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The proposed study investigated an attentional bias in experimentally-induced dysphoria using self-relevant pictures in a dot probe study design. Participants generated their own photographs, using digital cameras to capture stimuli that are self-relevant and emotional to them. It was hypothesized that individuals with induced dysphoria would exhibit a greater attentional bias to negative stimuli than participants with induced happiness when self-generated pictures were used in a dot-probe paradigm. In addition, exploratory analyses were conducted to examine possible gender effects. To examine the first hypothesis, a MANOVA was conducted including the priming groups and gender as the predictors and the bias scores as the dependent variables. Results did not support the primary hypothesis. Regarding gender effects, females responded longer on all trials, and the interaction of gender and priming condition neared significance for negative attentional bias scores. It was also hypothesized that the importance and valence ratings of the pictures would significantly predict response latency, but this prediction was not supported by the data. The findings of this study are discussed in terms of cognitive theories of attentional biases in depression as well as methodological issues in this line of work.

EXAMINING SELF-RELEVANCE AS A FACTOR IN THE ATTENTIONAL BIAS IN INDUCED DYSPHORIA USING SELF-GENERATED PICTURES

by

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CHAPTER I

INTRODUCTION

Beck's cognitive theory of depression (Beck, 1967) has laid the foundation for other theories and research on "cognitive" aspects of depression such as rumination, mood congruency, selective attention and negativity biases. According to Beck's original theory (1967), depressed and non-depressed individuals process information differently. Consistent with previous work on schemas as a broad construct, Beck proposed that all individuals encode and organize information from the environment into schemas (Rush & Beck, 1979). Schemata are defined as "organized networks of past reactions and experiences that form a relatively cohesive body of knowledge capable of guiding subsequent perception and behaviors," (Segal 1988, p.147). External circumstances prompt the activation of a given schema, which influences the individual's interpretation of the event and his/her emotional responses as well (Rush & Beck, 1979). Any individual has access to a plethora of schemata in reference to an event, but subconsciously activates certain schemata in response to the situation.

Although non-depressed individuals also use schematic processing (Dykman et al., 1989; Haack et al., 1996, Haaga & Beck, 1995; Hollon & Garber, 1988), it is proposed that negativity biases arise in depressed individuals because even though they have access to all types of information, negative information (reactions and experiences) is activated more readily and is also used to "fill in the informational gaps" in ambiguous situations (Halberstadt et al., 2008, p. 844). Thus, depressed individuals may experience problematic “matching of stimulus and appropriate schema due to the intrusion of inappropriate schemas displacing the more appropriate ones” (Rush & Beck, 1979, p.204). Therefore, it is hypothesized that the difference between depressive and non-depressive cognition may be a function of attention to negative content, as depressed individuals orient to and recall negative information more readily than those that are non- depressed (Halberstadt et al., 2008). In addition, Beck suggests that these maladaptive schemas may be more readily activated under conditions of stressful or negative life events (Beck, 1987). Therefore, according to Beck’s diathesis-stress model, negative depressive cognitions will be exacerbated in the face of stress.

Negativity Biases in Explicit Memory Tasks and Self Report Measures: Content Negativity

Beck captured the concept of content negativity with the introduction of the cognitive triad. The cognitive triad consists of three negative views depressed individuals tend to express: negative views of the self, the future, and the world (Beck, 1976). Research has confirmed a negativity bias in the content of depressive self views and thoughts in explicit memory tasks. These tasks include measures that overtly prompt participants to retrieve knowledge about themselves, the world, and also past events and experiences (Baddeley, Eysenck & Anderson, 2009). Depressed individuals tend to report more negative self views than non-depressed on questionnaires such as the Automatic Thoughts Questionnaire (Hollon & Kendall, 1980) and the Crandell Cognitions Inventory (Crandell & Chambless, 1986). These measures require the respondent to recall the frequency with which he or she experiences certain thoughts or ideas. Depressed individuals also tend to endorse lower self esteem and are more likely to engage in self blame in the face of negative life events (Wisco, 2009). Recent research has also identified the concept of self rumination, where one has the tendency to dwell on one's own experiences of depression. Ruminative thought is proposed to place the individual at an increased risk of developing or maintaining depressive symptomatology (Nolen-Hoeksema, 1991; Nolen-Hoeksema, Wisco & Lyubomirsky, 2008; Wisco, Nolen-Hoeksema, 2008).

Negativity Biases and Elaborative Processing

Although there has been a plethora of research documenting negative depressive cognition in explicit memory tasks and self report questionnaires such as those mentioned previously, recently there has been a shift to examine underlying processes whereby these cognitions arise (Williams, Watts, Macleod & Matthews, 1997). Researchers have found a negativity bias in implicit memory tasks as well (e.g. word-stem completion, priming). Implicit memory tasks do not overtly prompt participants to recall past events or experiences, but indirectly examine the behavioral responses of the participants (Baddeley, Eysenck & Anderson, 2009). Although the bias exhibited in these implicit tasks has been specific to tasks that required deeper processing (Mogg & Bradley, 2005; Watkins, 2002). Depth of processing refers to the extent the stimuli (semantic or pictorial) are processed and incorporated into memory (Wisco, 2009). Deeper processing has been suggested to occur later than automatic or early processing, may include elaboration in memory, and requires greater attentional resources compared to shallow or automatic processing (Wisco, 2009). Levels of processing models have been criticized for their inability to explain whether differences in performance (e.g., recall rates) are due to retrieval and/or encoding effects (Baddeley, Eysenck & Anderson, 2009). In addition, depth of processing is often correlated with the passage of time and associated with enhanced encoding, such that deeper processing is thought to be associated with longer lengths of time spent encoding the material. However, this tends to be a circular argument that lacks clarification as to the underlying mechanisms accounting for the observed results. In addition, length of time is not a reliable predictor of depth of processing, as research has documented poorer performance with increased study times (Baddeley, Eysenck & Anderson, 2009). Thus, the encoding and retrieval procedures (e.g. elaboration, context dependent cues) implemented may have greater utility in explicating the underlying mechanisms in negativity biases using both explicit and implicit memory task paradigms.

However, the current state of research examining negativity biases fails to take these factors into account (Wisco, 2009). For example, current research examining negative attentional biases only offer snapshots of attentional engagement using response latency paradigms. Mogg and Bradley's (2005) review of the attentional bias research indicated that attention biases in depression have been documented only at longer presentation times (>1200 ms) and in tasks examining attentional displacement (focus of attention at the offset of target presentation) rather than the initial focusing of attention. This implies that negativity biases may arise in later stages of information processing and may require greater lengths of time for the effects of encoding effects (e.g. greater elaborative processing) to affect performance. Wisco has integrated Williams and colleagues (1997) original theory that negativity biases are specific to elaborative processes of explicit memory tasks with these recent findings and argues that biases are not limited to explicit memory tasks requiring elaborative processing, but rather are found in any tasks that require deeper levels of processing and may or may not include elaboration.

Elaborative processing "refers to the creation of associations between a stimulus and existing material stored in memory" (Wisco, 2009, p. 384). This concept is fairly similar to the concept of a schema which provides an organized framework of past reactions and experiences (Segal, 1988). In elaborative processing, the more associations one makes between a stimulus and existing information in one's memory, the greater the chances are of recalling that stimulus. Elaborative processing is similar to schematic processing, as everyone engages in elaborative processing, but the content retrieved may tend to be more negative in depressed individuals and therefore contribute to negativity biases. In reference to negative attentional biases, elaborative processing of the negative stimuli may affect attentional allocation causing enhanced vigilance to and impaired disengagement from negative information. Two factors that have been documented to play elemental roles in elaborative and /or schematic processing are self-relevance and mood congruency.

Self-relevance.

Self-relevance refers to ideas, concepts, experiences and memories that are relevant and/or significant to oneself. Self-referential information has been thought to enhance elaboration in memory, as the self is a highly familiar and accessible concept (Klein & Loftus, 1988; Symons & Johnson, 1997). This facilitation of processing is referred to as the *self-referential encoding* effect. Research on the self-referential encoding effect has demonstrated greater recall for negative adjectives that are self-relevant than for positive or other self-relevant words for depressed individuals (D'Argembeau, Comblain & Van der Linden, 2005; Dozois & Dobson, 2001; Denny & Hunt, 1992; Kuiper & Derry, 1982; Derry & Kulper, 1981). For non-depressed individuals, the opposite was found, as these individuals tended to recall more positive self-relevant adjectives than any other words (Wisco, 2009). In addition, Wisco noted that negativity biases only arose in the self-referential conditions and not in other-referential condition. This further confirms the importance of self-relevance in negativity biases in depressed individuals. Baños, Medin & Pascual (2001) have also found a moderating effect of self-relevance on the recall of negative information, where preferential recall is enhanced in depressed individuals if the information is self relevant. Therefore, although depressed and non-depressed individuals exhibit self-referential encoding effects, it seems that content negativity is a factor for depressed individuals. Negative adjectives about the self may be more readily activated in schematic processing, which may play a factor in the enhanced recall rates. Johnson, Joorman and Gotlib (2004) also found that improved positive recall of positive self referential adjectives was associated with improvement in depressive symptoms in a 12 week follow-up. These studies lend further support for the importance of self-relevance in examining cognitive biases in depression.

In addition, the importance of self-relevance has been well demonstrated in explicit self report measures and is evident in the instruments that are used to assess cognitive biases. Many of the assessments that are used to measure aspects of the cognitive triad are composed of only self-relevant content. Haaga, Dyck and Ernst (1991) have proposed that the negative views of the future and the world in Beck's cognitive triad are those that are specific to the self, and so are in relation to one's own future and one's own world. For example, two commonly used measures to assess future views, Beck's Hopelessness Scale (Beck, Weissman, Lester & Trexler, 1974) and the Cognitive Triad Questionnaire (Crandell & Chambless, 1986) contain items that are specific to one's own future (include statements in the first person) as opposed to the future in general. Also, McIntosh and Fischer (2000) performed a factor analysis of the Cognitive Triad Questionnaire and narrowed it down to one factor they called "self-relevant negative attitude" (p. 881). This suggests that the nature of these negative cognitions is defined by self-relevance and supports the hypothesis proposed by Haaga, Dyck and Ernst.

