University of Calgary

# Mood and Cognition:

# Mood State Dependence and Information Processing in Remitted Depression

by

Kate E. Hamilton

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Abstract

Individuals vulnerable to depression are postulated to have latent maladaptive cognitive schemas consisting of negative self-referent information. Mood induction is a procedure for activating latent depressogenic cognitive processes. Fifty-five never depressed (ND), and 42 remitted depressed (RD), undergraduate females were identified on the basis of scores on the Beck Depression Inventory – II (BDI-II), the Inventory to Diagnose Depression – Lifetime Version (IDD-L), and a DSM-IV based questionnaire for depression. ND and RD individuals were randomly assigned to a negative or neutral mood induction condition. Individuals were compared on colour-naming latency, self-referent endorsement, and incidental recall of emotional Stroop stimuli. RD individuals in the negative mood condition showed significantly longer mean colour-naming latency relative to ND individuals in the neutral mood condition, irrespective of Stroop valence. Regardless of experimental condition, a significantly greater mean number of positive Stroop stimuli were endorsed being self-referent, while a significantly greater mean number of negative Stroop stimuli were recalled. Implications for mood priming in depression research are discussed.

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Many individuals experience transient symptoms of mild depression, or dysphoria, throughout their lives. Major Depressive Disorder (MDD), however, is a persistent, recurrent, and debilitating mental disorder with deleterious personal consequences. Individuals with MDD frequently suffer significant impairment in the areas of interpersonal, occupational/academic, or cognitive functioning. Major Depressive Disorder is one of the most commonly observed disorders in mental health care facilities. Approximately 5% of the general population are currently depressed, while17% of individuals are estimated to experience major depression during their lifetime (Kaelber, Moul, & Farmer, 1995; Kessler et al., 1994). The financial cost associated with MDD in Canada is estimated to be 4.4 billion dollars annually (Dozois, 1999).

The essential feature of MDD, as outlined in the *Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition* (DSM-IV; American Psychiatric Association [APA], 1994), is depressed mood or diminished pleasure. Four of the following symptoms must also be present: significant weight change or appetite change, insomnia or hypersomnia, psychomotor agitation or retardation, fatigue or loss of energy, feelings of worthlessness or excessive guilt, diminished ability to concentrate or indecisiveness, or recurrent thoughts of death or suicidal ideation. These symptoms must persist for most of the day, nearly every day, for a minimum of two consecutive weeks, and must signify a shift from previous functioning. These symptoms must result in clinically significant distress or impairment in social, occupational, or other domains of

functioning. The symptoms must not be a result of the direct physiological effects of a substance or a general medical condition. Finally, bereavement must not provide a sufficient account of the symptoms (DSM-IV; APA, 1994).

Epidemiological studies consistently reveal that adult women are two to four times as likely as adult men to develop Major Depressive Disorder (Kaelber, Moul, & Farmer, 1995; Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993; Nolen-Hoeksema, 1987, 1991; Sprock & Yoder, 1997; Weissman & Klerman, 1977). Approximately 19% of adult women experience Major Depression during their lifetime (Kaelber, Moul, & Farmer, 1995). These epidemiological studies suggest that approximately 11% of adult women experience Major Depression during a one-year period. Incidence estimates suggest that approximately 2% of adult woman develop new cases of Major Depression annually. Although depression is a pervasive mental disorder affecting men and women of all ages, the present study investigates major depression in adult women in light of the disproportionate rate of morbidity.

The onset and course of Major Depressive Disorder is variable. The mean age of onset for the first episode of major depression among women is estimated to be twenty-four. The first episode of major depression is typically preceded by sub-clinical symptoms of depression. The majority of individuals with Major Depressive Disorder experience remission of symptoms, followed by recurrent episodes (Gotlib & Hammen, 1992). Individuals not receiving some form of therapy typically remain depressed for a six-month period or longer. In approximately 20% to 30% of cases, a sub-clinical constellation of symptoms persists. Only in 5% to 10% of cases does the full criteria for Major Depressive Disorder continue to persist beyond two years (DSM-IV; APA, 1994).

Cognitive Theory of Depression

The pervasive nature of major depression, its devastating impact on psychosocial functioning and its profound monetary liability, have prompted the generation of diverse etiological models for the disorder. Etiological models derived from psychodynamic, behavioural, interpersonal, life event, biological, and cognitive orientations have enjoyed a history of empirical support (Beckham & Leber, 1995; Gotlib & Hammen, 1992; Mann, 1989; Paykel, 1992). Cognitive theories of depression have achieved considerable notoriety within psychology. The present study used a cognitive framework to investigate depression.

Cognitive theories of depression may be conceptualised in terms of structures, propositions, operations, and products (Ingram, Miranda, & Segal, 1998). Theories focussing on cognitive structures emphasise how information is stored and organised. Short-term memory is an example of a cognitive structure. Theories focusing on cognitive propositions emphasise the meaning of information stored and organised within a structure. Episodic knowledge is an example of a cognitive proposition. The cognitive schema (Beck 1963, 1967, 1987) encompasses structures and propositions, and is assumed to be the critical architectural foundation within which information is meaningfully organised. Theories focusing on cognitive operations emphasise the processes underlying cognition. Information attentional allocation is an example of a cognitive operation. Theories focusing on cognitive products emphasise the thoughts an individual may experience in response to the interaction of information with cognitive structures, propositions, and operations.

Beck's Cognitive Model of Depression

Beck's original diathesis-stress model of depression (Beck, Rush, Shaw, & Emery, 1979) has received considerable empirical attention. The model postulates that dysfunctional cognitive processing mediates the relationship between stressful life events and depression. How an individual perceives and interprets his or her life experiences critically influences his or her physiological, affective, and behavioural response (Beck, 1964).

The cognitive triad (Beck et al., 1979) is conceived as a central component of depression. Individuals vulnerable to depression tend to view themselves, the world, and the future in a negatively biased manner. For instance, an individual may perceive himself or herself to be inadequate despite contrary evidence. The depressed individual typically views the world as harsh and demanding. Further, this individual believes the future is bleak and hopeless.

This negative cognitive set, or schema, is a product of enduring negative self-referent core beliefs based on past experience (Beck, 1963, 1967, 1976, 1987). The schematic template actively filters, categorises, and evaluates incoming stimuli. A critical assumption is that these maladaptive cognitive structures remain dormant until activated by stressful life events. When activated, these schemas are thought to provide access to an intricate network of depression-related themes and instigate a corresponding pattern of negative self-focused information processing (Ingram, et al., 1998; Segal & Ingram, 1994).

At an intermediate level, self-focused information processing is characterised by attitudes, rules, and assumptions. For instance, an individual assumes that it is

unacceptable to fail and that he or she must perform optimally in every situation. This intermediate level of cognitive processing gives rise to a superficial level of cognitive processing characterised by automatic thoughts. Automatic thoughts are brief, transient images or thoughts that rapidly materialise. These automatic thoughts frequently go unrecognised - typically, it is the consequent mood that is brought to awareness (Beck, 1995).

In summary, underlying schemas influence perception and manifest as automatic thoughts. When activated, enduring maladaptive core beliefs generate distorted assumptions or expectations and produce situation-specific negative automatic thoughts, which consequently induce depressive affect and behaviour in response to typical, but stressful, life events. The causal relationship between cognition, affect, and behaviour remains controversial (DeRubeis & Feeley, 1990).

Mood-State Dependence Theory

Recent empirical research suggests that cognitive schemata may be mood-state dependent (Ingram et al., 1998). Beck's diathesis-stress model of depression provides a theoretical framework for conceptualising the mood-state dependence of cognitive processing, which is assumed to play a causal role in depression. As noted, the model emphasises interactions among cognitive vulnerabilities and stressful life events. Specifically, individuals vulnerable to depression are postulated to have latent, but reactive, maladaptive cognitive schemas consisting of negative self-referent information. A key assumption is that these maladaptive cognitive structures remain dormant until activated by a negative event or mood state. When activated, these schemas provide access to a complex network of negative themes, and subsequently actuate a

corresponding pattern of negative self-focused information processing that precipitates depression. Importantly, accessing these maladaptive cognitive processes requires a negative mood-state because dysfunctional information processing becomes undetectable when an episode of depression remits (Beck, 1987).

Priming

Priming is an empirically supported procedure for activating latent depressogenic cognitive schemas, operations, and products. The critical assumption underlying priming studies is that cognitive vulnerability can only be adequately assessed when putatively dormant negative self-referent schemata are activated. In the absence of schematic activation, non-significant research findings cannot be used to invalidate a particular cognitive variable as a risk factor due to the inability to address the question of whether or not a dormant vulnerability was operative during assessment (Ingram et al., 1998). Although priming studies are designed to ensure that latent predisposition factors are operative during assessment, not all priming procedures are reliable or valid. Methodological flaws in early priming studies may account for non-significant findings.

Priming studies have applied incidental recall paradigms to investigate maladaptive cognitive structures in individuals at risk for depression. Teasdale and Dent (1987) investigated incidental recall of self-descriptive positive and negative adjectives in remitted depressed and never depressed participants. The priming procedure consisted of a standard music induction. Participants listened to a depressing piece of music ('Russia under the Mongolian Yoke'; see Clark, 1983) for seven minutes, with instructions to try hard to get into a depressed mood. Statistical analysis of scores on the Visual Analogue Scale (VAS) demonstrated that the negative mood priming procedure was effective.

Remitted depressed participants and never depressed participants did not differ significantly on measures of adjective recall in the normal mood condition. However, in the negative mood priming condition, remitted depressed participants, relative to never depressed participants, recalled significantly more negative self-descriptive adjectives. These recall patterns, putatively representing latent maladaptive cognitive schemas, appear to be vulnerability factors.

Gilboa and Gotlib (1997) investigated the differential influence of negative and positive affect priming procedures on remitted depressed and never depressed individuals with respect to incidental recall. The priming procedure involved a five-minute autobiographical re-experiencing task focusing on positive or negative events while listening to negative affect or positive affect music (Beethoven's string quartet op. 131 and Vivaldi's "Spring" violin concerto op. 12). Remitted depressed individuals demonstrated superior memory for negative affect information relative to never depressed individuals. The two groups did not differ significantly in terms of their memory for positive or neutral affect words. In addition, Hedlund and Rude (1995) found that remitted depressed individuals recalled a significantly greater number of negative affect words relative to never depressed individuals following a self-focus manipulation. No significant group differences were observed for positive affect words.

