conscious recollection than the non-depressed students (who had low BDI scores.) If the cognitive performance of the depressed patients had been on a continuum with the students who had high BDI scores, we would have expected the patients to have higher conscious recollection overall, plus higher conscious recollection of positive words, than the controls. Alternatively, the students with high BDI scores could have demonstrated lower overall conscious memory when compared to those with low BDI scores, in line with the performance of the depressed patients. However, neither of these alternatives was found to occur. In sum, the students with high BDI scores did not perform similarly to the patients with major depressive disorder.

The differences in memorial performance of the patients and students in these studies have important implications. If one is going to draw conclusions about a particular psychiatric disorder, it is important to directly study a group of patients with the disorder. A
group of university students with elevated scores on relevant self-report questionnaires may perform very differently than the actual group of patients who are of interest.

Coyne (1994) discussed several reasons why students with high levels of distress (e.g., high BDI scores) are not an adequate analog for patients with major depressive disorder. Clinical depression is conceptually and empirically distinct from that measured by self-report questionnaires. Major depressive disorder is often associated with severe functional impairment, is relatively uncommon, and, by definition, lasts at least two weeks, but more commonly for months. In contrast, high scores on self-report depression inventories are relatively common in university students and tend to be transient, lasting only a few hours or days. In addition, depressive disorders are more often associated with severe life events than with chronic stress; however, psychological distress as measured by self-report questionnaires is more closely associated with chronic stress than with severe life events. These differences between students with elevated depression scores and patients with depressive disorders highlight the importance of not assuming that the performance of one group will predict that of the other.

Although students with elevated scores on depression inventories are not analogous to patients with major depression, this does not suggest that one should not study university students. Participants with high levels of psychological distress are still of interest as a distinct group of individuals. The point of this discussion is to recognize the differences between patients and students so no assumptions are made about a continuum of performance. In the present studies, there appeared to be a continuum of memorial performance within the group of student participants. The student participants in Study 1 and
Study 3 with the lowest ASI and trait anxiety scores appeared to have lower overall conscious recollection when compared to students with higher ASI and trait anxiety scores. However, the patients had elevated ASI scores but their level of overall conscious recollection was similar to that of the students with low ASI and trait anxiety scores. Thus, the memorial performance of the students and the patients was not continuous. If it had been, the patients would have been expected to have similar, or possibly higher, conscious recollection when compared to the students with high ASI and trait anxiety scores. Clinical symptoms of depression appear to have a different impact on memorial performance than do high depression levels on a self-report questionnaire.

These considerations bring to question whether an experimental paradigm such as the PDP, which was developed for use with a healthy population of individuals, can be directly transferred for use in a patient population. It was assumed that the PDP paradigm would be applicable for use with depressed patients since it had been successfully used with dysphoric students. However, in light of the above discussion, it is necessary to question whether this is a fair assumption. Since the depressed patients differed in memorial performance on the PDP paradigm when compared to the students, one must ask whether this paradigm is applicable to this population of participants. Perhaps the PDP paradigm is not transferrable from a normal, healthy population, and this is why the performance of the patients differed so greatly from that of the students. It is not possible to distinguish whether the differences in memorial performance between the patients and students was a result of true differences in cognitive processing or whether the PDP paradigm is simply not applicable to this patient population. Further research with the PDP paradigm with clinical populations is needed.
before conclusions regarding this question can be drawn.

**Meaning of R and A’**

Not only did we find differences in the memorial performance of the student and patient participants, we also found that our results differed from some of the past studies of memorial performance in anxious and depressed participants. The failure to replicate some of these findings may have been due to differences in the methodologies used. Indeed, differences in methodology may have resulted in many of the inconsistencies found in the literature regarding cognitive processing in anxiety and depression.

The benefits of the PDP paradigm over implicit/explicit tests of memory in terms of the measurement of consciously-controlled and automatic memory biases were discussed in the introduction. Although the PDP has obvious benefits over the implicit/explicit memory paradigm, it is possible that this paradigm is measuring something different from what is traditionally considered automatic and consciously-controlled memory.

We must examine more closely the interpretation of R and A’ in the PDP list discrimination paradigm. As discussed in the introduction, this PDP paradigm defines conscious recollection in terms of the participants’ ability to use the memory of some criterial feature, such as the source of an item or context in which an item was presented (e.g., visual versus auditory presentation), as the basis for their response (Yonelinas & Jacoby, 1996). In contrast, automatic aspects of memory may include not only recognition judgements based on feelings of familiarity, but also recollection of information that is noncriterial for the task being performed. Thus, automatic memory processes involve the retrieval of other information which gives rise to feelings of recognition without allowing the individual to
successfully identify the source (e.g., visual or auditory presentation) of the word (Gruppuso et al., 1997).