Although negativity biases have been well documented with self relevant information in *explicit* memory tasks, evidence for negativity biases has been mixed in *implicit* memory tasks with few paradigms utilizing self relevant material. Though recent research has documented negativity biases in implicit memory tasks such as lexical decision priming, anagram solving and word stem completion tasks, these designs have not incorporated self-referential information (Bradley, Mogg & Williams, 1994, 1995; Rinck & Becker, 2005; Ruiz-Caballero & Gonzalez, 1994, 1997; Watkins et al. 1996).

Still, many studies that have utilized depression-specific stimuli and self- referential encoding conditions in implicit memory tasks have failed to document biases (Baños, Medina & Pascual, 2001; Danion, Kauffman-Muller, Grange, Zimmerman & Greth, 1995; Denny & Hunt, 1992; Illsley, Moffoott & O'Carroll, 1995; Lim & Kim, 2005; Tarsia, Power & Sanavio, 2003; Watkins, Matthews, Williamson & Fuller, 1992).

In addition to studies focused on memory, research examining attentional biases has found negative biases, but at longer stimuli presentation times with stimuli such as faces or self- relevant stimuli (words). For example, Koster et al. (2005) used a modification of the exogenous cuing task that examines both engagement to and disengagement away from a stimulus developed by Posner (1980). This task includes the presentation of a target in one of two spatial locations on a screen. Following the target's presentation, a stimulus then replaces either the target's location (valid trial) or appears in the opposite position of the target (invalid trial). Participants were instructed to respond as quickly as possible to indicate the location of the target. During this task, the target presentation time and the target valence is varied across trials. Therefore, only one stimulus is presented on the screen at a given time and attentional maintenance and disengagement is calculated by comparing the latency of responses of the emotionally valenced valid and invalid trials to those of the neutral trials. In the first experiment, the stimuli for both experiments consisted of negative, positive, and neutral words, with the negative words being self referential adjectives associated with loss and failure presented for 1500 ms (Koster et al., 2005). The second experiment was similar to the first, but varied word presentation times from 150, to 500 to 1500ms. The results indicated that both dysphoric and control participants had exhibited faster response times during valid trials for negative words in comparison to the neutral words, although there was one substantial difference. The controls also had faster response times with the positive words, whereas the dysphoric participants did not. This effect was replicated in the second experiment, but only for the presentation of 1500 ms, suggesting that this bias is seen in later stages of information processing with self- relevant stimuli. These results suggest that dysphoric individuals tended to exhibit these biases not in early automatic phases of information processing, but after information may be elaborated upon in memory and when the information is self-relevant. Therefore, including self-relevant stimuli in future implicit memory paradigms will be important to capture negativity biases and to also further examine information processing models of depression (Wisco, 2009).

Studies have shown that self-referential processing is associated with specific neural pathways and engages cognitive resources. In a study by Gray et al. (2004), the amount of cognitive resources associated with processing self-relevant information was examined with ERP readings of P300 (amplitude signifies magnitude of attentional resources that are engaged). Participants were presented six words or phrases in blocks of information that served as autobiographical categories in three possible presentations (total of 93 blocks presented). During one presentation, the self-relevant target was presented among other non-targets. In another presentation, a red target (word or phrase in red letters) was presented among non-targets. The last presentation included a novel random word/phrase among targets. Participants were instructed to signal if they had seen any red targets during the block presentation. Results indicated that attentional processing was directed at self–relevant information around 500 ms after presentation regardless of the item's relevance to the task. This offers insight to the attentional resources that may play roles in the maintenance of attention, especially when self-relevant stimuli are used.

Neuro-imaging research has also shown increased activation in the medial prefrontal cortex during self-referential processing (Wisco, 2009). Activity in the MPC was enhanced when rating self-descriptive adjectives in comparison to other positivity ratings, describing others and rating adjectives that described others (e.g. Craik et. al, 1999; Kelly et al., 2002; Schmitz, Kawarhara-Baccus & Johnson, 2004; Macrae, Moran, Heatherton, Banfield & Kelly, 2004). The brain appears to be processing self-referential material differently, which may provide insight into negativity biases seen in depression that tend to manifest as thoughts and beliefs that are predominantly self-focused.

Mood congruency.

Mood congruency is another concept involved in schematic activation where mood state has an effect on information processing. According to the mood congruency hypothesis, one's mood state should facilitate the processing of concurrent mood-related information (Bower, 1981). In terms of schematic activation, the information that matches the individual's mood state should be more accessible and more easily recalled with self-referential information intensifying the effect (Segal, 1988). Research that incorporated mood priming (an experimental manipulation to invoke a particular mood state such as sadness or happiness in participants) in examining a negativity bias has produced mixed results across many different experimental paradigms. Some studies have demonstrated the mood congruent processing bias (Bradley et al., 1997; Gotlib & Cane, 1987; Ingram & Ritter, 2000; Mogg et al., 1995), while others have not (Hill & Dutton, 1989; Mogg, Millar & Bradley, 2000). Hill and Dutton examined attentional biases to self-esteem threatening words in sub-clinically depressed individuals using the dot probe computer task. Words were presented in pairs for 750 ms, with one appearing at the top of the screen and the other at the bottom. Participants were instructed to read aloud the word presented at the top and to read to themselves the word at the bottom of the screen. They were then instructed to respond as quickly as possible to indicate when a probe appeared on the left side of the screen. Following the dot probe task, participants were administered a recall task. Results indicated slower responses times overall for the depressed group, but no enhanced recall for the threat-related words. The shorter stimulus presentation and differences in methodology for assessing bias scores may have contributed to the null findings of this study.

Mogg, Millar & Bradley (2000) examined attentional biases for sad, threatening and happy faces in clinically depressed, anxious and control participants using a dot probe design supplemented with eye-tracking equipment to assess initial orienting of attention as well. Results indicated non-significant findings with attentional biases for sad faces in depressed individuals when stimuli were presented for 1000ms. Of the 15 depressed individuals included in the study, 14 had concurrent anxiety diagnoses. Anxious individuals usually exhibit biases for threat related information at shorter presentation times, but do not consistently exhibit biases for depression relevant stimuli.

Therefore, the comorbidity of these diagnoses may have played a role in attenuating biases for sad faces in this study. Thus, the mixed findings in the literature may be due to differences in presentation times, comorbidity of anxiety, and methodological differences across experimental paradigms. Most studies that have documented biases included presentation rates >1000ms, lacked clinical rates of anxiety in the samples and used similar methodologies for assessing biases.

Cognitive Processing Summary

In sum, cognitive models suggest that individuals with depression selectively attend to the least favorable information and prime activation of negative self schemas from that information that may exacerbate and/or maintain depression (e.g. Beck 1976, 1983, 1987; Ingram, 1984). Beck also suggests that depressogenic thinking may be a function of a diathesis-stress model in which these maladaptive schemas are activated in face of negative and/or stressful life events (Beck, 1987). So, individuals may have a plethora of schemas, but maladaptive schemas may be activated in individuals vulnerable to depression in the face of stressful events, when the information is self-referential and when they are in a depressed mood. Depressed individuals tend to orient and attend to negative information, and dysphoric (mildly depressed) individuals tend to exhibit a similar pattern as well (Williams 1996; Koster, 2005), so it seems that mood state may be an elemental role in information processing models of negativity biases. In addition, self-relevance has been documented to enhance the effects of elaboration in memory and has played important roles in negativity biases. Neurological evidence suggests that self-referential processing involves distinct neural correlates, and that self-referential information may contribute something unique to negativity biases that would not be exhibited by other types of stimuli. Negative attentional biases have been readily documented when the stimuli utilized in experimental paradigms are self-relevant. Therefore, schematic activation under conditions of depressed/dysphoric mood and self-relevance may underlie selective attention to negative information which may result in the expression of an attentional bias. In addition, these negativity biases arise in “deeper stages” of information processing which typically occur later in attentional processing (>1000ms following stimulus exposure).

Experimental Paradigms and Attentional Biases

Although explicit memory tasks may offer beneficial information concerning responses or outward manifestations of behavior, they offer little insight into the underlying mechanisms that may be driving these responses. Segal (1989) argued that explicit memory paper and pencil tasks were inadequate methods for testing schematic theories, and advocated for indirect experimentation methods that could control for mood based fluctuations and self report issues. Recent research has begun to address this point, utilizing implicit memory paradigms and performance based tasks to examine underlying mechanisms of attentional processing. As discussed previously, research examining negativity biases in attention have consistently documented them at longer stimulus duration intervals (>1000ms), indicating that these biases arise during later stages of processing. These studies have typically utilized various experimental paradigms ranging from emotional Stroop to exogenous cuing tasks to examine attentional biases through latency of response to emotional stimuli. However, the two most commonly utilized paradigms are discussed in this brief review.

The most frequently utilized paradigm for examining an attentional bias is the emotional Stroop task with words serving as stimuli. In this task, emotional and neutral words are presented in different colors. The task is to identify the color in which the designated word is presented as quickly as possible, ignoring the content of the word. Longer response times to identify the colors of emotional words compared to non-emotional words are indicative of an emotion bias. While some studies have documented a bias toward negative emotional words in dysphoric or clinically depressed individuals (Dudley, O'Brian, Barnett, McGuckin & Britton, 2002; Gotlib & Cane, 1987; Gotlib and McCann, 1984; Lim & Kim, 2005), some have not (Dalgleish et al., 2003; Grant & Beck, 2006; Gotlib, Kasch et al., 2004; Hedlund & Rude, 1995; Hill & Knowles, 1991; Yovel & Mineka, 2004, 2005). This task requires response suppression, as participants must inhibit recalling the presented word in order to name the color. This may lead to unintentional processing of associated semantic information, and may also involve differential strategic processing across individuals. Thus, it may be difficult to differentiate whether interference in this task may be a result of encoding or retrieval effects (Gotlib, Kasch et al., 2004).