Priming studies have utilised information processing paradigms to investigate maladaptive cognitive processes or operations in individuals at risk for depression. Gotlib and Cane (1987) examined attention bias and construct accessibility in depressed participants during an episode of depression and again at discharge using a modified Stroop task consisting of depressive, manic, and neutral content words. The priming

procedure involved the participants listening to, and repeating, lists of positive or negative prime words. During an episode of depression, depressed participants, relative to non-depressed controls, demonstrated longer response latencies with depressive content words than with non-depressive content words. However, at discharge this group difference was non-significant. It remains unclear whether treatment effects successfully altered maladaptive cognitive structures. The implications of this study are discussed in a later section.

Ingram et al. (1994) employed a priming procedure to investigate attentional allocation processes in individuals at risk for depression. A dichotic listening task was used to assess attention to negative and positive stimuli. The priming procedure consisted of standard eight minute music induction ('Russia Under the Mongolian Yoke'; see Clark, 1983) followed by an autobiographical induction (participants were instructed to think about the saddest event in their lives and write a paragraph of two describing this event). Statistical analysis of Multiple Affect Adjective Checklist (MAACL) scores revealed a negative mood priming effect. In the no-priming condition, remitted depressed and never depressed participants did not differ significantly in terms of tracking errors. However, in the negative mood condition, remitted depressed participants made significantly more tracking errors in response to the negative and positive stimuli compared to the never depressed participants. The authors suggest that individuals at risk for depression possess a reactive, but diffuse, schema activating process.

In a replication of the above research, Ingram and Ritter (1998) found a specific (non-diffuse) schematic activation process in remitted depressed participants. Specifically, in the negative mood condition, the remitted depressed participants

compared to the never depressed participants made significantly more tracking errors in response to the negative stimuli but not the positive stimuli. Non-significant group differences in the no-priming condition were replicated. These findings provide empirical support for construct accessibility through priming; however, they contradict the emotionally diffuse nature of attentional allocation patterns in at risk individuals (as cited in Ingram et al., 1998).

Finally, self-report inventories have been used in priming studies to assess maladaptive cognitive products in individuals at risk for depression. Miranda and Persons (1988) examined the mood-state dependence of dysfunctional attitudes in remitted depressed and control participants. The Velten (1968) mood-induction procedure was employed. Participants were instructed to read, and attempt to feel the mood suggested by, sixty self-referent depression (e.g., I am discouraged and unhappy about myself) or elation (e.g., I am full of energy) statements or sixty neutral statements. Participants were asked to feel each statement as intensely as possible and recall past experiences congruent with these feelings. Following the negative mood induction, the remitted depressed participants endorsed significantly more dysfunctional attitudes than did control participants. A non-significant group difference was found in the no-induction condition. Miranda, Persons, Byers (1990) replicated these findings. These studies support the view that dysfunctional attitudes, or maladaptive cognitive products, are cognitive risk factors for depression. Furthermore, these dysfunctional attitudes appear to be mood-state dependent.

Extending this research, Roberts and Kassel (1996) examined dysfunctional attitudes, automatic positive and negative thoughts, and self-esteem. Naturally occurring

low positive and high negative affect, as assessed by the MAACL, were used as mood primes. Low positive affect loads on MAACL items such as enthusiastic, tender, joyful, and loving; whereas, negative affect loads on MAACL items such as sad, afraid, lonely, and furious. Results revealed that negative affect was more strongly associated with negativity on all measured cognitive constructs in remitted-dysphoric participants as compared to never-dysphoric participants. Significant group differences were not found for low positive affect or the combination of high negative affect and low positive affect. This study lends credence to the growing body of empirical research suggesting that at risk individuals possess maladaptive cognitive schemas, which when activated, give rise to dysfunctional attitudes.

The Stroop Interference Effect

Theories focusing on cognitive operations of depression have emphasised biases in attention allocation; specifically, sensitivity to and preoccupation with environmental stimuli. Cognitive models assume that attentional bias plays a critical role in the causation and maintenance of depression. Information processing tasks have been used to examine attentional bias whereby selective attention to emotionally relevant stimuli disrupts task performance. The most commonly used experimental paradigm to investigate attention bias is the Stroop task (Stroop, 1935).

The Stroop task requires participants to name the colour of ink in which the colour and non-colour words are presented. It is a well-documented finding that participants demonstrate longer response times for naming the ink colours of different-colour words (i.e. green printed in blue ink) than they do to naming the ink colours of non-colour words (i.e. sock printed in blue ink) (MacLeod, 1991). Investigators have

interpreted this difference in terms of response interference – the automatic processing of the content of the colour word interferes with the competing response of naming the different ink colour, resulting in an increased latency for naming the ink colour of colour relative to non-colour words.

Modified versions of the original Stroop task have demonstrated an interference effect for semantically activated words. Emotion-relevant interference effects, putatively arising from attentional bias, correlate with various forms of psychopathology. Specifically, modified versions of the Stroop task have been used to investigate attentional bias in the following disorders: generalised anxiety disorder (Golombok et al., 1991; Martin, Williams, & Clark, 1991; Mathews & MacLeod, 1985; Mogg, Mathews, & Weinman, 1989), panic disorder (Carter, Maddock, & Magliozzi, 1992; Ehlers, Margraf, Davies, & Roth, 1988; Hope, Rapee, Heinberg, & Dombeck, 1990; McNally, Riemann, & Kim, 1990; McNally, Reimann, Louro, Lukach, & Kim, 1992; McNally et al., 1994), phobias (Hope et al., 1990; Lavy & van den Hout, 1993; Mattia, Heinberg, & Hope, 1993; Watts, McKenna, Sharrock, & Trezise, 1986), obsessive-compulsive disorder (Foa, Hai, McCarthy, Shoyer, & Murdock, 1993; McNally et al., 1994), post traumatic stress disorder (Cassiday, McNally, & Zeitlin, 1992; Foa, Freske, Murdock, Kozak, & McCarthy, 1991; Kaspi, McNally, & Amir, 1995; McNally, Riemann, & Zeitlin, 1990; Thrasher, Dalgleish, & Yule, 1994) eating disorders (Cooper & Fairburn, 1992; Lovell, Williams, & Hill, 1997), schizophrenia (Carter, Robertson, Nordahl, O'Shora-Celaya, & Chaderjian, 1993; David, 1993; Buchanan et al., 1994), and depression (Bentall & Thompson, 1990; Carter et al., 1992; David, 1993; Hale & Strickland, 1975; Gilboa & Gotlib, 1997; Gotlib & Cane, 1987; Gotlib & McCann, 1984; Hill & Knowles, 1991;

Kinderman, 1994; Kleiger & Cordner, 1990; Mogg, Bradley, Williams, & Mathews, 1993; Rush, Weissenburger, Vinson, & Giles, 1983; Segal, Hood, Shaw, & Higgins, 1988; Segal, Gemar, Truchan, Guirguis, & Horowitz, 1995; Segal & Vella, 1990; Williams & Broadbent, 1986; Williams & Nulty, 1986) . See Dozois and Dobson (1996) for a review of the Stroop task in psychopathology.

The Emotional Stroop Task and Depression

The Emotional Stroop Task for depression uses positive, neutral, and negative affect words as opposed to colour and non-colour words used in the original Stroop task. Beck's cognitive model of depression suggests that depression-prone individuals possess latent negative self-referent schemas. When activated, environmental information is filtered automatically through these negative self-referent schemas. These schemas should increase a vulnerable individual's attention to the content of the negative affect words, thereby interfering with their ability to name quickly the colours in which these negative affect words are printed. Depressed individuals, as well as primed remitted depressed individuals, should show increased response latency on the Emotional Stroop Task when viewing negative affect words relative to positive and neutral affect words. Individuals not at risk for depression theoretically should not show this effect.

The Emotional Stroop Interference Effect with depressed participants has been empirically supported. Gotlib and McCann (1984) employed the emotional Stroop paradigm to investigate construct accessibility among depressed and non-depressed individuals. Depressed individuals demonstrated significantly longer colour-naming latencies to negative affect words relative to positive and neutral affect words. By contrast, non-depressed individuals showed no such differential response pattern. A

second experiment involving a mood-induction was conducted to test whether the emotional Stroop effect was a result of transient mood-state, or as postulated, was the result of depressogenic information processing. Non-depressed participants showed no emotional Stroop effect across negative, neutral, or manic mood induction conditions. Hence, it does not appear that the emotional Stroop effect observed in the initial experiment can be attributed to transient mood disparity among depressed and non-depressed individuals. Taken together, the two experiments support Beck's cognitive model suggesting that depressed individuals possess highly accessible negatively biased cognitive constructs.

In a subsequent study, Klieger and Cordner (1990) successfully replicated Gotlib and McCann's (1984) original experiment using a classic Stroop paradigm (e.g., small number of stimuli repeated) and standardised depression scores. Mildly dysphoric individuals showed significantly longer colour naming latency to negative affect words relative to neutral affect words. Non-depressed individuals did not show this effect. Mildly and moderately dysphoric individuals showed significantly longer colour naming latency to negative affect words relative to non-depressed individuals. In general, these findings support Gotlib and McCann's conclusions regarding the accessibility of depressogenic cognitive constructs in depression.

Additional studies using the emotional Stroop task support the existence of depressogenic cognitive constructs, and consequent maladaptive information processing in depression. Williams and Nulty (1986) found that a large proportion (68%) of stable depressed individuals (past depression/current depression) showed longer colour naming latency to negative affect words relative to neutral affect words. Only a small proportion

(17%) of never depressed individuals showed such an interference effect. Interestingly, an intermediate proportion (44%) of unstable depressed individuals (past depression/no current depression) showed the interference effect. These findings suggest that the emotional Stroop interference effect for negative affect words reflects stable biases in construct accessibility as opposed to transient mood. Gotlib and Cane (1987) reported that hospitalised depressed individuals showed a longer colour naming latency to negative affect words relative to positive and neutral affect words. The never depressed control group showed no interference effect across affect word categories. Similarly, Kinderman (1994) found that depressed individuals demonstrated longer colour naming latency to negative affect words than positive and neutral affect words. Never depressed individuals showed no interference effect across affective word types. In a more recent study, Dozois (1999) also found that depressed individuals took longer to name the colours of negative affect words relative to positive content words. Non-depressed and anxious individuals showed no such emotional Stroop effect. In summary, it appears as though depressed individuals exhibit negative attentional bias in response to negative affect information.