The importance of the context or source of the word for memory in the PDP list discrimination task indicates that this paradigm is assessing something more than memory for the content of the word stimuli. Memory for the context of the word presentation is critical for successful completion of the tasks involved in the exclusion test. In fact, Buchner, Erdfelder, Steffens, & Martensen (1997) suggest that judgements in the PDP list discrimination paradigm involve basically the same memory processes as do source-monitoring tasks. Mistakes may be made in the exclusion task of the PDP if there is a problem with source confusion. For example, the word may be remembered as having been read from List 1 when it was actually heard in List 2. Although the participant remembered that the word was presented during the encoding phase of the study, she did not remember the source or context of the presentation of the word.

Within the PDP, conscious recollection is situation specific and is defined by the demands of the task (Yonelinas & Jacoby, 1996). For successful performance in the PDP list discrimination paradigm, participants must monitor the source of the items presented. R, which is intended to measure conscious recollection, appears to measure the retrieval and use of information related to the context in which the item was presented (Gruppuso et al., 1997). Memory of the context of the presented item is certainly one aspect of conscious recollection; however, conscious recollection may involve other aspects of study experience such as semantic information, information about the word’s association with other studied words, etc. Thus, the PDP presents a strict definition of conscious recollection that distinguishes between
criterial and noncriterial recollection (Yonelinas & Jacoby, 1996).

The interpretation of the PDP's A' (automatic memory) is specific to the retrieval of information which enables the recognition of an item as having been presented during the encoding task but does not allow for the successful recollection of the context of the presentation (i.e., list membership.) Automatic memory in this PDP paradigm involves the retrieval of information that is insufficient for performance of the task and thus has a more generic or undifferentiated quality to it (Gruppuso et al., 1997). Thus, noncriterial recollection is treated as automatic memory (Yonelinas & Jacoby, 1996).

The strictness of the definitions of conscious recollection and automatic memory does not have to be seen as a weakness of the PDP procedure. However, because of these more specific interpretations of R and A', the results of the present studies which involved the PDP list discrimination paradigm must be interpreted carefully and cannot be compared to those of other studies without bearing these interpretations in mind. For example, the decrease in overall R of the patients with major depressive disorder must be interpreted as a decrease in the retrieval or use of information related to the context of the words presented. Similarly, the decrease in overall A' of the depressed patients without a seasonal pattern when compared to patients with a seasonal pattern indicates a difference in the ability to recognize that the item was presented during encoding without being able to recall the context of the presentation. The importance of memory for source information must be considered when comparing the results of these studies to the findings of other studies which may have used different paradigms which did not involve source discrimination.
Availability versus Accessibility

One final issue that has not been discussed is whether cognitive biases in anxiety and depression are due to differences in the content and framework of cognitive structures or differences in the accessibility of the material in the cognitive structures. The term construct *availability* is used to describe the particular types of cognitive constructs that are present in memory for processing information; whereas, construct *accessibility* is the readiness with which a construct is accessed in information processing (Higgins, King, & Mavin, 1982). Individuals may differ in their construct availability and/or construct accessibility. Construct accessibility has been shown to be affected by expectancies, goals, instructional sets, and prior activation (Higgins & Brendl, 1995).

An important question is whether the construct availability of anxious or depressed individuals differs from nonanxious or nondepressed individuals, and/or whether the accessibility of their constructs differ. For example, the male depressed patients in the present studies may have had more negative material available in their cognitive structures when compared to the healthy control participants, or, alternatively, the amount and type of negative material in their cognitive structures could have differed. Although the studies in this thesis did not attempt to distinguish between these two alternatives, past studies have demonstrated differences in both availability and accessibility of constructs when the cognitive processing of depressed and healthy individuals was compared. Depressed patients appear to have an overrepresentation of negative content within their cognitive schemata, as well as increased accessibility of the negative material due to increased cohesiveness of the schemata (Kuiper & Derry, 1981).
Although no attempt was made to distinguish between the availability and the accessibility of constructs in this thesis, this is not meant to diminish the importance of this issue in the area of cognitive processing in the emotional disorders. This distinction has important implications for the treatment of anxiety and depressive disorders, especially when considering techniques in cognitive-behavioral therapy. Because there was no measurement of reaction time or time involved in rating or recognizing words, no measure of accessibility was obtained in the present studies. A deeper analysis of whether differences in construct availability and/or construct accessibility underlie the memory biases in anxious and depressed individuals remains to be explored in future investigations.