The other commonly used paradigm is the dot probe task or "attentional probe" (Yiend, 2009). During the dot probe task, two stimuli are presented side by side on a monitor for a specified duration of time. When used to examine attentional biases involving emotional stimuli, neutral and emotional words or images are generally presented in pairs for a specified duration on the screen. Immediately following their presentation, a dot will appear in one of the two locations where the previous stimuli were presented. Participants are instructed to respond as quickly as possible to indicate the location of the probe by pressing a designated button on the keyboard. A faster response when the probe replaces the location of an emotional stimulus (attentional vigilance), and a delayed response when the probe replaces the location of a neutral stimulus (attentional avoidance) indicate attentional biases (Yiend, 2009). This visual probe design was adapted by MacLeod, Mathews and Tata (1986) as a paradigm of visuo-spatial attention and response time (Mogg & Bradley, 2006). Within this paradigm, engagement of attention can be measured by response times to a visual probe (Posner, Snyder & Davidson, 1980). Stroop tasks work best with words and word strings, while dot probe tasks are better designed for pictorial stimuli (e.g. faces, pictures).

Relevant Research Utilizing Dot Probe Design

In many of the previous studies examining the attention bias to negative information, words have been used as the stimuli. Researchers have suggested that perhaps faces instead of words should be used because of the interpersonal deficits that are frequently seen in depression. Gotlib, Krasnoperova, Yue & Joorman (2004) examined an attentional bias to emotional information in clinically depressed participants (diagnosed with Major Depressive Disorder), clinically anxious individuals (diagnosed with Generalized Anxiety Disorder) and controls using emotional stimuli (happy, sad and threatening faces) in a visual probe design. The stimuli were presented in pairs (emotional with neutral) for a duration of 1000 ms. Results indicated that clinically depressed participants oriented towards only sad faces (Gotlib et al., 2004a). In addition, Gotlib, Kasch, Traill, Joorman & Arnow (2004b) examined attentional biases using a recall task, dot probe task with faces (sad, angry and happy), and emotional Stroop task in clinically depressed, clinically socially anxious and control participants. Results from the dot probe task were comparable to Gotlib et al's (2004a) other study, with enhanced vigilance towards sad stimuli in the depressed group. Mogg et al. (2000) examined a bias using interpersonal stimuli presented for 1000 ms as well. However, Gotlib et al.'s results were not replicated, as no discrimination was found between the depressed and the control group. The results may have been confounded by the co-morbidity of depression and anxiety in the depressed group, as Gotlib et al's studies included a "purely" depressed sample while the depressed sample in Mogg et al's study was not screened for anxiety (Mogg et al., 2005). A bias for happy faces has been found in anxious individuals, which may have attenuated the negative attentional biases in the depressed group (Mogg et al., 2005).

Joorman and Gotlib (2007) examined whether or not this bias may be a state marker of the depressive episode or a trait-like characteristic of vulnerable individuals. The study included a currently depressed group, a formerly depressed group, and a control group. They utilized a dot-probe design and the stimuli consisted of a set of 20 faces with sad, happy and neutral expressions. Consistent with the notion that attentional biases operate in a trait-like manner, they hypothesized that both the formerly depressed and the currently depressed would demonstrate a bias toward sad faces in comparison to the control group. This hypothesis was supported; both the formerly depressed group and the currently depressed group selectively attended to sad faces presented for 1000 ms. They also found that the controls exhibited biases to orient attention towards the happy faces and avoid the sad (Joorman & Gotlib).

In addition, research has shown negative attentional biases in participants with subclinical depressive symptoms. Shane and Peterson (2007) examined attentional biases to emotional information in dysphoric individuals in two studies. In the first study using a dot probe design, the stimuli consisted of 40 positive, 40 negative and 120 neutral pictures chosen from the International Affective Picture System database (IAPS; Lang, Bradley & Cuthbert, 2005). The negative stimuli consisted of pictures related to sadness and threat. The dysphoric group showed a tendency to direct attention away from positive stimuli, but did not demonstrate a bias toward negative pictures. Study 2 also used dysphoric individuals, but stimuli in the dot probe task consisted of 40 positive, 40 depression-related and 100 neutral words. These words were rated and matched on word length, arousal and anxiety or depression relevance (Shane & Peterson, 2007). Results showed both a bias away from positive information and a bias towards depression-specific stimuli among the dysphoric participants.

Summary of Findings

So, in terms of the research completed on the negative attentional bias, it has been documented when using a priming method in non-dysphoric individuals, self-relevant stimuli (faces or self-relevant words), and an increased duration of greater than 1000 ms for stimuli presentation (Mogg et. al, 2005). Research utilizing the dot probe task has only documented biases at presentation times greater than 1000 ms. Mogg and Bradley (2005) found a bias for depressed words presented for 1000 ms, but not at shorter presentation times. Because this bias has been consistently expressed at longer presentation times, this indicates a problem not with orienting, but with disengaging attention (Bradley et al, 1997). Posner and Petersen (1990) identified thee subsystems of attention orienting: orienting to sensory events, alerting signals, and maintaining a vigilant or alert state. Although the experimental designs discussed above operationalize an attentional bias in terms of response latency, they provide only a brief glance of attentional processing and are only tapping into the alerting and maintaining phases of attention. In order to measure attentional shifting, eye-movement designs would need to be implemented as well.

Self-Relevance and Attentional Bias

Additional research is needed exploring the role of self relevance and mood congruency on disengaging attention in dysphoric, non-dysphoric, and clinically depressed individuals. If individuals are not exhibiting vigilance to certain stimuli or are having no problems disengaging from the information, it may be due to the fact that they have little or no meaning to the person and the stimuli being processed at a more "shallow" level. Depression can have different effects on different individuals, so it may be necessary to choose stimuli that are self-relevant and emotional for each participant. Levine and Edelstein (2009) discuss the role of attention "magnets" in memory narrowing (enhanced memory for central versus peripheral information), and propose that everyday emotional events may lack these highly arousing magnets. However, these everyday emotional events that are high in personal concern are typically the focus of rumination and distorted cognitions. MacLeod and Rutherford (1992) provided evidence for specificity effects in emotional Stroop paradigms, where anxious individuals experienced the greatest interference from items high in concern relevance (Mogg et al., 1989; Mathews & MacLeod, 1985). These individuals exhibited biases only for threat-relevant stimuli, which are salient for anxious individuals.

In addition, Gilboa-Schechtman et al. (2000) argue that emotionality, concern-relevance and mood congruence are three factors that play a role in selective processing. They found that self-generated words enhanced the effects seen by selective processing and that personal concern elicited a greater bias than emotion ratings (Gilboa-Schechtman et al, 2000). As mentioned earlier, salience of information is elemental in schematic activation and selective processing of information, as self-referential information influences the ease to which this information is accessible. Although self referential encoding effects have been documented across many experimental paradigms, the role self-generated images play in attentional biases has yet to be explored.

Research has utilized images that have been normed in reference to valence and arousal (IAPS images), which has provided further clarification to the role of attentional processing in biases and implicated possible underlying neural mechanisms of these attentional biases as well (e.g., Northoff et al., 2006; Vogt et al. 2008). These images are typically high in attention magnets (e.g., gore, death), but are not are the content of everyday thoughts and worries that may play contributing roles in depressive symptomatology. Therefore, by incorporating stimuli each individual chooses into the experimental design, a high degree of self-relevance should be captured. Utilizing pictorial stimuli that reflect everyday emotional experiences increases ecological validity and avoids ambiguities and/or confusions in literal interpretations of words which can be advantageous to those who are more visually-oriented (Mogg & Bradley, 1999).

The negative attentional bias has been demonstrated in non-clinical populations, which will serve as the target population for this investigation. Williams et al (1996) found no real difference between non-clinical and clinical populations in exhibiting a pattern of selective attention. Depression may be expressed on a continuum of functioning, with an arbitrary line drawn between sub-clinical and clinical depression. So, examining the bias in dysphoric individuals will provide additional information to the processes that may underlie this bias.

Across many different experimental paradigms, dysphoria has been operationalized one of two ways: through naturally occurring dysphoria (including individuals scoring above some cutoff on a depression screening measure such as the BDI), or by experimentally inducing a mood state in non-dysphoric participants. In terms of the latter, there are several mood induction procedures that have been utilized across many different experimental paradigms throughout the years. Westerman et al. (1994) conducted a meta-analysis on the validity of different mood induction techniques. Their results indicated that a combination of music, imagination and film may be effective (~75% effectiveness across studies) in inducing negative mood (1994). Scherrer and Dobson (2009) have also indicated the effectiveness of the Velten procedure, where participants read self referential statements and are instructed to feel a specific mood.

Westerman et al. (1994) also proposed that the purpose of the experiment and the instructions provided to re-experience a given mood state may have enhancement effects on the efficacy of the mood induction. Therefore, the mood induction procedure utilized by Gilboa-Schectman et al. (2000) was chosen for this study.

The goals of this study were, first, to examine if the mood manipulated dysphoric individuals exhibited a negative attentional bias using self-generated pictorial stimuli and, second, to examine if gender, priming condition, self-relevance and valence were significant predictors of reaction times in negative and positive trials. Participants were asked to take sixty-four pictures of different types of stimuli in their everyday environment (16 negative, 16 positive and 32 neutral) and rated these pictures on importance and valence. The pictures taken by the participants were included as the stimuli in a dot probe paradigm along with participant-rated neutral pictures as fillers in the task. Prior to completing the dot probe attention task, all participants underwent a mood manipulation. The mood manipulation was administered as suggested by Gilboa-Schlectman (2000), where participants were read a script and asked to re-live a negative/positive experience while listening to music (Beethoven for negative condition and Vivaldi for positive condition). It was hypothesized that mood manipulated dysphoric individuals would exhibit a significantly greater attentional bias to negative stimuli than participants exposed to a positive mood induction when self-generated pictures were used in a dot-probe paradigm. The bias is defined in terms of latency of response with the prediction that that there will be delayed responses in trials where the probe replaces the position of a non-negative stimulus, and faster responses when the probe replaces the position of the negative stimulus. It was also hypothesized that self-relevance (importance ratings of pictures) and valence would be significant predictors of reaction times in dysphoric individuals. Specifically, individuals would exhibit longer response latencies to negative pictures when the pictures were more important and emotional to them. In addition, gender was included as an independent variable in both hypotheses for exploratory reasons, as gender may play roles in the processing of emotional information in relation to interpretation and reactivity (Cahill, 2006). Given the current study design, it may be informative to examine the role gender may play in attentional biases when using self-generated photographs.