The Emotional Stroop Task and Self Reference

Segal et al. (1988) examined the construct accessibility of self-relevant affect Stroop stimuli following an emotionally congruent or incongruent priming procedure. Results revealed a significant prime-target relatedness effect for depressed individuals. Specifically, longer colour naming latencies were observed when the prime and Stroop target word were both self-referent than when only the Stroop target word, and not the prime, was self-referent. The effect was obtained for both negative and positive affect

prime-target pairs. Notably, depressed individuals endorsed a significantly greater number of negative adjectives as being self-referent relative to controls. Results support the view that depressed individuals possess negative self-referent schemata that influence information processing and consequent interpretation of events in a negatively biased manner. Segal and Vella (1990) replicated these findings with the addition of a heightened self-awareness induction procedure. While looking into a mirror, participants listened to a recording of a passage from the General Record Examination test booklet. Individuals in the heightened self-awareness condition demonstrated significantly longer colour naming latencies for self-relevant prime-target pairs relative to individuals not in the heightened self-awareness condition.

In a subsequent study, Segal et al. (1995) successfully replicated these findings using positive and negative affect priming phrases. Depressed individuals demonstrated longer colour naming latencies for negative self-referent words primed with negative self-referent phrases relative to negative self-referent words primed with negative non-self-referent phrases and both self-referent and non-self-referent positive target-prime combinations. Non-depressed individuals did not show this prime-target effect. These findings suggest that depressed individuals possess highly accessible negative self-referent cognitive constructs. Thus, negative self-referent information may be more highly interconnected than generic negative affect information. In addition, the results suggest that both self-referent and non-self-referent positive information may be less interconnected in depressed individuals.

Segal and Gemar (1997) provide a unique and compelling case in support of Beck's model purporting that depressed individuals possess highly interconnected

negative self-referent information. The authors used the emotional Stroop task, primed with varying levels of self-referent phrases, to investigate cognitive organisation and information processing in depressed individuals before and after cognitive behavioural therapy. Only Gotlib and Cane (1987) have investigated the cognitive malleability of depressogenic constructs (assessed via a primed self-referent Stroop task) following therapy; however, in their study treatment modality (e.g., psychotherapy and/or pharmachotherapy) was not systematically controlled. Theoretically, cognitive therapy for depression should reduce or modify maladaptive knowledge constructs (Beck, 1967). As anticipated, Segal and Gemar (1997) found that less depressed individuals at post-treatment showed significantly less colour naming interference for self-referent negative affect words primed by self-referent negative affect phrases as compared to non-self-referent primes. By contrast, non-treated depressed individuals and treatment non-responders showed higher levels of negative interference.

A number of explanations for reduced Stroop interference following cognitive therapy are plausible. Perhaps cognitive therapy successfully modified the organisation of maladaptive cognitive schemata. However, cognitive reorganisation is not specific to cognitive therapy; interpersonal therapy as well as pharmacotherapy have been shown to alter unprimed Stroop interference (Cooper & Fairburn, 1994; Mattia et al., 1993). It may be the case that depressed individuals in cognitive therapy learn to generate and evaluate alternative interpretations of events, and hence have less accessible cognitive networks for negative information. In keeping with this view, it is the level of activation, and not necessarily the cognitive structure that is altered. Regardless, it is apparent that some form of cognitive organisational change, as measured by the emotional Stroop task,

occurs in response to successful cognitive therapy. Future research is needed to determine whether cognitive therapy alters underlying cognitive structures and/or accessibility, and whether such change is treatment specific (e.g., cognitive therapy, interpersonal therapy, pharmachotherapy).

The Emotional Stroop Effect and Artifactual Explanations

Three artifactual explanations for the emotional Stroop effect must be considered. The first asserts that the interference effect of emotion-relevant words is due to priming. Specifically, emotion-relevant words, all having a common theme, may prime subsequent emotion-relevant words, while random control words are unlikely to prime one another. However, studies controlling for inter-category priming - making control words also categorical - have found an interference effect of emotion-relevant words (Williams, Mathews, & MacLeod, 1996). The second artifactual explanation assumes that the interference effect is due to repetition of a small number of critical words. However, single critical-word presentation studies have demonstrated an interference effect with emotion-relevant stimuli (Gotlib & Cane, 1987). The third artifactual explanation posits that the interference effect is due to individuals consciously attending to emotion-relevant stimuli. However, subliminal emotional Stroop tasks have found interference with emotion-relevant stimuli (MacLeod & Hagan, 1992; Mogg et al., 1993). Altogether, it does not appear that the emotional interference effect is due to inter-category priming, critical word repetition, or conscious strategies.

The Emotional Stroop Effect and Connectionist Models

A number of explanatory models have been developed to account for the attentional bias observed in the Stroop Effect (Cohen, Dunbar, & McLelland, 1990; Luo,

1999; MacLeod, 1991; Mathews & Harley, 1996; Williams et al., 1996). These models attempt to explain how emotion-relevant stimuli accrue attentional resources. Schema and network theories describe the activation of threatening knowledge structures in response to emotion-relevant material, which induce disproportionate processing resources (Beck, 1985; Bower, 1981).

Cohen, Dunbar, and McClelland's (1990) connectionist model offers a conceptual framework for understanding attentional bias on the Stroop task. They propose two interacting pathways - one for colour naming and the other for word reading - which have input, intermediate, and output units. Dissimilar patterns of activation on a single point of intersection within the network result in interference. The model postulates three critical assumptions: increased strength of a processing pathway following prolonged exposure to certain material, increased resting activation level for concern-related material, and short-term neuromodulatory control of input units associated with threat or loss (Williams et al., 1996).

The emotional Stroop effect can be conceptualized in three ways using Cohen et al's (1990) connectionist framework. First, emotion-relevant stimuli may be highly practised, thereby resulting in greater relative interference at the output stage. However, modelling the emotional Stroop effect in terms of practice effects is inadequate. Therapy, which increases practice or familiarity with emotional-relevant stimuli, reduces the emotional impact of this material and can eliminate the emotional Stroop effect. Clearly, practice alone is an insufficient account of the emotional Stroop effect.

Second, the emotional Stroop effect can be modelled in terms of an increased resting level of activation of input units for threatening stimuli. If only this process is

operational, then the emotional Stroop interference effect should occur with any personally salient emotional material – whether positive or negative. The literature supports the notion that personally salient emotional material is necessary to explain emotional Stroop interference in non-clinically disturbed individuals (Williams et al., 1996). As previously mentioned, modified versions of the emotional Stroop task have generated interference effects for semantically activated word stimuli in clinical populations (e.g., individuals with a phobia of spiders show an interference effect with spider-related stimuli).

Third, these sensitive input units, when associated with threat, may be subject to neuromodulatory control, which in turn affects the responsivity of these units. This process, alone or in combination with the second process, suggests that negative emotional material would have an added Stroop interference effect over and above personally salient emotional material. In clinically disturbed individuals, personally salient emotion material and negative emotional material is critical in determining the extent of the emotional Stroop effect (Williams et al., 1996).

A conceptual model of the emotional Stroop effect is illustrated in the following example. Assume that the resting level of input activation for the word 'lonely' is .7 for people who are depressed and .4 for people who are not depressed. Assume that the resting level of activation for the neutral word 'fireplace' is .3 for both depressed and non-depressed people. The model predicts a chronically higher activation output when a depressed person sees the word 'lonely', increasing the activation level throughout the word-reading pathway and resulting in greater interference with colour-naming at the

response module. The depressed person shows little interference with the word 'fireplace' and the non-depressed person shows little interference for either word.

Purpose and Rationale

The primary purpose of this study was to examine the mood state dependence of maladaptive cognitive processing in individuals identified as at risk for depression. Given our knowledge about relapse rates in depression, and consistent with previous research, depression risk was operationalised by virtue of study participants having previously experienced a clinically significant episode of depression. Remitted depressed and never depressed individuals, randomly assigned to a negative or neutral mood priming condition, were compared on cognitive reactivity to emotionally laden word stimuli. Cognitive reactivity was assessed as a function of response latency on the Emotional Stroop Task using positive and negative affect words and non-words presented via a computer monitor.

A secondary purpose of this study was to investigate the self-reference effect of positive and negative affect Stroop stimuli among remitted depressed and never depressed individuals. Self-referent encoding was assessed as a function of the degree to which positive and negative affect words were endorsed as "like me" versus "not like me" following the emotional Stroop task. In addition, incidental recall of positive and negative affect Stroop stimuli was examined. Incidental recall was assessed as a function of the number of negative versus positive affect Stroop stimuli recalled immediately following the emotional Stroop task.

The study of maladaptive cognitive processing in individuals at risk for depression has been instrumental in developing our knowledge and understanding of

depression. However, the vast majority of these studies are intrinsically limited; specifically, they fail to use priming procedures to activate latent cognitive structures. This study, in accordance with the most recent empirical findings in the area of information processing, affords an innovative investigation into the cognitive antecedents of depression. Understanding depression within a theoretical framework is vital to its prevention and treatment. This study offers to substantiate the need for mental health professionals to use priming procedures when assessing depression, and has the potential to serve as a method for differentiating vulnerable and non-vulnerable individuals.

Hypotheses

The following hypotheses were based on: a) research supporting the mood-state dependence of cognitive constructs, and b) research supporting interference specificity in response latency on the Emotional Stroop task with depressed participants. Remitted depressed participants in the negative mood induction condition were expected to show significantly longer response latency for negative affect Stroop stimuli as compared to remitted depressed participants in the neutral mood induction condition and never depressed participants in either mood induction condition. By contrast, remitted depressed participants in the negative mood induction condition were not expected to show significantly longer response latencies for positive or neutral affect Stroop stimuli, as compared to remitted depressed participants in the neutral mood induction condition and never depressed participants in either mood induction condition.

The following hypotheses were based on empirical research investigating the self-referent effect among depressed individuals. It was hypothesised that remitted depressed participants in the negative mood induction condition would endorse a significantly

greater proportion of negative affect words relative to the remitted depressed participants in the neutral mood induction condition and never depressed individuals in either mood induction condition. No significant group differences were hypothesised for positive affect words. Further, it was anticipated that reaction time and self-referent scores for negative affect Stroop stimuli would be significantly correlated for remitted depressed participants in the negative mood induction condition as compared to the remitted depressed participants in the neutral mood induction condition and never depressed participants in either mood induction condition. No significant group differences were anticipated for the positive affect words.