**Future Directions**

Further research using techniques such as the PDP is needed to clarify differences in cognitive processing of anxious and depressed individuals. The PDP technique is useful in this area of research since it allows us to examine conscious and automatic cognitive processes without the limitations of methods which assume that tasks are process pure.

The results of the present studies differ greatly from those of Hertel and Milan (1994). Thus, it is obvious that although the general method used affects the results of the studies, there are other important variables which affect the data. In the future, it would be interesting to continue to examine anxious and depressed individuals' memory for specific types of words. Perhaps seemingly small differences in the word stimuli used could result in large differences in the results found. Similarly, participant characteristics such as level of depressive symptoms need to be measured in a more consistent manner so that scores on questionnaires can be held constant when measuring cognitive biases with differing
techniques or differing word stimuli. In short, we need to determine which variables affect the cognitive processing data of individuals with anxiety or depression.

Finally, the present studies are no exception in finding that high levels of anxiety often accompany high levels of depression, and vice versa. This comorbidity of anxiety and depressive symptoms needs to be further researched, especially regarding the effect of mixed anxiety and depression on cognitive processing.
References


investigation of the cognitive avoidance hypothesis. *Cognitive Therapy and Research, 15*, 371-386.


McNally, R. J., Amir, N., Louro, C. E., Lukach, B. M., Riemann, B. C., & Calamari,


Mavissakalian, M. (1990). Differential efficacy between tricyclic antidepressants and


changes with antidepressant treatment. *Journal of Anxiety Disorders*, 9, 117-123.


Anxiety and depression: Distinctive and overlapping features (pp. 3-26). New York: Academic Press.


Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to
rapidity of habit-formation. *Journal of Comparative Neurology and Psychology, 18*, 459-482.

Appendix A

**PDP Final Word List**

**HPA:**
- ALERT
- ATTENTIVE
- COMFORTABLE
- CONCENTRATING
- DELIGHTED
- ECSTATIC
- EFFICIENT
- ELATED
- ENERGETIC
- FORGIVING
- HELPFUL
- LIGHTHEARTED
- LIVELY
- OVERJOYED
- PASSIONATE
- PEPPY
- PLAYFUL
- PLEASANT
- PROUD
- REFRESHED
- TRUSTING
- VIGOROUS
- WAKEFUL
- WITTY

**PT:**
- COLLAPSED
- DISABLED
- Diseased
- DIZZY
- FATAL
- GORY
- HARMFUL
- HAZARDOUS
- HURT
- INCURABLE
- INFECTED
- INSANE
- LETHAL
- MORTAL
- MUTILATED
- NUMB
- POISONOUS
- SICK
- STRANGLED
- SUFFOCATING
- SWEATY
- UNWELL
- WOUNDED

**HNA:**
- AFRAID
- ANNOYED
- CREEPY
- DISAPPOINTED
- DISGUSTED
- FEARFUL
- FLUSTERED
- FRUSTRATED
- GUILTY
- INSECURE
- JITTERY
- NERVOUS
- PANICKY
- PEEVED
- REPelled
- REVOLTED
- SCARED
- SCORNFUL
- SHAKY
- SHOCKED
- SPITEFUL
- SUSPICIOUS
- TENSE
- TORMENTED

**NSR:**
- AWKWARD
- BORING
- CRITICIZED
- DESPISED
- DISGRACEFUL
- EMBARRASSED
- FOOLISH
- HATED
- HUMILIATING
- IDIOTIC
- IMMATURE
- INCOMPETENT
- INTIMIDATED
- LONELY
- OFFENDED
- PATHETIC
- RIDICULOUS
- SHAMEFUL
- SHUNNED
- STUPID
- UNKIND
- UNLOVED
- USELESS
CN: ANALYTICAL CALCULATING CANDID CASUAL COMMANDING CONSERVATIVE DAINTY DELICATE EXACTING GUARDED HESITANT HYPNOTIC INFORMAL INSISTENT MASCULINE MECHANICAL METROPOLITAN MYSTICAL RESERVED SELECTIVE SILENT SPEEDY UNDECIDED VOCAL

UN: ABSOLUTE ABSTRACT APPLICABLE ARBITRARY CATEGORICAL CIRCULAR CUMULATIVE CYCLIC FREQUENT GRADUAL HABITUAL IDENTICAL LENGTHY LINKED LITERAL MARGINAL MEASURABLE METHODICAL MODERATE NEGLIGIBLE NOTICEABLE PERIODIC RELEVANT VERBAL