CHAPTER II

METHOD

Participants

Participants consisted of undergraduate students enrolled in psychology courses at the University of North Carolina at Greensboro. Participants signed up for the experiment through a computerized registration system. One hundred and one students were consented for the study and 57 were included in the primary statistical analyses including only low BDI (BDI < 6) participants (7 excluded for technical problems/incomplete data and 21 dropped out prior to completion of the entire study). The low BDI sample consisted of Caucasian (52.6%), African American (31.6%), Asian (7%), Hispanic (5.3%) and racially identified other (3.5%) UNC-G students with a mean age of 19.51 (SD = 1.992, range = 18-26). Inclusionary criteria included a BDI score of 6 or lower at the second visit prior to the mood manipulation and computer task. Sixteen participants scored high on the BDI, but were permitted to complete the study for class requirements. Additional information regarding low BDI participant characteristics is provided in Table 1. Although the goal of this study was to examine attentional biases using self-generated pictures in a non-dysphoric sample, 16 participants with high BDIs completed the study for class requirements. The high BDI sample (N=16) consisted of African-American (62.5%), Caucasian (25%), Native Hawaiian or Pacific Islander (6.3%) and racially identified other (6.3%) UNC-G students with a mean age of 20.13

(SD = 4.689, range = 18-37).

Materials

Demographics/past history. A questionnaire was administered to gather demographics information such as age, ethnicity and income.

BDI (Beck Depression Inventory). This questionnaire was used to assess the severity of depressive symptomatology. The BDI has demonstrated reliability and validity (Beck 1976, 1988) and has been recognized to tap features that map onto clinical depression as defined by the DSM-IV TR criteria. The BDI asks questions in reference to the domains of the somatic, emotional and cognitive domains of depression. Participants are asked to answer 21 questions in reference to how they have been feeling in the past week including that day. Each question is on a scale of 0-3, with highest possible score being 63. According to the recommendations of the BDI for use with non- clinical samples by Kendall, Hollon, Beck, Hammen & Ingram (1987), a proposed a cut off score of 6 or lower was used as inclusionary criteria for data analysis since this experimental paradigm included a mood induction procedure. For this study, the documented internal consistency for the BDI was good (Cronbach's α=.84).

STAI (State-Trait Anxiety Inventory). Both state and trait versions of the State and Trait Anxiety Inventory are measures of anxiety to assess trait and state anxiety characteristics. High levels of anxiety may have a confounding effect on the data, and must be considered in data interpretation. The STAI has documented reliability and validity (Spielberger et. al, 1983). The internal consistency for this study was good for the STAI-State (Cronbach's α=.88) and excellent for the STAI-Trait

(Cronbach's α=.92).

Visual analogue scales. Three visual analogue scales were administered prior to and following the mood induction procedure, following the computer task, and immediately after the happy mood induction that followed the computer task to serve as a manipulation check for depressed mood. These scales will assess sad, happy and anxious mood states and will range from 0-100%, asking the participant how he/she feels right at that moment (Bradley et al., 1997). An additional scale was included to assess overall affect (0 denoting very negative affect and 100 denoting an extremely positive mood). However, this scale proved to be psychometrically problematic, and was not included in statistical analyses.

Rating scales. Two rating scales were completed for each picture after the participant has taken the pictures. One rating scale served as measure of emotional valence where participants were shown the picture and asked how emotional the image was to them. Participants responded on a scale of -5 to 5 (-5 extremely negative, -4 very negative, -3 moderately negative, -2 somewhat negative, -1 slightly negative, 0 neutral, 1 slightly positive, 2 somewhat positive, 3 moderately positive, 4 very positive, 5 extremely positive). After rating the valence of the image, participants then provided a brief description concerning the reason the image was emotional to them as well. The second scale assessed the importance of the image to the participants. Participants were shown the image and asked "How important is this image to you?" Participants responded on a scale of 1-4 (1=not at all important, 2=somewhat important, 3=moderately important and 4=very important).

Stimuli. Stimuli consisted of pictures taken by participants a week prior to their completion of the computer task. Participants were instructed to take 16 negative images,16 positive images and 32 neutral images. Participants were provided with instructions of how to use the camera and the appropriate pictures to include in the experiment. In addition, numerous examples of each type of stimulus to photograph (negative, positive and neutral) were provided and participants were required to provide 3 examples of each stimulus type in session. Experimenters offered support and clarification to assist in the selection of pictures throughout the experiment as well. Participants received emails with further examples and were required to review their pictures with the experimenters prior to incorporation of their pictures into the computer task. If pictures were inappropriate, blurry, out of focus, or did not elicit strong emotions within the individuals upon review, participants were provided with more time to re-take more appropriate pictures that were discussed and approved by the experimenter. Following the capture of stimuli, the 64 images were then uploaded into the dot probe computer task. A subset of 32 pictures of neutral images that were rated as low valence by the participant were included from a pool of 80 participant-generated images as fillers in the computer task. In terms of pairings, there were 16 pairs of an emotional stimulus (positive or negative) and a neutral stimulus, all of which were images taken by the participant. Sixteen pairs of neutral- neutral pairs that participants rated as neutral from the participant generated neutral picture pool, were included as fillers in the experimental design as well. The order and presentation of the images were randomized for each participant. All stimuli pairs were presented 4 times, for a total of 192 trials. The order of the stimuli pairs was randomized for each participant and the presentation of the images were randomized within each pair. The location of the probe and stimuli were counterbalanced, so participants saw an equal number of probes and emotional pictures on the right and left sides of the screen.

Attention task. A dot probe study design served as the attention task in the proposed study. The dot probe task was run using the computer program Eprime on a Dell Optiplex 755 desktop computer. Two stimuli (512 x 384) were presented side by side on the monitor for 1200 ms. Immediately following their presentation, a 72 point size dot appeared in the center of one of the two locations where the previous stimuli were presented. Participants were instructed to respond as quickly as possible to indicate the location of the probe by pressing a designated button on the SR response box.

Mood priming task. The mood priming method adapted from the study by Gilboa-Schlectman et al (2000) was used to induce dysphoric and positive mood in non- dysphoric participants. Participants in the negative mood-induced condition were first instructed to follow the "relive" instructions by Salovey (1992). They were then instructed to concentrate on their feelings as they heard Beethoven's spring quartet op131 for five minutes. After participants completed the computer task, they were instructed again to follow the "relive" instructions by Salovey for a positive memory as they heard Vivaldi's "Spring" concerto of the "Four Seasons" op. 12. Individuals in positive priming condition followed these instructions as well, but heard Vivaldi's Spring Concerto both preceding and following the computer task.

Procedures

The present study was conducted in a psychology research lab at the UNC-G. This study examined the attentional bias in induced dysphoria and included non-dysphoric students which were randomly assigned to a positive priming and negative mood priming condition.

Screening for inclusion. Participants were recruited through Experimetrix, a psychology experiment sign-up system. Participants were screened by age (must have been 18 or older), English language comprehension (must have been able to speak and read English) and visual impairment (no visual impairments other than corrective vision). In addition, participants who scored above a 6 on the BDI were not included in the final sample.

Study experimental protocol.

Consent and acquiring stimuli. Students who have signed up through experimetrix came to the lab for initial consent for participation in the study and were randomly assigned to a positive mood or negative mood priming condition. They completed the BDI and STAI and rated 80 participant-generated neutral pictures. Participants were given a digital camera and detailed instructions on how to use the camera and the types of pictures to take. Students were given a week to take 16 pictures of negative stimuli, 16 pictures of positive stimuli, and 32 pictures of neutral stimuli. Students practiced using the camera in the lab and were provided with instructions of what images (content and quality) are appropriate for the study. These instructions were an attempt to ensure that the images would be in concordance with all

Institutional Review Board regulations. Participants could not include photographs of people (unless publicly accessible) or photographs that included nudity. Participants were also instructed to avoid taking photographs in situations that would place themselves or others in harm (e.g., someone robbing a bank, shooting or fighting), and were not allowed to take pictures of people other than themselves. Any images that were deemed inappropriate were not included in the study. Students were also provided with examples of appropriate stimuli as probes to assist them in the task as well. For the negative stimuli, participants were instructed to take five to six images of stimuli that elicit sadness or dysphoria. This was a manipulation to attempt to capture salient information to depression, as dysphoria is commonly one of the main features of depression. Other studies have also attempted to use mood congruent stimuli as well (e.g., Bradley et al., 1997; Gotlib et al., 2004; Mogg et al., 1995), although none have implemented the previously described strategy.

Incorporating stimuli into the dot probe task. Participants returned the camera back to the lab within a week from the time of consent. The pictures the participant captured were uploaded onto the computer, along with 32 of the previously rated neutral images. Sixty-four stimuli were then incorporated into the dot probe experiment through the computer program Eprime for each participant (16 self-generated negative, 16 self- generated positive, 32 self-generated neutrals and 32 experimenter-provided neutrals that were presented in pairs of 16 negative-neutral, 16-positive-neutral and 16 neutral-neutral as fillers).