It was anticipated that remitted depressed participants in the negative mood priming condition would recall a significantly greater proportion of negative affect Stroop stimuli relative to remitted depressed participants in the neutral mood induction condition and never depressed participants in either mood induction condition. No group difference on the proportion of positive affect Stroop stimuli were anticipated.

Design

A 3(Stroop Stimulus) by 2(Depression History) by 2(Mood Induction) split-plot repeated measures analysis of variance (ANOVA) design was used to investigate emotional Stroop interference, self-referent endorsement, and the incidental recall. Stroop Stimulus (30 positive affect words, 30 negative affect words, and 30 non-words) served as the within-subject factor, while Depression History (never depressed versus remitted depressed) and Mood Induction (negative versus neutral) served as a between-subject factors. Stroop colour naming latency, measured in milliseconds, served as the primary

dependent variable, although ratings of self-descriptiveness, (0-100) and incidental recall (the number of negative and positive Stroop stimuli recalled) were also collected.

## Method

### Participants

Female University of Calgary students were solicited through the Psychology Department Bonus Credit Research Participation System into either a remitted or never depressed group. Selection criteria for the remitted depressed group were based on the following: scores below 13 on the Beck Depression Inventory – II (BDI-II); scores above 20 on the Inventory to Diagnose Depression – Lifetime Version (IDD-L); and past presence of five of nine criteria for major depression on a DSM-IV criterion-based questionnaire (APA, 1994). Selection criteria for the never depressed group were based on the following: scores below 13 on the BDI-II; scores below 20 on the IDD-L; and no significant history of depression as measured by the DSM-IV criterion-based questionnaire.

### Measures

*Depression.* The Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996; Dozois, Dobson, Ahnberg, 1998) was used to assess depressive symptomatology. The BDI-II is a psychometrically sound 21 item self-report measure. Each item is answered on a 0 to 3 scale with total scores ranging from 0 to 63. A cut score of 13 was used in this study (e.g., participants scoring 13 or more were excluded from the study). The BDI-II has been found to demonstrate high internal consistency ($\alpha$=.93 among university students; $\alpha$=.92 among outpatients). Content validity, factorial validity, and diagnostic discrimination have been established (Dozois et al., 1998).

A DSM-IV criterion-based questionnaire focusing on Major Depressive Disorder was formulated to assess past history of depression (APA, 1994). The questionnaire is a 9 item self-report measure. Respondents are instructed to think of the most depressed two-week period in their life and indicate (using a check mark) whether they experienced any of the following symptoms. Two additional items assess bereavement and medication/physical illness. A cut score of 5 was used in this study (e.g., participants endorsing five or more of the nine criteria were classified as having experienced a significant episode of depression). The DSM-IV criterion-based questionnaire is shown in Appendix A.

The Inventory to Diagnose Depression-Lifetime Version (IDD-L; Zimmerman & Coryell, 1987; Zimmerman, Coryell, & Wilson, 1986) was used to validate past depression status defined by the DSM-IV criterion-based questionnaire. The IDD-L is a 22 item self-report measure. Each item is rated on a 0 to 4 scale with total scores ranging from 0 to 88. For each item, the respondent indicates whether the symptom occurred for more or less than two weeks. For items marked "more than two weeks", a cut score of 20 was used (e.g. participants scoring 20 or above were classified as having experienced a significant episode of depression). Additional items assess the origin, duration, impairment, and treatment of the depression. The IDD-L has good sensitivity (74%) and specificity (93%). The IDD-L is shown in Appendix B.

*Mood-State.* The Visual Analogue Scale (VAS) was used to assess current mood-state. Participants rated instantaneous mood on 100-point scales labelled 0 (positive mood) to 100 (depressed mood). A 20-point increase on the VAS served as the criterion for a mood induction effect. The VAS is shown in Appendix C.

*Attentional Bias.* The Emotional Stroop Task was used to assess attentional bias. Two personality dimensions, sociotropy and autonomy, have been postulated to mediate depression. Sociotropy refers to invested beliefs and objectives that pertain to the establishment and maintenance of interpersonal attachments. Autonomy refers to invested beliefs and objectives that pertain to the establishment and maintenance of independence, individuality, and achievement. In light of the poor predictive power of autonomy in depression, and the well documented association between sociotropy and depression, only the dimension of sociotropy was examined (Dozois, 1999). Thirty positive and 30 negative interpersonally oriented sociotropic word adjectives - matched on degree of valence, emotionality, imaginability, word frequency, and word length – were used (Dozois, 1999). In addition, 30 non-word letter strings, matched on length, were used.

The sixty sociotropic adjectives and 30 non-word letter strings were displayed in capital letters (8 mm high) on a 15" computer monitor. Each stimulus was presented in one of 5 colours (white, yellow, green, purple, or blue), with 6 positive words, 6 negative words, and 6 non-word letter strings printed in each colour. The adjectives were presented in an intermixed fashion with a different random order for each participant. A microphone was positioned approximately 3 cm from the participant's mouth, and was connected to a voice-activated relay system which stopped the timer at the initiation of the participant's verbal response and recorded responses in milliseconds.

Procedure

One hundred and ninety six participants were solicited for the current study. Fifty-four participants were excluded due to score above 13 on the BDI-II. Thus, 28% of the sample reported significant symptoms of depression. This percentage is higher than

typical estimates, but not unexpected given the recruitment procedure. Thirty-three participants were excluded due to inconsistent IDD-L and DSM-IV classification. Nine participants were excluded because of their inability to demonstrate a negative mood induction effect. Two participants were excluded due to bereavement. Finally, one participant was excluded as a result of technical failure. No participants were excluded as a result of impaired vision. Thus, ninety-seven participants completed the current study.

Participants were asked to carefully read and sign a consent form. The consent form informed participants that they might experience unpleasant feelings. The consent form indicated that participants could end the experiment at any point without penalty. All participants completed the BDI-II. All participants completed the IDD-L and the DSM-IV criterion-based questionnaire. All participants completed the VAS to assess mood-state.

Remitted depressed and never depressed participants were randomly assigned to either a neutral mood priming condition or a negative mood priming condition. Two methods were used in the negative mood priming condition: a music priming procedure and an autobiographical priming procedure. The music priming procedure consisted of participants listening to Sergey Prokofiev's "Russia Under the Mongolian Yoke" played at half speed (Clark, 1983; Teasdale & Dent, 1987). To enhance mood effects while listening to the music, participants were instructed to think about the saddest event in their lives. Participants were asked to write a paragraph or two describing this event. The music continued during this period for a total of 8 minutes (adapted from Ingram, Bernet, and McLaughlin, 1994). Two methods were used in the neutral mood priming condition: neutral music priming and a neutral picture viewing procedure. The neutral music

priming procedure consisted of participants listening to low levels of typical office background noises, while they examined a standard neutral picture from a children's' storybook. Participants were instructed to write a paragraph or two describing the picture. The neutral music continued during this period for a total of 8 minutes.

All participants completed the VAS to ensure that the mood induction procedure was effective. Participants in both priming conditions completed the emotional Stroop task. Participants were told that 5 colours would be used, and they were given 15 practice trials. When it was evident that the participants understood the task, they were presented with the 90 randomly ordered stimuli. Participants were instructed to name the colour of the presented word. Each trial began with a 1-second presentation of a fixation point followed by a 250-millisecond blank screen and then the immediate presentation to the adjective. Twenty randomly selected participants were monitored on colour-naming error rate (error rates were below 1% across experimental conditions). The computer calculated reaction time in milliseconds. All participants completed an incidental recall task; specifically, each participant recalled as many sociotropic words and non-word letter strings as possible from the emotional Stroop task. All participants then rated the self-relevance of the 90 words on a 100-point scale, with 0 to 50 indicating 'not like me' and 51 to100 indicating 'like me'.

For ethical reasons, participants in the negative mood priming condition received a positive mood priming procedure. Participants were asked to write a paragraph about the most positive event in their lives, while listening to an uplifting piece of music. These participants completed the VAS to ensure that they would not leave the lab in a mood more negative than the one in which they entered. A second positive mood priming

procedure was administered if necessary. Participants were debriefed and thanked for their participation. Care was taken to ensure that participants who scored above 13 on the BDI-II and/or endorsed a 2 or 3 rating on item 9 (suicidality) of the BDI-II received referral information.

## Results

### Design and Analysis

A 3 (Stroop Stimulus) by 2(Depression History) by 2(Mood Induction) split-plot repeated measures analysis of variance (ANOVA) design was used to investigate the emotional Stroop effect. Stroop Stimulus (30 positive affect words, 30 negative affect words, and 30 non-words) served as the within-subject factor, while Depression History (never depressed versus remitted depressed) and Mood Induction (negative versus neutral) served as a between-subject factors. Stroop colour naming latency, measured in milliseconds, served as the primary dependent variable, although ratings of self-descriptiveness, (0-100) and incidental recall (the number of negative and positive Stroop stimuli recalled) were also analysed.

Preliminary analyses were conducted to ensure that the assumptions underlying the split-plot repeated measures analysis of variance were met; namely sphericity, homogeneity of variance, normality, and independence of subjects. The assumption of sphericity for analyses involving within-subjects factors with more than two levels was examined using the Mauchly's test of sphericity. The Greenhouse-Geisser $\varepsilon$ adjustment, as opposed to the standard F-test, was used when the assumption of sphericity was violated. The assumption of homogeneity of variance for analyses involving between-subject factors with more than two levels was examined using the Levene test for

homogeneity of variance. Separate variance estimates, as opposed to the pooled mean-square error term, were used for follow-up t-tests when the assumption of homogeneity of variance was violated. Variables violating the assumption of homogeneity of variance were transformed. The assumption of normality was examined using tests of kurtosis and skewness. The split-plot repeated measures analysis of variance is generally robust to violations of the normality assumption (Maxwell & Delaney, 1990).

An alpha level of .05 was used for all planned comparisons. Type I error rates were controlled within each family of post hoc statistical tests using the Bonferroni adjustment ($\alpha/c$, where $\alpha$ denotes alpha and c denotes the number of contrasts). Therefore, the adjusted alpha per contrast for the between groups effects on positive, negative, and non-word Stroop stimuli was .0167 (e.g., .05/3). The adjusted alpha per contrast for the within-groups effects was also .0167.