BUFFER WORDS: CENTRAL GENERAL NATIONAL PARTICULAR PRIVATE PUBLIC RECENT SPECIFIC STANDARD STILL STRAIGHT TECHNICAL
## Appendix B

### WORD LIST ABC:

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<tr>
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<td>INTIMIDATED</td>
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<td>RICDULOUS</td>
<td>SHAMEFUL</td>
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<tr>
<td>STUPID</td>
<td>SHUNNED</td>
<td>UNKIND</td>
</tr>
<tr>
<td>UNLOVED</td>
<td>USELESS</td>
<td>WORTHLESS</td>
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</table>
CATNEU: 
- ANALYTICAL
- CASUAL
- DAINTY
- GUARDED
- HESITANT
- INFORMAL
- MECHANICAL
- RESERVED

UNCNEU: 
- APPLICABLE
- CYCLIC
- HABITUAL
- IDENTICAL
- LINKED
- MEASURABLE
- NEGLIGIBLE
- RELEVANT

BUFFERS: 

VISUAL

Beginning: NATIONAL
- SPECIFIC
- RECENT

End: PRIVATE
- TECHNICAL
- BRIEF

AUDITORY

Beginning: STANDARD
- PUBLIC
- CENTRAL

End: GENERAL
- STILL
- PARTICULAR

A
- CALCULATING
- COMMANDING
- DELICATE
- INSISTENT
- METROPOLITAN
- SPEEDY
- UNDECIDED
- VOCAL

B
- ABSOLUTE
- ARBITRARY
- CUMULATIVE
- GRADUAL
- LITERAL
- MARGINAL
- MODERATE
- PERIODIC

C
- CANDID
- CONSERVATIVE
- EXACTING
- HYPNOTIC
- MASCULINE
- MYSTICAL
- SELECTIVE
- SILENT
- ABSTRACT
- CATEGORICAL
- CIRCULAR
- FREQUENT
- LENGTHY
- METHODICAL
- NOTICEABLE
- VERBAL
Appendix C

Demographic Information Sheet:

PARTICIPANT INFORMATION SHEET

Date: __________________________
Date of Birth: __________________________ Age: __________________________
Sex: M ___ F ___ Ethnicity: __________________________
Marital Status: __________________________
Native Language Spoken: __________________________
Number of years high school: ______ Number of years university: _____
Have you ever been diagnosed with a depressive or anxiety disorder?

Yes _____ No _____
If yes:

What was(were) the diagnosis(es)? __________________________
When were you diagnosed? __________________________
How were you treated? __________________________
Was the treatment successful? __________________________
When did the symptoms remit? __________________________

Have any members of your family been diagnosed with a depressive or anxiety disorder?

Yes _____ No _____
If yes:

Which family member(s)? __________________________
What was(were) the diagnosis(es)? __________________________
Appendix D

Instructions to Participants:

1. Ask participant to read and sign consent form.

2. "A list of words will be presented one at a time on the computer screen. There will be a beep each time a new word is presented, so you'll know to be looking up at the screen if you hear a beep. Also, before the first word is presented, there will be a beep, then a pause and then the word will appear. So there will be a short delay before the words start."

   "I want you to say each word out loud and rate the emotionality of each word on this seven-point scale. [*Place example sheet in front of subject.*] Judging by the meaning of the word, (-3) would be used for a word with highly negative emotional tone, (0) would be neutral in emotional tone, and (+3) would be used for a word which is highly positive in emotional tone. There are no right or wrong answers; just write down the number that you think represents the emotional tone of each word. You will have 7 seconds to say the word aloud and write the rating for its emotional tone in the slot. There will be a memory test for these words later in the study."

   "But first I'll start you with a few example words to make sure you understand the instructions. You won't need to remember these words."

   **If okay:** "Okay, good. You seem to understand what I want you to do. Now we'll start the real experiment. As I said, there will be a memory test for these words later in the study."

   **If odd:** Ask why the word was rated as it was. Give instructions again if necessary.

3. "Now I'd like you to listen to a list of words that will be presented on this tape recorder. I want you to basically do the same thing that you did with the words that you saw on the computer, but this time you don't have to say the words out loud. You just have to rate the emotional tone of the words using the same 7-point scale. You will have about 6 seconds to rate the emotional tone of each word. Again, there will be a memory test for these words later in the study. Are you ready?"