Completing the dot probe task. Participants returned to the lab for their final visit after returning the camera. All participants completed the BDI, STAI, and VAS scales. In both priming conditions, the mood induction procedure was completed, and then was followed by administration of the VAS scales as a manipulation check for assessing mood. Participants were seated 70 inches from the computer screen. Participants were instructed to read instructions presented on the computer screen and then were positioned appropriately with the SR response box (right index finger positioned on the right-most button and left index finger positioned on the left-most button). Instructions were verbally reviewed again and participants were instructed to respond and quickly and accurately as possible for the entire duration of the task. Participants then began practice trials of stimuli that consisted of geometric shapes in an attempt to control for valence and/or arousal effects during practice trials. Participants completed these practice trials for 30 seconds and were asked if they would like to repeat the practice trials or if they were ready to begin the task. All stimuli were presented for
1200 ms, with a dot probe presentation of 300 milliseconds. Upon completion of the task, participants were provided with the VAS scales to assess mood. Both conditions then completed the positive mood priming procedure and were administered the VAS scales again to ensure their mood has been stabilized (happy rating returned to within 20 points of baseline). Following the positive mood priming procedure, they completed the rating scales in reference to each picture they provided. Following these ratings, they were thoroughly debriefed as to the purpose of study and issues of confidentiality were also discussed again.

Statistical Method

A power analysis was computed a priori using the computer program G*Power to determine the size of the sample that would be needed to see a medium effect. The a priori power analysis was completed for multiple regression (omnibus) with alpha set at .05. For a medium effect size and power of .80 for four predictors, the total sample size needed was 68 participants.

In order to eliminate the influence of outliers, response times less than 100 milliseconds and greater than 2000 milliseconds were removed from analyses. In addition, incorrect responses were not included in analyses as well. Average reaction times were calculated separately for each stimulus type and type of trial (valid and invalid). Valid trials are when the probe replaces a negative stimulus and invalid is when the probe replaces a non-negative stimulus.

Attentional bias scores were computed using the following equation (Mogg et al., 1995; Gotlib et al., 2004; Bradley et al., 1997): **½[(RpLe-RpRe)+(LpRe-Lple)]** where R=right position, L=left position, p=probe and e=emotion (negative, positive or neutral). Positive values indicated attention towards emotional stimuli and away from neutral, and a negative value indicated attention away from emotional stimuli (Gotlib et al., 2004).

Study Hypotheses

To test the hypothesis that participants who underwent negative mood priming would exhibit an attentional bias (positive score or enhanced vigilance) for negative information, a 2 (Group: positive and negative condition) X 2 (Sex: female and male) MANOVA was conducted on the emotional bias scores (positive and negative). Secondly, to assess if importance and valence were significant predictors of reaction times in negative and positive trials controlling for gender, a 1 Way Random Effects ANCOVA was conducted in HLM. As stated earlier, the inclusion of gender in all these statistical analyses was completely exploratory.

Traditional regression analyses include multiple assumptions which may be compromised by the nested data in this study (responses at multiple time points within individuals). Therefore, in order to assess the relationships among the variables in this study, it was necessary to use a statistical method that accounts for the inherent dependency among response time data from multiple time points within individuals. Hierarchical Linear Modeling (HLM) assesses relationships between and within variables using nested data structured in levels within hierarchical frameworks (Raudenbush & Bryk, 2002). HLM offers enhanced hypothesis testing by taking into account that variables such as response time latencies may be similar within and across individuals; furthermore, HLM can assess cross-level effects of nested data with greater accuracy than other statistical methods for nested designs (Raudenbush & Bryk, 2002). This project includes nested data (responses within individuals) and some instances of missing data; therefore HLM was utilized to test the aforementioned hypotheses concerning importance and valence ratings and response time latency. Please see model below and note that those variables names appearing in bold and italics were grand-mean centered.

Level-1 Model

$RT_{ij} = \beta_{1j}$ (NEGTRIAL$_{ij}$)+ β_{2j} (POSTRIAL$_{ij}$)+ β_{3j} (PROBETYPE$_{ij}$)+

β_{4j}(***VALRATIN***$_{ij}$)+β_{5j} ***IMPRATIN***$_{ij}$)+ r_{ij}

Level-2 Model

$\beta_{1j} = \gamma_{10} + \gamma_{11}$ (PRIMECON) + γ_{12} (GEND_REC) + u_{1j}

$\beta_{2j} = \gamma_{20} + \gamma_{21}$ (PRIMECON) + γ_{22} (GEND_REC) + u_{1j}

$\beta_{3j} = \gamma_{30} + \gamma_{31}$ (PRIMECON) + γ_{32} (GEND_REC) + u_{1j}

$\beta_{4j} = \gamma_{10} + \gamma_{41}$ (PRIMECON) + γ_{42} (GEND_REC)

$\beta_{5j} = \gamma_{50} + \gamma_{51}$ (PRIMECON) + γ_{54} (GEND_REC)

Level 1 predictors in this model constitute the nested data (information that corresponds to each response of the individual during the computer task). The variables included in this level 1 model included the type of stimulus presented (negative or positive), the position of the probe (replaced emotional or neutral picture), and the importance and valence ratings of the emotional picture included in each trial. While level 1 variables indicate responses within each individual, level 2 predictors correspond to variables that identify the individuals in this study. The variables of interest for this model were the priming condition of the participant (negative or positive) and their gender (female or male).

CHAPTER III

RESULTS

Demographic and Participant Characteristics

The primary analyses including low BDI participants included 57 participants: 27 participants (10 male, 17 females) in the positive mood condition and 30 (9 male, 21 females) in the negative mood condition. All demographic and participant characteristics for low BDI completed participants are included in Table 1. The conditions did not differ significantly in respect to age $t\ (55) = -.362$, $p>.05$, race $\chi^2(4, 57) = 2.38$, $p >.05$, and gender $\chi^2(1, 57)=.32$, $p >.05$ However, the two conditions differed significantly in respect to STAI-State scores [$t(44.26) = -3.3$, $p<.0$, d = -.15] and STAI-Trait scores [$t(55) = -2.267$, $p <.05$, d = -.08]. Although these differences are statistically significant, they are not within the clinical range for anxiety. Therefore, STAI scores were not included in statistical analyses.

Separate analyses were conducted including the high BDI participants. These analyses included the 57 low BDI participants plus the 16 participants with BDI scores above the cutoff of 6. This secondary sample included 73 participants: 36 in the positive mood condition (15 male, 21 female) and 37 in the negative mood condition (9 male, 28 female). The conditions did not differ significantly in respect to age [$t\ (71) = .57$, $p >.05$], race [$\chi^2(5, 73) = 3.71$, $p >.05$], and gender [$\chi^2(1, 73)=2.49$ $p >.05$]. However, the two conditions differed significantly in respect to STAI-State scores [$t(65.91) = -3.14$, p

$< .01$ d= -.10]. Again, though these differences are statistically significant, they are not within the clinical range for anxiety. Therefore, STAI scores were not included in statistical analyses.

Participant Importance and Valence Ratings

First, an Independent Samples t-test was conducted on the primary sample to examine whether importance and valence ratings for negative and positive pictures differed in the two priming conditions. The conditions did not differ significantly in ratings of importance for positive [$t(55) = -1.442$, $p > .05$] and negative pictures [$t(55) = .062$, $p > .05$]. Although the conditions did not differ significantly on valence ratings for positive pictures [$t(55) = -.020$, $p > .05$], they did differ significantly in respect to valence ratings for negative pictures [$t(55) = 2.733$, $p < .01$, d = .10]. Participants in the negative mood condition rated negative pictures as more negative on average than participants in the positive mood condition. An Independent Samples t-test was conducted to examine gender differences in ratings as well. Results indicated that females rated negative and positive pictures both as more important [$t_{neg\ imp}(55) = -2.07$, $p < .05$, d= -.07; $t_{posimp}(29.196) = -2.06$, $p > .05$, d= -.07] and rated positive pictures as more positive [$t(55) = -2.04$, $p < .05$, d= -.07]. However, there were no significant differences between males and females in ratings of emotionality for the negative pictures [$t(55) = 1.598$, $p < .05$]. Secondary analyses were conducted on the combined low/high BDI sample as well. The Independent Samples t-test examining importance and valence ratings for negative and positive pictures in the two priming conditions showed the same results. Conditions did not differ significantly in ratings of importance for positive [$t(71) = -.147$, $p > .05$] and negative pictures [$t(71) = -1.155$, p > .05]. Although the conditions did not differ significantly on valence ratings for positive pictures [$t(71) = -.575$, $p > .05$], they did differ significantly in respect to valence ratings for negative pictures [$t(71) = 3.056$, $p < .01$, d=..09]. Consistent with the low BDI sample, participants in the negative mood condition rated negative pictures as more negative on average than participants in the positive mood condition. The Independent Samples t-test including gender indicated that females rated only positive pictures as more important [$t(33.414) = -2.19$, $p<.05$, d= -.13], and positive pictures as more positive as well [$t(71) = -2.08$, $p<.05$, d= -.06]. There were no significant differences in reference to the importance or emotionality of the negative pictures between males and females [$t_{neg\ imp}(71) = -1.40$, $p>.05$, $t_{negval}(71) = -1.31$, $p > .05$]

Validity of Experimental Mood Manipulation

Participants were administered an experimental mood manipulation prior to completing the dot probe task. To examine the effects of the mood manipulation, two separate Repeated Measures t-tests were conducted with both conditions on the sadness and happiness ratings at baseline and following the mood induction. Low BDI participants in the negative mood priming condition experienced a significant increase in sadness [$t(29) = -8.624$, $p<.001$, d= .59] and decrease in happiness [$t(29) = 9.19$, $p<.001$, d=.63]. Participants in the positive mood induction experienced a significant increase in happiness [$t(29) = -4.051$, $p<.001$, d= -.28] and decrease in sadness [$t(29) = 2.164$, $p<.05$, d= .15]. Refer to Table 4 for estimates of group means and standard deviations. A Repeated Measures ANOVA was conducted on the sadness and happiness ratings including gender and condition as the fixed effects. Results indicated no significant effects for gender.