Sample Characteristics

Sociodemographic information for the four experimental conditions (never depressed/neutral mood, never depressed/negative mood, remitted depressed/neutral mood, remitted depressed/negative mood) is presented in Table 1. A one-way analysis of variance (examining the continuous variable of age) and chi-square analyses (examining the dichotomous variables of marital status and ethnicity) were conducted to determine whether significant group differences existed across these demographic variables. Statistically significant group differences were found on age, $F(3, 92) = 5.56$, $p = .001$, and marital status, $\chi^2 (3, N = 97) = 9.581$, $p = .022$. No statistically significant group differences were found on ethnicity, $\chi^2(12, N = 97) = 17.34$, $p = ns$.

Table 1

Sociodemographic Means (Standard Deviations) across Experimental Conditions

| Variable | Never depressed/ Neutral Mood M (SD)/n (%) | Never depressed/ Negative Mood M (SD)/n (%) | Remitted/ Neutral Mood M (SD)/n (%) | Remitted/ Negative Mood M (SD)/n (%) |
|---|---|---|---|---|
| Age | 24.54 (8.04) | 21.44 (5.27) | 30.8 (10.84) | 27.29 (8.25) |
| Education | | | | |
| University Level | 28 (100%) | 27 (100%) | 21 (100%) | 21 (100%) |
| Marital Status | | | | |
| Not Married | 23 (82%) | 26 (96%) | 13 (62%) | 15 (71%) |
| Married | 5 (18%) | 1 (4%) | 8 (38%) | 6 (29%) |
| Employment | | | | |
| Student | 25 (89%) | 23 (85%) | 9 (43%) | 15 (71%) |
| Employed/Student | 3 (11%) | 4 (15%) | 12 (57%) | 6 (29%) |
| Ethnicity | | | | |
| Caucasian | 19 (68%) | 13 (48%) | 15 (71%) | 20 (95%) |
| Asian | 4 (14%) | 7 (26%) | 2 (10%) | 1 (5%) |
| East Indian | 1 (4%) | 4 (15%) | 1 (5%) | 0 (0%) |
| Black | 1 (4%) | 1 (4%) | 0 (0%) | 0 (0%) |
| Other | 3 (10%) | 2 (7%) | 3 (14%) | 0 (0%) |

Never depressed/Neutral Mood, n = 28; Never depressed/Negative Mood, n = 27; Remitted Depressed/Neutral Mood, n = 21; Remitted Depressed/Negative Mood, n = 21

Statistical analyses were conducted to investigate the relationship of each dependent variable (Stroop reaction time, self-referent scores, and incidental recall scores) with age and marital status. Age was not significantly correlated with Stroop reaction time, $r(96) = .14$, $p$ = ns, but was significantly correlated with self-referent scores, $r(96) = .21$, $p = .03$, and incidental recall scores, $r(96) = -.21$, $p = .04$. Using marital status as a between subjects factor, ANOVAs revealed that no significant relationships were observed for marital status with Stroop reaction time, $F(1, 95) = 2.75$, $p$ = ns, self-referent scores, $F(1, 95) = .77$, $p$ = ns, or incidental recall scores, $F(1, 95) = .04$, $p$ = ns. Hence, age was included as a covariate in the self-referent effect and incidental recall analyses.

Symptom severity information on the BDI-II, IDD-L, and DSM-IV for remitted depressed and never depressed participants is presented in Table 2. According to Dozois, Dobson, and Ahnberg's (1998) proposed cut-offs for analogue research on the BDI-II, mean scores for all experimental conditions were in the "non-depressed severity range" for current depressive symptomatology. A one-way ANOVA revealed no significant group differences on BDI-II scores, $F(1, 95) = 2.66$, $p$ = ns. According to conventional cut-offs (Zimmerman & Coryell, 1987), mean IDD-L scores for the never depressed neutral and negative mood priming conditions were in the "non-significant" range for history of depression symptomatology, while mean IDD-L scores for the remitted depressed neutral and negative mood priming conditions were in the "significant" range. Similarly, mean DSM-IV scores for the never depressed neutral and negative mood priming conditions were in the "non-significant" range for history of depressive

Table 2

Symptom Severity Means (Standard Deviation) across Experimental Conditions

| Variable | Remitted Depressed | Never depressed |
|---|---|---|
| BDI-II | 5.86 (3.97) | 4.62 (3.50) |
| IDD-L | 37.60 (13.74) | 4.51 (5.35) |
| DSM-IV | 6.74 (1.34) | 2.36 (1.71) |

symptomatology, while mean scores for the remitted depressed neutral and negative mood priming conditions were in the "significant" range. A one-way ANOVA revealed a significant difference between the remitted depressed versus never depressed group on IDD-L mean scores, $F(1, 95) = 266.65$, $p < .001$. As anticipated, based on inclusion and exclusion criteria, the remitted depressed group ($M = 37.60$, $SD = 13.74$) demonstrated significantly greater mean IDD-L scores relative to the never depressed group ($M = .451$, $SD = 5.35$). Similarly, a one-way analysis of variance revealed significant remitted depressed versus never depressed group differences on DSM-IV mean scores, $F(1, 95) = 185.93$, $p < .001$. As expected, the remitted depressed group ($M = 6.74$, $SD = 1.34$) demonstrated significantly greater mean DSM-IV scores relative to the never depressed group ($M = 2.36$, $SD = 1.71$).

Visual analogue scale (VAS) scores representing subjective mood ratings are presented in Table 3. A one-way ANOVA revealed significant negative mood induction versus neutral mood induction group differences on mean VAS ratings, $F(1,95) = 131.70$, $p < .001$. Thus, the negative mood induction procedure ($M = 62.23$, $SD = 17.50$) generated significantly greater negative mood ratings on the VAS relative to the neutral mood induction procedure ($M = 24.14$, $SD = 15.13$). No significant group differences on VAS ratings were observed between remitted depressed and never depressed participants following the negative mood induction condition, $F(1, 46) = .67$, $p$ = ns. For ethical reasons, a repeated measures ANOVA was conducted to ensure that participants in the negative mood induction condition did not leave the lab in a more negative mood than the one in which they entered. Importantly, no significant differences were observed between

Table 3

Mean Visual Analogue Scale Scores across Experimental Conditions

| Variable | Negative Mood Condition | Neutral Mood Condition |
|---|---|---|
| VAS #1 | 18.23 (13.55) | 25.65 (16.55) |
| VAS #2 | 62.23 (17.50) | 24.14 (15.13) |
| VAS #3 | 43.04 (17.67) | ---------- |
| VAS #4 | 19.63 (16.84) | ---------- |

pre-study VAS ratings and post-study VAS ratings within the negative mood induction condition, $F(1, 46) = .50$, $p$ = ns.

The Emotional Stroop Effect. The primary hypothesis was that remitted depressed participants in the negative mood induction condition would show significantly longer response latency for negative affect Stroop stimuli, relative to remitted depressed participants in the neutral mood induction condition and never depressed participants in either mood induction condition. By contrast, remitted depressed participants in the negative mood induction condition were not expected to show significantly longer response latencies for positive or neutral affect Stroop stimuli, as compared to remitted depressed participants in the neutral mood induction condition and never depressed participants in either mood induction condition. Mean reaction times for negative affect, positive affect, and non-word Stroop stimuli across experimental conditions are presented in Table 4. Extreme reaction-time outliers (below 100 milliseconds or above 4000 milliseconds) were treated as missing data (Bradley, Mogg, White, & Miller, 1995). Due to a violation of the assumption of homogeneity of variance, reaction time analyses were computed using a natural log transformation to suppress the impact of outliers. However, no differences were observed between analyses computed using raw versus transformed data, and hence, raw reaction time results are reported here.

A 3 (Stroop Stimulus) by 2 (Depression History) by 2 (Mood Induction) split-plot repeated measures analysis of variance (ANOVA) design was used to investigate the emotional Stroop effect. The Greenhouse-Geisser $\varepsilon$ adjustment was used in response to a significant Mauchly's sphericity statistic ($W = .876$, $p = .002$) for the within-subjects factor Stroop Stimulus. A main effect of Mood Induction was observed, $F(1, 93) = 11.34$,

Table 4

Mean Reaction Times (Standard Deviations) for Positive, Negative, and Non-Word Stroop Stimuli across Experimental Conditions

| Variable | Never depressed/ Neutral Mood M (SD) | Never depressed/ Negative Mood M (SD) | Remitted/ Neutral Mood M (SD)) | Remitted/ Negative Mood M (SD) |
|---|---|---|---|---|
| Positive | 636.81(73.76) | 709.40(137.55) | 649.78(86.83) | 735.95(102.31) |
| Negative | 646.20(72.55) | 713.79(117.69) | 656.90(95.63) | 748.88(146.13) |
| Non-Word | 640.44(83.70) | 701.99(126.82) | 655.69(89.17) | 732.20(129.74) |

$p = .001$. Specifically, participants in the negative mood induction condition demonstrated significantly longer mean colour-naming latencies relative to participants in the neutral mood induction condition. No main effect of Depression History was observed, $F(1, 93) = 1.03$, $p$ = ns. No main effect of Stroop Stimulus was observed, $F(1.97, 183.27) = 1.87$, $p$ = ns. No Depression History by Mood Induction interaction was observed, $F(1, 93) = .12$, $p$ = ns. No Stroop Stimulus by Mood Induction interaction was observed, $F(1,93) = .64$, $p$ = ns. No Stroop Stimulus by Depression History interaction was observed, $F(1, 93) = .05$, $p$ = ns. No Stroop Stimulus by Mood Induction by Depression History interaction was observed, $F(1, 93) = .06$, $p$ = ns.

Given the interest in comparing remitted depressed participants in the negative mood induction condition to remitted depressed participants in the neutral mood induction condition and never depressed participants in both mood induction conditions, a series of t-tests were conducted. Remitted depressed individuals in the negative mood induction condition ($M = 739.01$, $SD = 22.58$) showed significantly longer mean colour-naming latencies, $t(47) = 3.52$, $p < .001$, irrespective of Stroop valence, relative to never depressed individuals in the neutral mood induction condition ($M = 641.15$, $SD = 19.55$).

Self-Referent Effect. It was hypothesised that remitted depressed individuals in the negative mood induction condition would endorse a significantly greater mean number of negative affect words relative to the remitted depressed individuals in the neutral mood induction condition and never depressed individuals in either mood induction condition. No significant group differences were hypothesised for positive affect words.