4. "Before we start the memory tests, I'd like you to do a brief distraction task. I need you to count backwards from 400 by 2's for 2 minutes out loud. I'll time you and tell you when to stop. You can start any time you're ready."

5. **Memory tests:**

   "Now I'm going to give you a list of words for a memory test. Some of the words were presented on the computer, some were presented on the tape recording, and some you haven't seen or heard during this experiment. They're all mixed up in this list."

   **Inclusion test:**

   "I want you to put a checkmark next to the words that you think were presented either on the computer or on the tape recorder. If you think the word is one you haven't seen or heard during the experiment, then put an "x" next to the word. So you'll be putting a mark, either an "x" or a checkmark, next to every word."

   "Do you understand the instructions?" - Repeat instructions.

   **Exclusion test:**

   "I want you to put a checkmark only next to the words that you think were presented on the tape recorder. If you think the word is one which you saw on the computer or one that you haven't
seen or heard during this experiment, then put an "x" next to the word. So you'll be putting a mark, either an "x" or a checkmark, next to every word."

- "Do you understand the instructions?" - Repeat instructions.

FOR BOTH:

"I just want you to look at one word at a time, so I'd like you to cover the words with this sheet of paper. Just move the paper down after you've made a mark next to each word and when you are ready for the next word." [Demonstrate for participant.] "You don't need to spend too much time on any one word. Do you have any questions?"

6. **Questionnaires:**

**Remind about confidentiality. No name or identifying information needed. Go through quickly with subject.**

[0-HAM-D] - for patients and controls in Study #3 and #4 only
1-PANAS-X
2-Beck Depression Inventory (examine before subject leaves)
3-Anxiety Sensitivity Index
4-State-Trait Anxiety Inventory
5-NES Five Factor Neuroticism scale -- short form
6-Demographic information sheet

7. Debriefing
Appendix E

Visual Rating Sheet:

Please say each word aloud and rate the words for emotional tone using the following seven point scale. The scale ranges from -3 (highly negative in emotional tone) to +3 (highly positive in emotional tone). Write down the corresponding rating next to each number to indicate the emotionality of each word in the order that they are presented.

<table>
<thead>
<tr>
<th>Highly negative (-3)</th>
<th>Neutral (0)</th>
<th>Highly positive (+3)</th>
</tr>
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<td>1. _________</td>
<td>19. _________</td>
<td>37. _________</td>
</tr>
<tr>
<td>2. _________</td>
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<td>38. _________</td>
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<td>3. _________</td>
<td>21. _________</td>
<td>39. _________</td>
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<tr>
<td>4. _________</td>
<td>22. _________</td>
<td>40. _________</td>
</tr>
<tr>
<td>5. _________</td>
<td>23. _________</td>
<td>41. _________</td>
</tr>
<tr>
<td>6. _________</td>
<td>24. _________</td>
<td>42. _________</td>
</tr>
<tr>
<td>7. _________</td>
<td>25. _________</td>
<td>43. _________</td>
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<tr>
<td>8. _________</td>
<td>26. _________</td>
<td>44. _________</td>
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<tr>
<td>9. _________</td>
<td>27. _________</td>
<td>45. _________</td>
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<td>10. _________</td>
<td>28. _________</td>
<td>46. _________</td>
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<td>11. _________</td>
<td>29. _________</td>
<td>47. _________</td>
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<td>12. _________</td>
<td>30. _________</td>
<td>48. _________</td>
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<td>13. _________</td>
<td>31. _________</td>
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<td>14. _________</td>
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<td>15. _________</td>
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<td>51. _________</td>
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<td>16. _________</td>
<td>34. _________</td>
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<tr>
<td>17. _________</td>
<td>35. _________</td>
<td>53. _________</td>
</tr>
<tr>
<td>18. _________</td>
<td>36. _________</td>
<td>54. _________</td>
</tr>
</tbody>
</table>
Appendix F

Auditory Rating Sheet:

Please rate each word for emotional tone using the following seven point scale. The scale ranges from -3 (highly negative in emotional tone) to +3 (highly positive in emotional tone). Write down the corresponding rating next to each number to indicate the emotionality of each word in the order that they are presented.