The high BDI participants displayed a similar pattern as well, although their baseline happiness ratings were lower (M_{pos}= 61.67, SD = 15.41; M_{neg} = 62.86, SD = 12.2) than the low BDI sample (M_{pos} = 83.70, SD = 10.06; M_{neg} = 82.17, SD = 10.23). Their baseline sadness ratings were higher (M_{pos}= 38.33, SD = 27.27; M_{neg} = 26.43. SD = 16.51) than the low BDI sample (M_{pos} = 6.58, SD = 10.04; M_{neg} = 13.00, SD = 21.07). Consistent with the low BDI sample, the participants in the positive mood condition experienced an increase in happiness (M_{pos1}= 61.67, SD = 15.41; M_{pos2} = 75.00, SD = 17.68) and decrease in sadness (M_{pos1}= 38.33, SD = 27.27; M_{pos2} = 20.56. SD = 20.38). The negative mood condition showed an increase in sad mood ($M_{neg\ 1}$= 26.43. SD = 16.5; $M_{neg\ 2}$= 53.57 SD = 31.45) and decrease in happy mood ($M_{neg\ 1}$= 62.86. SD = 12.2; $M_{neg\ 2}$= 44.29. SD = 20.09). These results were consistent with the low BDI findings reported previously.

Data Screening

Participant response times on the dot probe computer task that were less than 100ms or greater than 1000ms were excluded from data analyses (2 trials that accounted for .0% of data) to minimize the effect of outliers (Gotlib et al, 2004a). In addition, incorrect responses were removed from data analyses (Leyman, De Raedt, Schact & Koster, 2007). These erroneous responses account for .7% of data (64 trials). After removal of these trials, data analyses were then completed on 99.3% of the data.

Hypothesis 1: Group Differences in Bias Scores

In order to examine group differences in gender and priming condition in positive and negative bias scores, a 2 (Group: positive and negative condition) X 2 (Sex: female and male) MANOVA was conducted on the emotional bias scores (positive and negative) of the low BDI sample. There were no significant effects of gender in predicting negative bias scores [$F(1, 53) = .756$, $p > .05$] or positive bias scores [$F(1, 53) = .009$, $p > .05$]. Main effects for mood priming condition on negative [$F(1, 52) = .354$, $p > .05$] and positive attentional biases [$F(1, 53) = .035$, $p > .05$] were non-significant as well. However, the interaction of priming condition and gender showed a trend towards significance with negative bias scores [$F(1, 53) = 3.16$, $p = .081$], but not for positive bias scores [$F(1, 53) = .65$, $p > .05$]. Refer to Tables 5 and 7 and Figure 1 for estimated parameters.[1]

A 2 (Group: positive and negative condition) X 2 (Sex: female and male) MANOVA was conducted on the emotional bias scores (positive and negative) including the high BDI participants as well. There were no significant effects of gender in predicting negative bias scores [$F(1, 70) = .069$, $p > .05$] or positive bias scores [$F(1, 70) = .002$, $p > .05$]. Main effects for mood priming condition on negative [$F(1, 52) = .176$, $p > .05$] and positive attentional biases [$F(1, 53) = .019$, $p > .05$] were non-significant as well. Although the interaction showed a trend towards significance in the primary low

[1] An ANCOVA was conducted on the bias scores including gender and priming condition as fixed effects and STAI-State scores as a covariate. Results showed that the addition of the covariate did not change the results reported here.

BDI sample, it was non-significant for both negative bias scores [$F(1, 70) = 3.61$, $p = .081$], and positive bias scores [$F(1, 53) = .743$, $p > .05$] in the sample including both low and high BDI participants.

Hypothesis 2: Effects of Importance and Valence on Reaction Time

In order to examine the effects of participant ratings of valence and importance on reaction time, and to explore possible gender effects, a random effects ANCOVA was conducted using HLM. For the primary low BDI sample, results indicated that gender was found to be a significant predictor in reaction times for negative trials ($\gamma_{12} = 47.96$, $t(52) = 2.816$, $p < .01$) and positive trials ($\gamma_{22} = 40.20$ $t(52) = 2.626$, $p < .05$). These results indicate that reaction times vary significantly for males and females for positive and negative trials (refer to Table 6 for model fixed effects). Coefficients of gender were then examined to assess whether males or females had greater reaction times on average for negative trials. For coding of sex, males corresponded to a value of zero and females were assigned a value of 1. The coefficient was positive ($\gamma_{12} = 47.96$) for negative trials, indicating that on average females had longer response times (47.96 point increase in slope) in comparison to the males. For positive trials, the coefficient was also positive ($\gamma_{22} = 40.20$), indicating again that females on average had longer response times than males (40.20 increase in slope).

However, the results with the full sample of low and high BDI participants yielded different findings. Findings indicated only a trend towards significance for gender as a significant predictor of reaction time for positive trials ($\gamma_{21} = 26.35$ $t(69) =$

1.82, p = .07). Thus, these results suggest that females on average have longer response times than males on positive trials (26.35 increase in intercept in comparison to males).

CHAPTER IV

DISCUSSION

This study examined attentional biases for positive and negative information using photographs that participants provided and identified as emotional and important to them. Specifically, this study aimed to examine the role of self-relevance in attentional biases to emotional information using a novel experimental design that required participants to take pictures of stimuli in the environment that were important to them and elicited strong negative, positive and neutral emotions. These pictures served as the stimuli for the current study and were incorporated into a dot probe computer task that was administered to healthy college students (BDI ≤ 6) who underwent an experimental mood manipulation (negative or positive).

It was hypothesized that participants in the negative mood manipulation condition would exhibit significantly different bias scores for negative information than participants in the positive mood manipulation condition. This hypothesis was not confirmed, as results indicated no significant differences between the two conditions. Secondly, it was hypothesized that the importance and valence ratings of the pictures would significantly predict the participants' response times (participants would take longer to respond when pictures were important and emotional to them). This hypothesis was not supported. However, reaction times on negative and positive trials were found to be significantly different between males and females, with females responding slower on average on both types of trials. The current study included no predictions regarding gender, but an exploratory analysis of gender effects on the bias scores indicated a near significant interaction of gender and priming condition on negative bias scores in the low BDI sample. Males in the positive priming condition showed attention towards negative information, but males in the negative priming condition exhibited attention away from negative pictures. Females tended to show the opposite result, exhibiting attention away from negative information in the positive condition, and slightly towards negative information in the negative condition.

Gender has not been explored extensively in the attentional bias literature. However, a couple of recent studies have examined gender effects. Baert, DeRaedt and Koster (2010) initially included gender as a predictor in their statistical analyses examining attentional biases; however, gender was dropped from the final model due to the absence of significant gender effects. In addition, Vogt, DeHower, Koster, Van Damme and Crombez (2008) examined attentional biases for emotional information using IAPs pictures. They reported an interaction between arousal ratings and response latency in the female participants, as the females responded faster with pictures that were more highly arousing. Although this indicates a difference in information processing for arousing pictures in females, they did not find gender differences in response time per se. The females in the current study responded slower than the males on average, and the findings related to arousal cannot be addressed as arousal was not assessed for the pictures. However, the males and females in the current study exhibited differential patterns of responding to negative and positive pictures. In addition, there were significant gender differences on importance and valence ratings. Females tended to rate positive and negative pictures as more important, and also rated positive pictures as more positive than males. Though there were significant gender effects for ratings, there were no gender effects for the mood induction. Thus, both males and females responded equally well to the mood manipulation.

Although gender has not been extensively explored in previous research on attentional biases, the exploratory findings of this study implicate its possible significance. Cahill (2006) reported findings implicating the role of gender in the processing of emotional information. His results indicated that women rated unpleasant pictures as more arousing and responded with greater EMG activity, while men rated pleasant stimuli as more pleasant and responded with greater physiological arousal (Bradley et al., 2001; Bradley & Lang, 2007). Therefore, given these differences in interpretation and reactivity to valenced material, it seems informative to examine gender effects or at the very least, control for the effects of gender when examining attentional biases using emotional information in the future.

As stated previously, the inclusion of gender as a predictor in the MANOVA analyses on attentional bias scores was purely exploratory, and based on the observation of significant gender effects in the picture ratings in this sample. The tendency to exhibit attention away from negative information shown by the experimentally induced dysphoric males is inconsistent with findings in the extant literature. Dysphoric and depressed individuals generally exhibit a bias towards negative information, while non-dysphoric individuals exhibit a bias away (protective bias) from negative information

(Shane & Petersen, 2007). Non-depressed individuals tend to exhibit this protective bias, where they avoid negative information (Leyman et al., 2007). It is interesting that the males exhibited this pattern in the negative mood manipulation condition, whereas the females demonstrated a slight bias towards negative information. However, females in the positive mood condition demonstrated the protective bias that is consistently shown with non-dysphoric individuals in past research. There were a relatively low number of males included in the study, so these results require replication with a larger sample. In addition, there was a high degree of variability in the bias scores across individuals in both conditions. Therefore, the high variability in responses compounded with the small sample size of this study may have played contributing roles in detecting what may be a very small effect. These inconsistencies within priming conditions suggest that attentional biases may operate differently with mood-induced dysphoria than it does with naturally occurring dysphoria.

When the participants with BDI scores higher than the cut-off (above 6) were included in statistical analyses, these gender effects disappeared. The interaction of gender and priming condition on negative bias scores no longer approached significance, and the gender effect demonstrated with negative trials in the low BDI sample was no longer significant. This indicates that these initial effects demonstrated with the non-dysphoric group may be unreliable, or alternatively as previously suggested, that attentional biases may operate differently with non-dysphoric and dysphoric individuals. Unfortunately, this issue cannot be fully addressed with the current full sample due to the low number of high BDI individuals (N=16) and the limited number of males (N=4).