Mean Self-Referent Endorsement Ratings for positive and negative affect Stroop stimuli are presented in Table 5. A 2 (Stroop Stimulus) by 2(Depression History) by 2 (Mood Induction) split-plot repeated measures ANCOVA design, with age as a covariate, was used to investigate the self-referent effect. The Greenhouse-Geisser ε adjustment was used in response to a significant Mauchly's sphericity statistic ($W = 1.00$, $p < .001$) for the within-subjects factor Stroop Stimulus. No main effect of Mood Induction was observed, $F(1, 91) = 2.19$, $p$ = ns. No main effect of Depression History was observed, $F(1, 91) = 1.50$, $p$ = ns. A main effect of Stroop Stimulus was observed, $F(1, 91) = 5.20$, $p = .025$. A significantly greater mean number of positive Stroop stimuli ($M = 67.68$, $SD = 9.06$) were endorsed as being self-referent relative to negative Stroop stimuli ($M = 38.64$, $SD = 12.27$). No Stroop Stimulus by Mood Induction interaction was observed, $F(1, 91) = .01$, $p$ = ns. No Stroop Stimulus by Depression History interaction was observed, $F(1, 91) = .08$, $p$ = ns. No Mood Induction by Depression History interaction was observed, $F(1, 91) = .00$, $p$ = ns. No Stroop Stimulus by Depression History by Mood Induction interaction was observed, $F(1, 91) = .05$, $p$ = ns.

Further, it was anticipated that reaction time and self-referent scores for negative affect Stroop stimuli would be significantly correlated for remitted depressed individuals in the negative mood induction condition as compared to the remitted depressed individuals in the neutral mood induction condition and never depressed individuals in either mood induction condition. In contrast to prediction though, no significant correlation between reaction time and self-referent scores for negative affect Stroop stimuli for the remitted depressed individuals in the negative mood induction condition was observed, $r(21) = -.004$, $p$ = ns.

Table 5

Mean Self-Referent Endorsement Ratings (Standard Deviations) for Positive and Negative Affect Stroop Stimuli across Experimental Conditions

| Variable | Never depressed/ Neutral Mood M (SD) | Never depressed/ Negative Mood M (SD) | Remitted/ Neutral Mood M (SD) | Remitted/ Negative Mood M (SD) |
|---|---|---|---|---|
| Positive | 68.27(7.49) | 65.06(10.65) | 70.25(6.62) | 67.79(10.43) |
| Negative | 38.86(10.90) | 38.70(11.96) | 38.78(13.45) | 38.10(14.01) |

Incidental Recall. It was expected that remitted depressed individuals in the negative mood priming condition would recall a significantly greater mean number of negative affect Stroop stimuli, relative to remitted depressed individuals in the neutral mood induction condition and never depressed individuals in either mood induction condition. No group differences on the proportion of positive affect Stroop stimuli were anticipated. Mean incidental recall scores for positive and negative affect Stroop stimuli are presented in Table 6. A 2 (Stroop Stimulus) by 2(Depression History) by 2(Mood Induction) split-plot repeated measures ANCOVA design, with age as a covariate, was used to investigate incidental recall of Stroop stimuli. The Greenhouse-Geisser ε adjustment was used in response to a significant Mauchly's sphericity statistic ($W = 1.00$, $p < .001$) for the within-subjects factor Stroop Stimulus. A main effect of Mood Induction was observed, $F(1, 91) = 5.74$, $p = .019$. Participants in the negative mood induction condition recall significantly fewer negative affect Stroop stimuli relative to participants in the neutral mood induction condition. No main effect of Depression History was observed, $F(1, 91) = .47$, $p$ = ns. A main effect of Stroop Stimulus was observed, $F(1, 91) = 5.12$, $p = .026$. A significantly greater mean number of negative Stroop stimuli ($M = 1.39$, $SD = .107$) were recalled relative to positive Stroop stimuli ($M = 1.20$, $SD = .116$). No Stroop Stimulus by Mood Induction interaction was observed, $F(1, 91) = .35$, $p$ = ns. No Stroop Stimulus by Depression History interaction was observed, $F(1, 91) = .43$, $p$ = ns. No Depression History by Mood Induction interaction was observed, $F(1, 91) = .08$, $p$ = ns. No Stroop Stimulus by Depression History by Mood Induction interaction was observed, $F(1, 91) = .95$, $p$ = ns.

Table 6

Mean Incidental Recall Scores (Standard Deviations) for Positive and Negative Affect Stroop Stimuli across Experimental Conditions

| Variable | Never depressed/ Neutral Mood M (SD)/n (%) | Never depressed/ Negative Mood M (SD)/n (%) | Remitted/ Neutral Mood M (SD)/n (%) | Remitted/ Negative Mood M (SD)/n (%) |
|---|---|---|---|---|
| Positive | 1.18(1.02) | 1.07(1.07) | 1.45(1.32) | 1.14(1.11) |
| Negative | 1.54(1.25) | 1.44(1.09) | 0.95(0.83) | 1.57(1.25) |

## Discussion

A growing body of empirical research suggests that the manner in which currently depressed individuals organise and process negative information differs from non-depressed individuals (Dozois, 1999; Gotlib & McCann, 1984; Kinderman, 1994; Klieger & Cordner, 1990; Williams & Nulty, 1986). Currently depressed individuals tend to harbour negative self-referent core beliefs about themselves, the world, and the future. This maladaptive schematic template actively filters, categorises, and evaluates information in a biased fashion. For example, currently depressed individuals typically exhibit attention allocation bias in response to negative information. Specificity to depression has been demonstrated in terms of cognitive organisation and information processing.

The primary purpose of this study was to test the applicability of information processing research in depression to a sample of at risk individuals. It was unclear whether remitted depressed individuals exhibit this non-diffuse negative information processing bias, and to what degree this putative bias is mood-state dependent. It has been suggested that maladaptive cognitive schemas, which putatively give rise to a corresponding pattern of negative self-referent information processing, become dormant as an episode of depression remits (Ingram et al., 1998). Therefore, in order to access these distorted cognitive structures and operations, the individual must be currently experiencing a depressive episode, or must encounter an activating negative life event/ mood state (e.g., cognitive priming).

It was anticipated that remitted depressed participants in the negative mood induction condition would show significantly longer colour-naming latency for negative

affect Stroop stimuli than positive or non-word Stroop stimuli relative to remitted depressed participants in the neutral mood induction condition and never depressed participants in either mood induction condition. This hypothesis was not supported. Remitted depressed participants in the negative mood induction condition did demonstrate a significantly longer colour-naming latency relative to never depressed participants; however, this response latency, or attentional allocation bias, occurred irrespective of stimulus valence.

An unexpected significant mood induction effect was observed such that participants in the negative mood induction condition showed significantly longer mean colour-naming latencies relative to participants in the neutral mood induction condition. This finding suggests that negative mood-state has a significant impact on Stroop latency irrespective of depression history.

Secondly, it was anticipated that remitted depressed participants in the negative mood induction condition would endorse a significantly greater number of negative affect Stroop stimuli as being self-referent than positive affect Stroop stimuli relative to remitted depressed participants in the neutral mood induction condition and never depressed participants in either mood induction condition. This hypothesis was not supported. All participants, regardless of experimental condition, endorsed a significantly greater mean number of positive than negative affect Stroop stimuli. Furthermore, the hypothesis that reaction time and self-referent scores for the negative affect Stroop stimuli would be significantly correlated for remitted depressed individuals in the negative mood induction condition was not supported.

Finally, it was anticipated that remitted depressed individuals in the negative mood induction condition would recall a significantly greater number of negative affect Stroop stimuli relative to remitted depressed individuals in the neutral mood induction condition and never depressed individuals in either mood induction condition. This hypothesis was not supported. In general, participants recalled a greater mean number of negative than positive affect Stroop stimuli. However, participants in the negative mood induction condition recalled significantly fewer negative affect Stroop stimuli relative to participants in the neutral mood induction condition. This finding is difficult to interpret given that the extant literature suggests that negative mood is associated with superior recall for negative as opposed to positive valence material.

The results of this study conflict with information processing literature documenting a specific, or non-diffuse, negative information processing bias among currently depressed individuals. Unlike currently depressed individuals, remitted depressed participants in the negative mood induction condition of this study demonstrated a diffuse information processing bias (e.g., remitted depressed participants in the negative mood induction condition showed a significantly longer colour-naming response latency relative to never depressed participants in the neutral mood induction condition across positive and negative Stroop valence).

In addition, the results of this study run counter to Ingram and Ritter's (1998) finding of a specific negative attention allocation bias among primed remitted depressed individuals. This non-diffuse attention allocation bias to negative stimuli (using a dichotic listening task) coincides with information processing research with currently depressed

participants and supports the use of mood priming as a method of accessing negatively biased cognitive constructs.

Results of this study are in keeping with Ingram et al.'s (1994) suggestion that remitted depressed individuals possess a reactive, but emotionally diffuse, schema activating process. Specifically, remitted depressed participants in the negative mood priming condition demonstrated a diffuse information processing bias in response to negative and positive affect Stroop stimuli relative to never depressed participants in the neutral mood induction condition. However, the attention bias evidenced in this study may reflect a retardation effect attributable to remitted depressed status combined with negative mood-state rather than an emotionally diffuse schema activation process. This cautionary note is given in light of the significant interference generated by non-word Stroop stimuli. Had an emotionally diffuse schema activation process been operative, one would anticipate Stroop interference for positive and negative affect words but not for neutral affect words (e.g., non-words).

The Self-Referent Effect and Incidental Recall in Remitted Depression

Results of this study conflict in part with literature examining cognitive organisation in depression and remitted depression. Currently depressed individuals, and remitted depressed individuals exposed to negative mood manipulation, typically endorse and recall a significantly greater number of negative affect than positive affect adjectives (Derry & Kuiper, 1981; Gotlib & Gilboa, 1997; Hedlund & Rude, 1995; Teasdale & Dent, 1987). This trend supports the view that depressotypic schemas are operative during depression, and are accessible in remitted depression through negative mood priming.

In contrast, remitted depressed participants in the negative mood induction condition of this study endorsed a greater number of positive affect than negative affect Stroop stimuli. Remitted depressed participants in the negative mood induction condition of this study did, however, recall a greater number of negative affect than positive affect Stroop stimuli. Notably, these results were not unique to the negatively primed remitted depressed participants, but were observed across experimental conditions.