<table>
<thead>
<tr>
<th>Highly negative</th>
<th>Neutral</th>
<th>Highly positive</th>
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<tbody>
<tr>
<td>(-3)------------</td>
<td>(0)-----</td>
<td>(+3)------------</td>
</tr>
<tr>
<td>(-2)------------</td>
<td>(+1)----</td>
<td>(+2)------------</td>
</tr>
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</table>

1. _____________ | 19. ___________ | 37. ___________ |
2. _____________ | 20. ___________ | 38. ___________ |
3. _____________ | 21. ___________ | 39. ___________ |
4. _____________ | 22. ___________ | 40. ___________ |
5. _____________ | 23. ___________ | 41. ___________ |
6. _____________ | 24. ___________ | 42. ___________ |
7. _____________ | 25. ___________ | 43. ___________ |
8. _____________ | 26. ___________ | 44. ___________ |
9. _____________ | 27. ___________ | 45. ___________ |
10. _____________ | 28. ___________ | 46. ___________ |
11. _____________ | 29. ___________ | 47. ___________ |
12. _____________ | 30. ___________ | 48. ___________ |
13. _____________ | 31. ___________ | 49. ___________ |
14. _____________ | 32. ___________ | 50. ___________ |
15. _____________ | 33. ___________ | 51. ___________ |
16. _____________ | 34. ___________ | 52. ___________ |
17. _____________ | 35. ___________ | 53. ___________ |
18. _____________ | 36. ___________ | 54. ___________ |
Appendix G

Memory Test Sheets:

Test 1:

REVOLTED
HABITUAL
HESITANT
LETHAL
STUPID
PROUD
ALERT
RELEVANT
SILENT
FOOLISH
DISAPPOINTED
SICK
DAINTY
DIZZY
SCORNFUL
COMFORTABLE
CRITICIZED
CUMULATIVE
GRADUAL
SHUNNED
CREepy
TRUSTING
MUTILATED
MECHANICAL
ECSTATIC
MARGINAL
UNDECIDED
FRUSTRATED
INTIMIDATED
HURT
CIRCULAR
IDIOTIC
DISGUSTED
PLEASANT
INFECTED
EXACTING
NERVOUS
ATTENTIVE
OFFENDED
LITERAL
INSISTENT
UNWELL
NOTICEABLE
ANNOYED
METROPOLITAN
CONCENTRATING
UNLOVED
DISABLED
TENSE
DISEASED
Test 2:
COLLAPSED
LIVELY
COMMANDING
FLUSTERED
ARBITRARY
DISGRACEFUL
WITTY
HYPNOTIC
INCURABLE
MODERATE
INCOMPETENT
TORMENTED
STRANGLED
DELICATE
ABSOLUTE
HELPFUL
SCARED
IMMATURE
USELESS
AFRAID
CONSERVATIVE
MEASURABLE
OVERJOYED
HARMFUL
FEARFUL
HAZARDOUS
GUARDED
ENERGETIC
PERIODIC
EMBARRASSED
PATHETIC
IDENTICAL
WAKEFUL
GUILTY
ANALYTICAL
MORTAL
ABSTRACT
SHAMEFUL
RESERVED
LIGHTHEARTED
PEEVED
NUMB
PANICKY
BORING
APPLICABLE
MYSTICAL
FORGIVING
FATAL
SHOCKED
VIGOROUS
CANDID
WOUNDED
LONELY
VERBAL
WORTHLESS
REPELLED
INFORMAL
DELIGHTED
CATEGORICAL
POISONOUS
DESPISED
EFFICIENT
INSANE
INSECURE
CALCULATING
METHODICAL
GORY
AWKWARD
JITTERY
VOCAL
PLAYFUL
CYCLIC
## Appendix H

### Table 10.1. Questionnaire Scores [Mean (SD)]: LAS and HAS

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<th></th>
<th>ASI</th>
<th>BDI</th>
<th>STAI-STATE</th>
<th>STAI-TRAIT</th>
<th>PANAS-X NA</th>
<th>PANAS-X PA</th>
<th>NEO S.F.</th>
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<td>27.5</td>
<td>16.1</td>
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<tr>
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<td>(6.9)</td>
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<tr>
<td><strong>HAS</strong></td>
<td>34.8</td>
<td>20.0</td>
<td>47.7</td>
<td>54.4</td>
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<td>(10.9)</td>
<td>(10.1)</td>
<td>(7.2)</td>
<td>(7.5)</td>
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### Table 10.2. Questionnaire Scores [Mean (SD)]: LBD and HBD

<table>
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<th>BDI</th>
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<th>STAI-TRAIT</th>
<th>PANAS-X NA</th>
<th>PANAS-X PA</th>
<th>NEO S.F.</th>
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<td>(6.7)</td>
<td>(6.2)</td>
<td>(2.2)</td>
<td>(6.5)</td>
<td>(6.5)</td>
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<tr>
<td><strong>HBD</strong></td>
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<td>23.3</td>
<td>49.9</td>
<td>56.7</td>
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<td>(11.0)</td>
<td>(9.8)</td>
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<td>(7.7)</td>
<td>(7.2)</td>
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### Appendix I