Most research utilizing designs (dot probe paradigm) similar to the current study has not included induced dysphoric participants. However, there is one study by Bradley, Mogg and Lee that has (1997). Bradley, Mogg and Lee examined attentional biases for negative information in induced and naturally occurring dysphoria. Results indicated that mood induced individuals showed vigilance for negative information only at presentation times of 500ms, but not at 1000ms or at 14ms when masking was used. They also documented attentional biases for naturally occurring dysphoria at 1000ms in Study 2, and these biases correlated with the self-report measures of depression (Mogg, Bradley & Lee, 1997). Thus, it seems that there may be fundamental differences in attentional processing in induced and naturally occurring dysphoria. Dysphoric and depressed individuals generally do not exhibit negative attentional biases at durations < 1000ms, so Bradley, Mogg and Lee's finding is also inconsistent with the majority of attentional bias literature (e.g. Mogg & Bradley, 2005; Gotlib et. al., 2004a; Gotlib et al., 2004b). This indicates that mood congruency may be an adequate but not necessary component of negative attentional biases and questions of the reliability of attentional biases in general. Negative attentional biases are proposed to arise in later stages of information processing where negative schemata are activated and attention is subsequently directed towards negative information. This effect is supposedly enhanced under conditions of mood congruency and self-relevancy. However, the current study utilized both mood congruency and self relevant stimuli, and did not find evidence of attentional biases in the induced dysphoric individuals. Furthermore, results including induced dysphoric participants were not convergent across similar experimental paradigms. This further implicates functional differences between induced dysphoric and naturally occurring individuals and/or conceptual flaws in the theoretical rationale for negativity biases.

However, there are factors that were not included in the present design that may have contributed to these findings. A factor that is proposed to play an elemental role in negative attentional biases is depressive cognitions (Baert, De Raedt & Koster, 2010). As stated earlier, previous research has demonstrated enhanced vigilance, maintained attention towards, and impaired disengagement away from negative information across a variety of experimental paradigms in naturally occurring dysphoric and depressed individuals (e.g. Baert, De Raedt & Koster; Koster et al, 2005; Mogg et al, 2004). Baert, De Raedt and Koster suggest that the cognitive aspects associated with depression (e.g. cognitive distortions, negative views of self, guilt) play elemental roles in attentional biases towards negative information. A majority of studies documenting negative attentional biases has included dysphoric or depressed participants and has utilized self-relevant or interpersonally related information presented at longer presentation times (e.g. Koster et al, 2005; Mogg et al., 1995; Gotlib et al, 2004; Bradley et al., 1997). Therefore, attentional biases may stem from the elaboration of negative information (thoughts, events) in memory that may be further enhanced by mood congruency and self-relevance. Leyman, De Raedt, Schact and Koster (2007) suggest that attentional biases emerge in later stages of elaborative processing where negative schemata are activated, which subsequently “guides attention”. In addition, Yovel and Mineka (2004) contend that attentional biases are unreliable in sub-clinical populations that may lack these depressive cognitive symptoms.

Although this study incorporated self-relevant stimuli and mood congruency via a mood manipulation, the participants in this study lacked the depressive cognitive characteristics exhibited by dysphoric and depressed individuals. If negative attentional biases are contingent upon the presence of at least some minimal depressive cognitions (e.g. self-criticism, worthlessness, guilt), non-significant findings with a sample of healthy college students would be expected (Baert, De Raedt & Koster, 2010). In addition, Baert, De Raedt & Koster suggest that attentional biases and depressive symptom severity are correlated, so the extent that attentional biases will be expressed increases as severity of depressive cognitive symptomatology increases as well. This theoretical rationale provides justification for null findings in relation to attentional biases; however, it offers insufficient explanations for the results of the current study and Mogg, Bradley and Lee's study (1997). High BDI participants in the current study tended to display different patterns of responses in comparison with the low BDI participants. Males in the high BDI group tended to show attention away from negative information in the positive mood condition and females displayed the opposite effect, showing attention towards negative information. The high BDI negative mood condition included only females and trended towards attention away from negative information. These findings are inconsistent with low BDI results and past research as well. However, high BDI sample sizes were extremely low (N_{pos}=8, N_{neg}=7), so reliable conclusions cannot be made.

It is possible that the operationalization of self relevance for the current study has differential effects on attentional processing than previously utilized self-relevant stimuli in other experimental paradigms, or that the pictures included in this study were not valid indicators of self concern and emotionality. Participants were instructed to provide pictures of stimuli that were meaningful and elicited strong emotional reactions within themselves. The inclusion of pictures the participants provided was a manipulation intended to ensure the stimuli included were high in personal concern, and also were indicators of everyday stimuli. The pictures provided by participants ranged from objects to publicly assessable images of people/events, and elicited a range of emotions (negative, positive, neutral) from the participants. Therefore, pictures within and across participants had high variability in their content and emotionality (some included more fear or anxiety provoking than depression specific). In addition, extremely negative emotion-evoking stimuli may be difficult to identify in non-dysphoric individuals. Even after stimuli were identified, their importance can be transient and in the past. Therefore, the variability reflected in the content and in the participants' responses to the pictures may have played contributing roles in the results and the differential attentional processing exhibited by the participants.

Although these stimuli were high in personal concern, they lacked the "attention magnets" present in other pictorial stimuli such as IAPs photographs that have been used to examine attentional biases in depression and dysphoria. As stated previously, it has been suggested that these pictures contain attentional magnets, which are proposed to enhance memory but typically are not the content of depressive cognitions and rumination (Levine & Edelstein, 2009). These stimuli (IAPS photographs) are generally attention grabbing, and high in arousal (especially the negative images which may include mutilated bodies, gore, and violence). Images that elicit arousal may have different effects on attentional processing than those that reflect the typical daily concerns of individuals. Therefore, the negative attentional biases that have been documented using highly arousing pictures may be a function of arousal rather than salience, as often times these individuals will not come into contact with the content of these images. This would indicate that the experimental design was successful in the current study, but that attentional biases in terms of visually presented information may function as a result of arousal rather than personal concern. Negative attentional biases have been shown with sad and angry faces as well (e.g., Gotlib et al., 2004a, Gotlib & Joorman, 2007). However, this could also be a function of visual processing that may not be reflective of negative cognitions associated with depression. This again indicates problems with the conceptualization of negative attentional biases, and may indicate that self-relevance and mood congruency play only minor roles in comparison to depressive cognitions in attentional biases.

Strengths and Limitations

This study is one of the first to examine the role of self-relevance in attentional biases by means of participant generated pictures in a dot probe design. Although this was a manipulation to ensure the stimuli incorporated in the task were highly salient and emotional to the participants, the experimental protocol required a good deal of effort, time, creativity and emotional insight from the participants. This time- and effort-intensive design was not conducive to the sampling population of undergraduate students and their motivations for participation in research for course credit. As a result, a number of potential participants dropped out of the study before completing it. It is possible that those participants who did complete the entire study represented a select, and non-representative, group. The participants who completed the study tended to be highly motivated and willing to invest their time and effort. This experiment was difficult for some participants, as there were problems with emotionality ratings of positive and negative pictures. Therefore, it was difficult to assess the role these concepts may play in negativity biases in the current study. However, past research offered support to the notion of incorporating content specific, emotional and salient stimuli into research designs (Wisco, 2009). Thus, while the procedures used in the current study may have been difficult to implement, the basic idea of using idiographic and self-relevant stimuli warrants further exploration.

Another limitation mentioned previously is the sampling of non-dysphoric individuals. Although mood congruency plays a role in attentional biases, it may have been more informative to use naturally dysphoric individuals. As a result, it is difficult to ascertain the generalizability and applicability of these findings with the majority of the attentional bias literature. However, the present study utilized a mood manipulation that proved highly effective, particularly for the sad mood condition. The incorporation of music and self-reflection may translate well across various research paradigms to examine the effects of mood congruency in the future.

Future Directions

Due to the importance of self-relevance in depressive cognition, it may be informative to modify the current experimental paradigm for including participant provided pictures. Since most research has documented biases with depression relevant or interpersonal stimuli such as sad faces, perhaps the design should include only these types of stimuli as well. To further ensure the images are high in personal concern (relevant to the participant) and sadness, participants could complete Likert type rating scales in conjunction with taking the pictures. As a result, these concepts could be monitored more effectively. In addition, increased time could be devoted to the identification of all stimuli that will be included in the study as a manipulation to ensure appropriate pictures will be taken. Ideally, stimulus content would be equated across participants (e.g. 5 pictures of people, 5 pictures of objects) to control for additional attentional processing of different objects included in the pictures and as a baseline for comparison across individuals. In addition, although this study utilized digital cameras whose size and durability were preferable for a college sample, there were problems with picture quality. Cameras with greater picture quality might provide participants with greater ease in capturing pictures, and may also decrease the likelihood that pictures would have to be re-taken.

Other considerations for the current study include matching participants by gender, recruiting a larger sample, including a dysphoric group, and examining more complex hypotheses that model for time. There was a relatively large number of females and low number of males included in this study, so it may be informative to match participants on gender and recruit a larger more representative sample. In addition, inclusion of a larger dysphoric or depressed group may have different implications for the results as well. Dysphoric and depressed individuals may have greater ease providing negative pictures, although may encounter difficulties providing positive pictures instead. The time intensive design may not be attractive to these participants, as depression can be associated by anhedonia and lack of interest. However, it would be informative to explore attentional biases with a larger sample of dysphoric participants using generated pictures, and also compare the type of stimuli provided with that of a control group. Inclusion of a larger, more representative sample that included a dysphoric or depressed group would better generalize to other findings in the literature as well. Lastly, it may be informative to examine the influence of time, and interactions of importance, valence, and mood state using a larger sample size and dysphoric individuals with depressive cognitive symptomatology. The duration of the full dot probe task was long (8-9 minutes), and it may be important to assess discrepancies in responses as a function of the passage of time as well.

In terms of future studies on attentional biases, it seems informative to examine emotional attentional biases using dysphoric and depressed samples, exogenous cuing tasks and eye tracking equipment as well. Exogenous cuing tasks present stimuli one picture at a time, attempting to control for possible confounding factors due to the simultaneous presentation of two stimuli in the dot probe design. Utilization of these tasks in addition to eye tracking techniques would offer clarification as to all three systems of attentional processing: initial orientation, maintenance and the disengagement of attention and their role in attentional biases (Leyman et al., 2007).