Methodological Strengths and Limitations

The failure to obtain a specific interference effect for negative affect Stroop stimuli in this study may be attributable to a number of factors. First, it is possible that issues relating to the use of an analogue sample are involved. A formal diagnostic instrument (e.g., SCID) was not utilised in this study; instead, remitted depression status was defined using DSM-IV criteria and was validated using the IDD-L. It is not known whether the depressive episodes in this study would be deemed clinically significant, nor is it known whether additional mental afflictions were present (e.g., anxiety, substance abuse, etc.). The sample was comprised of relatively young well-educated individuals. Those in the remitted depressed condition experienced early onset depression. Although descriptive information concerning treatment history (e.g., antidepressant medication and/or psychotherapy) was collected and evaluated, this information was not factored into the inclusion or exclusion criteria. Notably, the proportion of remitted depressed participants who received treatment (e.g., medication, mental health service) was evenly distributed across experimental conditions (28% of the participants in each mood induction condition received medication, while 61% and 57% received the services of a

mental health professional. The results of this study may not generalise well to older, less educated individuals with later onset depression.

The exclusively female sample, and subsequent choice of sociotropic word stimuli, also limit the ecological validity of this study. Females were solicited in light of the disproportionately large incidence of depression among females as compared to males. Evidence suggests that sociotropic stimuli are more salient to depression, particularly among women, than autonomous word stimuli (Beck, 1987). The results of this study may not generalise well to men, or to non-sociotropic stimuli.

Second, factors associated with the mood induction paradigm are relevant. Remitted depressed individuals are postulated to have latent depressogenic schemas consisting of negative self-referent information. Accessing these cognitive constructs requires schematic activation. Cognitive mood priming is an empirically supported method for activating cognitive schemata. The particular negative mood induction procedure utilised in this study ('Russia under the Mongolian Yoke' plus a negative self-focused exercise) has been empirically validated (Clark, 1983; Ingram et al., 1994; Teasdale & Dent, 1987). In addition, visual analogue scale scores suggest that the negative mood induction protocol did significantly shift mood in a negative direction. However, variability in Stroop latency was considerably greater in the negative mood induction condition relative to the neutral mood induction condition. The implication is that the mood manipulation may not have been effective in all cases. Furthermore, it is conceivable that the transient mood shift was not maintained throughout all experimental tasks. Indeed, individuals in the negative mood induction condition showed a significant mood improvement prior to the positive mood induction procedure. This finding suggests

that the induced negative mood faded over the course of the three experimental tasks. The self-referent endorsement task would be most seriously affected by this mood change, and may in fact account for the unexpected finding that remitted depressed participants in the negative mood induction condition endorsed more positive affect than negative affect adjectives. It is conceivable that anticipated effects would have emerged had an alternative priming procedure been utilised (e.g., the Velten procedure).

Third, the type of the Stroop stimuli chosen is relevant. Depressed individuals are postulated to have highly accessible negative self-referent schemas, and hence it has been suggested that negative self-referent information may be more highly interconnected than generic negative information in depressed individuals (Segal et al., 1995). Negative sociotropic adjectives were used in this study to provide more interpersonally oriented stimuli. Unfortunately, given that the negative mood effect may not have been operative during the self-referent task, it is difficult to assess whether the negative Stroop stimuli were in fact self-referent of remitted depressed participants (e.g., in the absence of a cognitive activation, negative self-referent schemas in remitted depression are postulated to be dormant). The fact that negative Stroop stimuli colour-naming latency and self-referent scores for remitted depressed participants in the negative mood induction condition were not correlated, coupled with previous research reporting an interference effect for these words (Dozois, 1999), supports the hypothesis that the mood effect had diminished, and not that the words were inadequately self-referent.

Fourth, error rates were not collected for the entire sample. Although error rates across groups were below 1% on a significant portion of the data, it is conceivable that

group differences were not detected. In addition, error rate data collection may increase participant motivation and accuracy.

Finally, the issue of power must be addressed. In any research situation where null results are obtained, the researcher must ask the question of whether or not an adequate amount of power was available to detect an effect. A power of .86 was attained in this study using an alpha level of .05, an effect size of .44, and a sample size of 48. Power analysis revealed that doubling the sample size would have had a minimal impact in terms of detecting an effect. An unreasonably large number of participants would have been required to obtain significant effects.

Future Research

The current study did not find that remitted depressed individuals exhibit specific negative information processing biases. Future research examining this phenomenon would benefit from the following recommendations. First it would be advisable to establish an experimental sample of individuals with clinically significant depressive episodes in remission (e.g., diagnostic assessment). Furthermore, it would be wise to control for additional mental health disorders and disparate treatment history. Successful treatment of depression, be it pharmacological or psychotherapeutic, putatively alters the availability or accessibility of negative self-referent schemas, and hence may significantly compromise the homogenous nature of a remitted depressed sample in terms of cognitive organisation.

Secondly, the negative mood priming procedure must be maintained throughout the experimental manipulation. Multiple mood checks (e.g., VAS ratings) are recommended. Booster mood priming sessions between experimental tasks may be

required to prolong the negative mood effect (Clark, 1983). Finally, given that negative self-referent information is believed to be highly interconnected in depression relative to generic negative information, the mood induction and Stroop stimuli content should be highly self-relevant. Standardisation of induction potency is critical. Inconsistencies were observed on the autobiographical portion of the priming procedure; for example, some individuals recalled the death of a parent or loved one, while others recalled the death of a childhood pet.

Future research aimed at uncovering maladaptive cognitive constructs and information-processing patterns in remitted depression will enhance understanding of the factors associated with the onset, maintenance, and recurrence of clinical depression. Insight into these cognitive vulnerabilities, along with the development of sensitive mechanisms for detecting negative information processing biases, would surely improve our ability to assess the outcome of cognitive behaviour therapy and minimise relapse through intervention.

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Appendix A

This questionnaire is designed to determine whether or not you may have experienced a time of Clinical Depression in the past. To complete the questionnaire, first think of the time in your life when you felt the most sad or depressed. **Using the worst two-week period of that time in your life**, please indicate whether you experienced any of the following problems, where the problem was a change from previous functioning. Indicate the presence of a problem by placing a check mark in the box beside that problem.

- ☐ Depressed or irritable mood, most of the day, nearly every day.
- ☐ Marked loss of interest or pleasure in all, or almost all, activities of the day, nearly every day.
- ☐ Significant weight loss or weight gain (a change of more than 5% of your body weight) without purposely trying to change your weight (for example, by dieting), or a decrease or increase in your appetite, nearly every day.
    - ☐ Weight loss, or decrease in appetite.
    - ☐ Weight gain, or increase in appetite.
- ☐ A reduced need or ability to sleep (insomnia), or an increased need or ability to sleep (hypersomnia), nearly every day.
    - ☐ Insomnia
    - ☐ Hypersomnia
- ☐ Being slowed down in speech or movement (retarded), or being increased in speech or movement (agitation), nearly every day.
    - ☐ Retarded
    - ☐ Agitated
- ☐ Fatigue, or loss of energy, nearly every day.
- ☐ Feelings of worthlessness, or excessive or inappropriate guilt (not just blaming yourself or feeling guilty about depression or other problems), nearly every day.
    - ☐ Worthlessness
    - ☐ Excessive or inappropriate guilt
- ☐ Reduced ability to think or concentrate, or problems making decisions, nearly every day.
    - ☐ Reduced ability to think or concentrate
    - ☐ Problems making decisions
- ☐ Repeated thoughts of death (not just being afraid to die), repeated suicidal thinking without a specific plan, specific planning for committing suicide, or an actual suicide attempt.

During the two-week period you were describing above, were either of the following true:

- ☐ I felt sad or depressed because someone I loved had died. If so, how many weeks was it after they died that you were describing above? _____
- ☐ My sad mood or depression may be explained by a physical illness, or reaction to alcohol, drugs, or medication. If so, please explain:

Appendix B

In this next section, try to remember **THE WEEK IN YOUR LIFE YOU FELT THE MOST DEPRESSED**. Circle the number of the one statement that best describes how you felt. Remember to **also circle** whether you felt that way for **MORE** of **LESS** than two weeks.

0 I did not feel sad or depressed.
0 I occasionally felt sad or down.
1 I felt sad most of the time, but I was able to snap out of it.
2 I felt sad all of the time, and I couldn't snap out of it.
3 I was so sad or unhappy that I couldn't stand it.
**MORE** **LESS** than two weeks.

0 My energy level was normal.
1 My energy level was occasionally a little lower than normal.
2 I got tired more easily or had less energy than is usual.
3 I get tired from doing almost anything.
4 I felt tired or exhausted almost all of the time.
**MORE** **LESS** than two weeks.

0 I was not feeling more restless and fidgety than usual.
1 I felt a little more restless or fidgety than usual.
2 I was very fidgety, and I had some difficulty sitting still in a chair.
3 I was extremely fidgety, and I paced a little bit almost very day.
4 I paced more than an hour per day, and I couldn't sit still.
**MORE** **LESS** than two weeks.

0 I did not talk or move more slowly than usual.
1 I talked a little slower than usual.
2 I spoke slower than usual, and it took me longer to respond to questions, but I could still carry on a normal conversation.
3 Normal conversations were difficult because it was hard to start talking.
4 I felt extremely slowed down physically, like I was stuck in mud.
**MORE** **LESS** than two weeks.

0 I did not lose interest in my usual activities.
1 I was a little less intested in 1 or 2 of my usual activities.
2 I was less interested in several of my usual activities.
3 I have lost most of my interest in almost all of my usual activities.
4 I have lost interest in all of my usual activities.
**MORE** **LESS** than two weeks.

0 I got as much pleasure out of my usual activities as usual.
1 I got a little less pleasure from 1 or 2 of my usual activities.
2 I got less pleasure from several of my usual activities.

3 I got almost no pleasure from several of my usual activities.
4 I got no pleasure from any of the activities which I usually enjoy.
**MORE** **LESS** than two weeks.

0 My interest in sex was normal.
1 I was only slightly less interested in sex than usual.
2 There was a noticeable decrease in my interest in sex.
3 I was much less interested in sex now.
4 I lost all interest in sex.
**MORE** **LESS** than two weeks.

0 I did not feel guilty.
1 I occasionally felt a little guilty.
2 I often felt guilty.
3 I felt quite guilty most of the time.
4 I felt extremely guilty most of the time.
**MORE** **LESS** than two weeks.

0 I did not feel like a failure.
1 My opinion of myself was occasionally a little low.
2 I felt I was inferior to most people.
3 I felt like a failure.
4 I felt I was a totally worthless person.
**MORE** **LESS** than two weeks.

0 I didn't have any thoughts of death or suicide.
1 I occasionally thought life was not worth living.
2 I frequently thought of dying in passive ways (such as going to sleep and not waking up), or that I'd be better off dead.
3 I had frequent thoughts of killing myself.
4 I tried to kill myself.
**MORE** **LESS** than two weeks.