**Table 10.3.** Questionnaire Scores [Mean (SD)]: MDD patients, SAD patients, and Controls - Time 1

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<th>HAM-29</th>
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**Table 10.4.** Questionnaire Scores [Mean (SD)]: Responders and Controls - Time 2

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<th>HAM-21</th>
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<th>PANAS-X: NA</th>
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## Appendix J

Table 10.5. Memory Data Means for LAS and HAS Student Participants

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Table 10.6. Memory Data Means for LBD and HBD Student Participants

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Table 10.8. Memory Data Means for Male and Female Student Participants

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<td>0.38</td>
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### Table 10.10. Memory Data Means for LBD Male and LBD Female Student Participants

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**Table 10.11. Memory Data Means for Patient and Student Participants**

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Table 10.12. Memory Data Means for Patients With versus Without High ASI Scores

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<th>A</th>
<th>A'</th>
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<tbody>
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<td>HPA</td>
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<td>0.19</td>
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<tr>
<td>Patients Without High ASI Scores</td>
<td>HPA</td>
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Table 10.13. Memory Data Means for Male versus Female Patients (All)

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<th>A</th>
<th>A'</th>
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<tbody>
<tr>
<td>Male Patients</td>
<td>Positive</td>
<td>0.84</td>
<td>0.36</td>
<td>0.48</td>
<td>0.62</td>
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<td>Negative (Grouped)</td>
<td>0.85</td>
<td>0.47</td>
<td>0.38</td>
<td>0.73</td>
<td>0.51</td>
</tr>
<tr>
<td>Female Patients</td>
<td>Positive</td>
<td>0.87</td>
<td>0.54</td>
<td>0.33</td>
<td>0.76</td>
<td>0.57</td>
</tr>
<tr>
<td></td>
<td>Negative (Grouped)</td>
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<td>0.26</td>
<td>0.74</td>
<td>0.51</td>
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Table 10.14. Memory Data Means for Male versus Female MDD Patients

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<th>Exclusion</th>
<th>R</th>
<th>A</th>
<th>A'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male MDD Patients</td>
<td>Positive</td>
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<td>0.36</td>
<td>0.45</td>
<td>0.63</td>
<td>0.46</td>
</tr>
<tr>
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<td>Negative</td>
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<td>0.44</td>
<td>0.39</td>
<td>0.7</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>(Grouped)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female MDD Patients</td>
<td>Positive</td>
<td>0.81</td>
<td>0.31</td>
<td>0.5</td>
<td>0.44</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>0.75</td>
<td>0.48</td>
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<td>(Grouped)</td>
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Table 10.15. Memory Data Means for Male versus Female SAD Patients

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<th>Exclusion</th>
<th>R</th>
<th>A</th>
<th>A'</th>
</tr>
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<tbody>
<tr>
<td>Male SAD Patients</td>
<td>Positive</td>
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<td>0.35</td>
<td>0.55</td>
<td>0.6</td>
<td>0.4</td>
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<tr>
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<td>Negative</td>
<td>0.88</td>
<td>0.53</td>
<td>0.35</td>
<td>0.79</td>
<td>0.64</td>
</tr>
<tr>
<td></td>
<td>(Grouped)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female SAD Patients</td>
<td>Positive</td>
<td>0.89</td>
<td>0.64</td>
<td>0.25</td>
<td>0.91</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
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<td>0.55</td>
<td>0.26</td>
<td>0.76</td>
<td>0.55</td>
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<tr>
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<td>(Grouped)</td>
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Table 10.16. Memory Data Means for Female Patients (All) versus Female Controls

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<th>A</th>
<th>A'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female Patients</td>
<td>Positive</td>
<td>0.87</td>
<td>0.54</td>
<td>0.33</td>
<td>0.76</td>
<td>0.57</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>0.79</td>
<td>0.53</td>
<td>0.26</td>
<td>0.74</td>
<td>0.51</td>
</tr>
<tr>
<td></td>
<td>(Grouped)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female Controls</td>
<td>Positive</td>
<td>0.82</td>
<td>0.46</td>
<td>0.36</td>
<td>0.67</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>Negative</td>
<td>0.88</td>
<td>0.41</td>
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<td>0.57</td>
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</table>
Table 10.17. Memory Data Means for Female MDD Patients versus Female Controls

<table>
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<th>Exclusion</th>
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<th>A</th>
<th>A'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female MDD Patients</td>
<td>Positive</td>
<td>0.81</td>
<td>0.31</td>
<td>0.5</td>
<td>0.44</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>Negative (Grouped)</td>
<td>0.75</td>
<td>0.48</td>
<td>0.27</td>
<td>0.67</td>
<td>0.44</td>
</tr>
<tr>
<td>Female Controls</td>
<td>Positive</td>
<td>0.82</td>
<td>0.46</td>
<td>0.36</td>
<td>0.67</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>Negative (Grouped)</td>
<td>0.88</td>
<td>0.41</td>
<td>0.47</td>
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<td>0.57</td>
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Table 10.18. Memory Data Means for Female SAD Patients versus Female Controls

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<th>Exclusion</th>
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<th>A</th>
<th>A'</th>
</tr>
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<tr>
<td>Female SAD Patients</td>
<td>Positive</td>
<td>0.89</td>
<td>0.64</td>
<td>0.25</td>
<td>0.91</td>
<td>0.74</td>
</tr>
<tr>
<td></td>
<td>Negative (Grouped)</td>
<td>0.81</td>
<td>0.55</td>
<td>0.26</td>
<td>0.76</td>
<td>0.55</td>
</tr>
<tr>
<td>Female Controls</td>
<td>Positive</td>
<td>0.82</td>
<td>0.46</td>
<td>0.36</td>
<td>0.67</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>Negative (Grouped)</td>
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<td>0.47</td>
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Table 10.19. Memory Data Means for Male Patients (All) versus Male Controls

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<th>Exclusion</th>
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<th>A</th>
<th>A'</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Patients</td>
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<td>0.36</td>
<td>0.48</td>
<td>0.62</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>Negative (Grouped)</td>
<td>0.85</td>
<td>0.47</td>
<td>0.38</td>
<td>0.73</td>
<td>0.51</td>
</tr>
<tr>
<td>Male Controls</td>
<td>Positive</td>
<td>0.95</td>
<td>0.5</td>
<td>0.45</td>
<td>0.92</td>
<td>0.84</td>
</tr>
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### Table 10.20. Memory Data Means for Male MDD Patients versus Male Controls

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<th>A'</th>
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</thead>
<tbody>
<tr>
<td>Male MDD Patients</td>
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<td>0.36</td>
<td>0.45</td>
<td>0.63</td>
<td>0.46</td>
</tr>
<tr>
<td></td>
<td>Negative (Grouped)</td>
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<td>0.44</td>
<td>0.39</td>
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<td>0.46</td>
</tr>
<tr>
<td>Male Controls</td>
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<td>0.95</td>
<td>0.5</td>
<td>0.45</td>
<td>0.92</td>
<td>0.84</td>
</tr>
<tr>
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<td>Negative (Grouped)</td>
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### Table 10.21. Memory Data Means for Male SAD Patients versus Male Controls

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<th>A</th>
<th>A'</th>
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<td>0.6</td>
<td>0.4</td>
</tr>
<tr>
<td></td>
<td>Negative (Grouped)</td>
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<td>0.53</td>
<td>0.35</td>
<td>0.79</td>
<td>0.64</td>
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<tr>
<td>Male Controls</td>
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<td>0.45</td>
<td>0.92</td>
<td>0.84</td>
</tr>
<tr>
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<td>Negative (Grouped)</td>
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Table 10.22. Memory Data Means for Treatment Responders versus Controls at Time2

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<th>Exclusion</th>
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<th>A</th>
<th>A'</th>
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<tr>
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<td>HNA</td>
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<td>0.34</td>
<td>0.47</td>
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<td>0.28</td>
</tr>
<tr>
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<td>0.34</td>
<td>0.53</td>
<td>0.6</td>
<td>0.37</td>
</tr>
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<td>NSR</td>
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<td>0.4</td>
</tr>
<tr>
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<td>CN</td>
<td>0.94</td>
<td>0.41</td>
<td>0.53</td>
<td>0.79</td>
<td>0.57</td>
</tr>
<tr>
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<td>0.44</td>
<td>0.31</td>
<td>0.7</td>
<td>0.53</td>
</tr>
<tr>
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<tr>
<td></td>
<td>HNA</td>
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<td>0.43</td>
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<td>0.71</td>
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</tr>
<tr>
<td></td>
<td>PT</td>
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<td>0.53</td>
<td>0.35</td>
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</tr>
<tr>
<td></td>
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</tbody>
</table>
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