0 I could concentrate as well as usual.
1 My ability to concentrate was slightly worse than usual.
2 My attention span was not as good as usual and I had difficulty collecting my thoughts, but this didn't cause any problems.
3 My ability to read or hold a conversation was not as good as usual.
4 I could not read, watch TV, or have a conversation without great difficulty.
**MORE** **LESS** than two weeks.

0 I made decisions as well as usual.
1 Decision making was slightly more difficult than usual.
2 It was harder and took longer to make decisions, but I did make them.
3 I was unable to make some decisions.
4 I couldn't make any decisions at all.

**MORE** **LESS** than two weeks.

0 My appetite was not less than normal.
1 My appetite was slightly worse than usual.
2 My appetite was clearly not as good as usual, but I still ate.
3 My appetite was much worse.
4 I had no appetite at all, and I had to force myself to eat even a little.
**MORE** **LESS** than two weeks.

0 I didn't lose any weight.
1 I lost less than 5 pounds.
2 I lost between 5-10 pounds.
3 I lost between 11-25 pounds.
4 I lost more than 25 pounds.
**MORE** **LESS** than two weeks.

If you circled # 1, 2, 3, or 4: Were you dieting and deliberately trying to lose weight?
YES NO

0 My appetite was not greater than normal.
1 My appetite was slightly greater than normal.
2 My appetite was clearly greater than usual.
3 My appetite was much greater than usual.
4 I felt hungry all the time.
**MORE** **LESS** than two weeks.

0 I didn't gain any weight.
1 I gained less than 5 pounds.
2 I gained between 5-10 pounds.
3 I gained between 11-25 pounds.
4 I gained more than 25 pounds.
**MORE** **LESS** than two weeks.

0 I was not sleeping less than normal.
1 I occasionally had slight difficulty sleeping.
2 I clearly didn't sleep as well as usual.
3 I slept about half my normal amount of time.
4 I slept less than 2 hours per night.
**MORE** **LESS** than two weeks.

0 I was not sleeping more than normal.
1 I occasionally slept more than usual.
2 I frequently slept at least 1 hour more than usual.
3 I frequently slept at least 2 hours more than usual.
4 I frequently slept at least 3 hours more than usual.
**MORE** **LESS** than two weeks.

0 I did not feel anxious, nervous or tense.
1 I occasionally felt a little anxious.
2 I often felt anxious.
3 I felt anxious most of the time.
4 I felt terrified and near panic.
**MORE** **LESS** than two weeks.

0 I did not feel discouraged about the future.
1 I occasionally felt a little discouraged about the future.
2 I often felt discouraged about the future.
3 I felt very discouraged about the future most of the time.
4 I felt that the future was hopeless and that things would never improve.
**MORE** **LESS** than two weeks.

0 I did not feel irritated or annoyed.
1 I occasionally got a little more irritated than usual.
2 I got irritated or annoyed by things that usually didn't bother me.
3 I felt irritated or annoyed almost all the time.
4 I felt so depressed that I didn't get irritated at all by things that would normally bother me.
**MORE** **LESS** than two weeks.

0 I was not worried about my physical health.
1 I was occasionally concerned about bodily aches and pains.
2 I was worried about my physical health.
3 I was very worried about my physical health.
4 I was so worried about my physical health that I could not think about anything else.
**MORE** **LESS** than two weeks.

THE FOLLOWING QUESTIONS ARE ABOUT THE PERIOD OF DEPRESSION YOU JUST DESCRIBED.

1. Did anything cause the depression? YES NO
   If you circled YES, describe briefly:

2. How long did the depression last?
a) Less than 1 week
b) at least 1 week, but less than 2 weeks
c) at least 2 weeks, but less than 1 month
d) at least 1 month, but less than 6 months
e) at least 6 months, but less than 1 year
f) at least 1 year, but less than 2 years
g) 2 years or more

3. Did the depression effect your schoolwork, job, social life, performance of household chores, or anything else? YES NO
   If you circled YES, describe briefly:

4. Did you see a counselor, psychologist, or psychiatrist about how you were feeling? YES NO

5. Did you receive any medication for how you were feeling? YES NO

6. Were you hospitalized for the depression? YES NO

Appendix C

Please indicate your current mood by placing a mark on the line below. Zero indicates positive mood and 100 indicates negative (depressed) mood.

0 100
Positive Negative

You have been randomly assigned to participate in a negative mood condition, which involves trying to get yourself into a sad mood. To facilitate and maintain this sad mood, a piece of music will play in the background for 8 minutes. While listening to the music, please think about the saddest event, real or imagined, in your life (e.g., death of a loved one, personal failure, rejection). After thinking about the event for several minutes, write a paragraph or two describing the event. The content of the thoughts you generate to develop a sad mood is not of interest to us – we simply wish to facilitate your ability to generate a sad mood. Please put forth your best effort toward achieving a temporary negative-mood-state.

Please indicate your current mood by placing a mark on the line below. Zero indicates positive mood and 100 indicates negative (depressed) mood.

0 100
Positive Negative

Appendix D

Please indicate your current mood by placing a mark on the line below. Zero indicates positive mood and 100 indicates negative (depressed) mood.

0 100
Positive Negative

You have been randomly assigned to participate in a neutral mood condition. Please write a short paragraph describing the picture given to you. Office noise will play in the background for 8 minutes.

Please indicate your current mood by placing a mark on the line below. Zero indicates positive mood and 100 indicates negative (depressed) mood.

0 100
Positive Negative

Appendix E

Please indicate your current mood by placing a mark on the line below. Zero indicates positive mood and 100 indicates negative (depressed) mood.

0 100
Positive Negative

Having participated in a negative mood induction condition, we believe it is important for you to participate in a positive mood induction condition. We do not want you to leave the study in a mood more negative than the one with which you entered. While listening to the music, please think about the most positive event, real or imagined, in your life. Write a short paragraph about this event.

Please indicate your current mood by placing a mark on the line below. Zero indicates positive mood and 100 indicates negative (depressed) mood.

0 100
Positive Negative

# Appendix F

Please write out as many words from the computer task as you can recall.

Appendix G

Please rate the following words by placing a slash on the line below.

APPROVING

0 50 100
"Not Like Me" "Like Me"

COMICAL

0 50 100
"Not Like Me" "Like Me"

CONNECTED

0 50 100
"Not Like Me" "Like Me"

DELIGHTFUL

0 50 100
"Not Like Me" "Like Me"

DESIRABLE

0 50 100
"Not Like Me" "Like Me"

ENCOURAGED

0 50 100
"Not Like Me" "Like Me"

ENERGETIC

0 50 100
"Not Like Me" "Like Me"

INSECURE

0 50 100
"Not Like Me" "Like Me"

ADMIRED

0 50 100
"Not Like Me" "Like Me"

IRRITABLE

0 50 100
"Not Like Me" "Like Me"

ENTERTAINING

0 50 100
"Not Like Me" "Like Me"

EXTROVERTED

0 50 100
"Not Like Me" "Like Me"

GENTLE

0 50 100
"Not Like Me" "Like Me"

GRACIOUS

0 50 100
"Not Like Me" "Like Me"

RESENTFUL

0 50 100
"Not Like Me" "Like Me"

SHOWY

0 50 100
"Not Like Me" "Like Me"

GIFTED

0 50 100
"Not Like Me" "Like Me"

UNASSERTIVE

0 50 100
"Not Like Me" "Like Me"

HILARIOUS

0 50 100
"Not Like Me" "Like Me"

HUMBLE

0 50 100
"Not Like Me" "Like Me"

ANNOYING

0 50 100
"Not Like Me" "Like Me"

JOYFUL

0 50 100
"Not Like Me" "Like Me"
LIVELY

0 50 100
"Not Like Me" "Like Me"
NEIGHBOURLY

0 50 100
"Not Like Me" "Like Me"
NONJUDGMENTAL

0 50 100
"Not Like Me" "Like Me"
OUTGOING

0 50 100
"Not Like Me" "Like Me"
PLAYFUL

0 50 100
"Not Like Me" "Like Me"
PLEASURABLE

0 50 100
"Not Like Me" "Like Me"
SELFLESS

0 50 100
"Not Like Me" "Like Me"
SOFT-HEARTED

0 50 100
"Not Like Me" "Like Me"
SPONTANEOUS

0 50 100
"Not Like Me" "Like Me"
VALUABLE

0 50 100
"Not Like Me" "Like Me"
WONDERFUL

0 50 100
"Not Like Me" "Like Me"

AGGRESSIVE

0 50 100
"Not Like Me" "Like Me"

ALONE

0 50 100
"Not Like Me" "Like Me"

BOSSY

0 50 100
"Not Like Me" "Like Me"

COMBATIVE

0 50 100
"Not Like Me" "Like Me"

CONTROLLING

0 50 100
"Not Like Me" "Like Me"

MARVELOUS

0 50 100
"Not Like Me" "Like Me"

ATTENTION-SEEKER

0 50 100
"Not Like Me" "Like Me"

CRITICIZED

0 50 100
"Not Like Me" "Like Me"

DEPENDENT

0 50 100
"Not Like Me" "Like Me"

FORCEFUL

0 50 100
"Not Like Me" "Like Me"

GOSSIPER

0 50 100
"Not Like Me" "Like Me"

HOT-TEMPERED

0 50 100
"Not Like Me" "Like Me"
IMMATURE

0 50 100
"Not Like Me" "Like Me"
COMMUNICATIVE

0 50 100
"Not Like Me" "Like Me"
DEMANDING

0 50 100
"Not Like Me" "Like Me"
CONFIDING

0 50 100
"Not Like Me" "Like Me"
IMPATIENT

0 50 100
"Not Like Me" "Like Me"
JUDGMENTAL

0 50 100
"Not Like Me" "Like Me"
LAZY

0 50 100
"Not Like Me" "Like Me"
LONELY

0 50 100
"Not Like Me" "Like Me"
LONESOME

0 50 100
"Not Like Me" "Like Me"
NEEDY

0 50 100
"Not Like Me" "Like Me"
OVERBEARING

0 50 100
"Not Like Me" "Like Me"

PESSIMISTIC

0 50 100

"Not Like Me" "Like Me"

POSSESSIVE

0 50 100

"Not Like Me" "Like Me"

PUSHY

0 50 100

"Not Like Me" "Like Me"

QUARRELSOME

0 50 100

"Not Like Me" "Like Me"