In addition, although there has been a shift towards examining attentional biases and negativity biases in implicit memory tasks, there has been a paucity of research addressing the underlying mechanisms that may be driving these biases. Theories such as elaborative processing and depth of processed have been suggested to play elemental roles in negativity biases; however, depth of processing accounts may offer inadequate explanations that equate length of time passed with the level of depth of processing. The longer response latencies that have been shown across research paradigms utilizing self-relevant stimuli may be attributable to any number of factors such as intrusive thoughts, rumination, affective processing, inattention and/or fatigue. Although further research is needed to add to the research confirming attentional biases in depression using cleaner paradigms (e.g. exogenous cuing tasks), additional research should be completed incorporating multiple paradigms (explicit, implicit, attentional tasks) to confirm theoretical foundations whereby these biases are thought to arise. Leyman, De Raedt, Schact & Koster have suggested that these biases operate in combination with negative depressive cognitive features. Therefore, assessing consistencies across multiple tasks while taking encoding and retrieval effects into account would serve as an informative first step in the future.

Summary

In summary, this study examined attentional biases to emotional information using participant generated pictures in a dot probe design with mood induced (positive and negative) participants. Primary results including non-dysphoric individuals indicated no significant differences between the two conditions in negative or positive attentional biases and no significant findings in reference to reaction time and the importance and valence ratings of the participant generated pictures. However, there were significant gender differences in response times, with females responding slower on average than males. Exploratory analyses indicated a near significant interaction of gender and priming condition on negative bias scores as well. Females also tended to rate pictures as more important than males, which may play roles in future designs that attempt to use the aforementioned study design.

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APPENDIX A. TABLES AND FIGURES

Table 1

Low BDI frequency of demographic variables and means and standard deviations for the STAI- State and STAI Trait and BDI self-report measures.

	Positive Priming Condition			***Negative Priming Condition***		
Gender	**N**	**Mean**	**SD**	**N**	**Mean**	**SD**
Male	10			9		
Female	17			21		
Age (mean)		19.41	1.72		19.6	2.24
Race						
African American	9			9		
American Indian or Alaskan Native	0			0		
Asian	3			1		
Hispanic or Latin American	2			1		
Caucasian	12			18		
Other	1			1		
STAI-State*		9.81	4.96		16.43	9.66
STAI-Trait*		11.2	6.63		16.57	10.50
BDI		2.33	1.75		2.67	1.81

*indicates significant group differences at the .05 level

Table 2

Low BDI group mean values for importance and valence ratings by condition.

	Condition	N	Mean	Std. Deviation	Std. Error
Negative Importance Ratings	*Positive*	27	2	0.57672	0.11099
	Negative	30	2.21	0.50067	0.09141
Negative Valence Ratings*	*Positive*	27	4.02	1.11926	0.2154
	Negative	30	3.24	1.05642	0.19288
Positive Importance Ratings	*Positive*	27	2.93	0.6923	0.13323
	Negative	30	2.91	0.69587	0.12705
Positive Valence Ratings	*Positive*	27	9.09	1.17505	0.22614
	Negative	30	9.09	1.13332	0.20691

* denotes significance at .05 level

Table 3 Low BDI group mean values for importance and valence ratings by gender.

	Gender	Mean	Std. Deviation	N
Negative Importance Ratings*	*Male*	1.9079	.48697	19
	Female	2.2155	.54655	38
Negative Valence Ratings	*Male*	3.9474	1.24726	19
	Female	3.4391	1.07150	38
Positive Valence Ratings*	*Male*	8.6645	1.25437	19
	Female	9.3010	1.03577	38
Positive Importance Ratings*	*Male*	2.6414	.77640	19
	Female	3.0592	.60281	38

* denotes significance at .05 level

Table 4

Low BDI means and standard deviations for Visual Analogue Scale mood ratings prior to and following mood manipulation.

Condition	Happy Time 1		Happy Time 2		Sad Time 1		Sad Time 2	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Positive	83.70	10.06	91.30	8.84	6.85	10.01	4.44	8.47
Negative	82.17	10.23	45.00	23.49	13.00	21.07	56.00	26.57

Table 5

Low BDI means and standard deviations for negative and positive bias scores for each condition by gender.

	Positive Mood Condition		**Negative Mood Condition**	
	Mean	**SD**	**Mean**	**SD**
Negative Bias Scores				
Males	6.6563	8.88	-3.0076	14.2
Females	-4.1251	15.6	.6883	15.60
Total	-.1320	14.33	-.4205	15.05
Positive Bias Scores				
Males	4.4825	24.20	-1.6796	23.96
Females	-1.1080	19.15	2.7214	22.28
Total	.9626	20.89	1.40	22.46

Table 6

Low BDI HLM model estimations with robust standard errors.

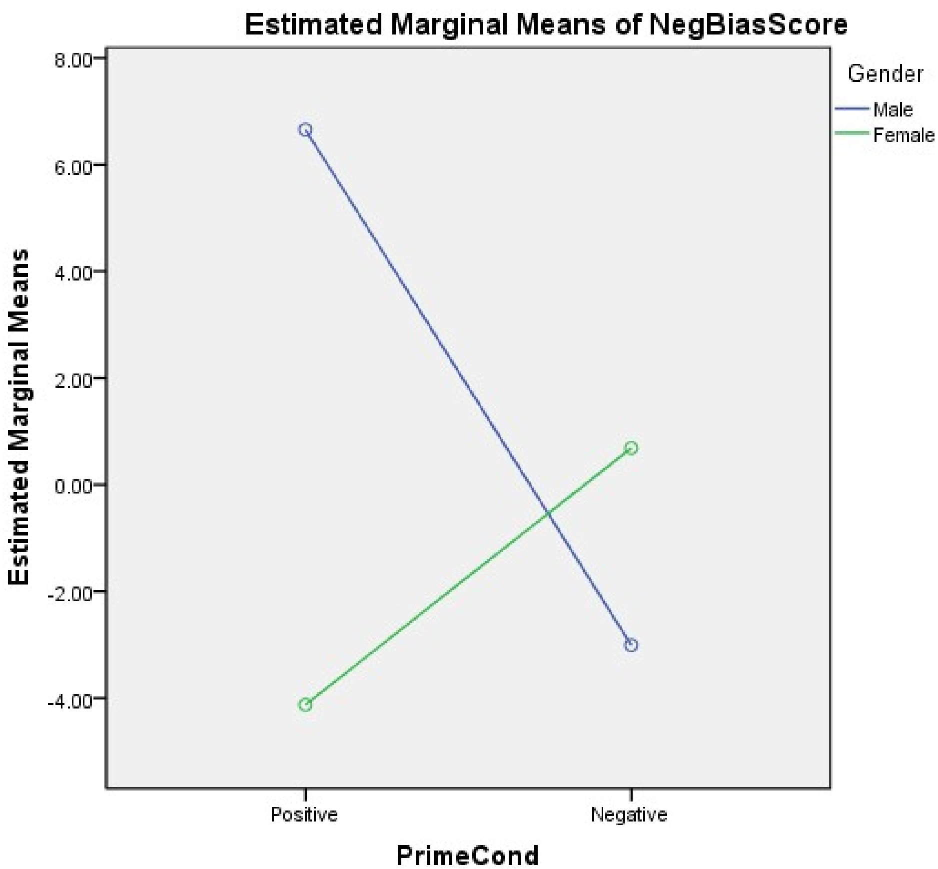
Fixed Effects	Coefficient	Std Error	t-ratio	df	p value
Neg Trial Slope, β_{1j}					
Intercept, γ_{10}	336.28	10.9	30	54	<.001
Prime Condition γ_{11}	-1.44	14.64	-.10	54	0.922
Gender γ_{12}	*47.96	13.38	3.58	54	<.001
Pos Trial Slope, β_{2j}					
Intercept, γ_{20}	350.59	13.71	25.58	54	<.001
Prime Condition, γ_{21}	-2.45	14.58	-.17	54	0.867
Gender, γ_{22}	*40.20	14.12	2.85	54	0.006
Probe Type Slope, β_{3j}					
Intercept, γ_{30}	1.67	3.43	.49	54	0.906
Prime Condition, γ_{31}	-.10	3.72	-.03	54	0.979
Gender, γ_{32}	-1.79	3.81	-.47	54	0.640
Valence Rating Slope, β_{4j}					
Intercept, γ_{40}	-2.57	1.46	-1.76	7072	0.078
Prime Condition, γ_{41}	-0.20	1.15	-.17	7072	0.868
Gender, γ_{42}	1.74	1.24	1.41	7072	0.161
Importance Rating Slope, β_{5j}					
Intercept, γ_{50}	.59	1.42	.42	7072	0.676
Prime Condition, γ_{51}	1.26	1.59	0.79	7072	0.428
Gender, γ_{52}	0.06	1.63	0.04	7072	0.969

* denotes significance at .05 level

Table 7. Group mean reaction times standard deviations by condition and picture valence.

		Group							
		Low BDI				*High BDI*			
		Negative		*Positive*		*Negative*		*Positive*	
Valence	*Validity*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Negative	Valid Trial	374.18	62.57	368.01	53.93	411.32	76.11	400.76	104.47
	Invalid Trial	373.76	63.28	367.88	50.57	406.21	84.76	398.73	92.84
Positive	Valid Trial	374.96	64.99	369.75	56.72	416.96	80.64	389.06	91.21
	Invalid Trial	376.36	58.89	370.71	53.74	423.20	82.88	392.56	80.48

Figure 1. Interaction of gender and prime condition for low BDI negative bias scores.



APPENDIX B. STUDY DOCUMENTS

Computer Rating Task (eprime)

For this task, you will be asked several questions about different pictures. Please answer each question as accurately as possible. If you have any questions, please ask the research assistant. Please click on continue to begin.

What emotion do you IMMEDIATELY feel in response to this image?

-5=extremely negative

-4=very negative

-3=moderately negative

-2=somewhat negative

-1= slightly negative

0=nothing at all

1= slightly positive

2=somewhat positive

3=moderately positive

4=very positive

5=extremely positive

How important is this image to you?

1=not at all that important

2=somewhat important

3=moderately important

4=extremely important

In one to two sentences, please describe why this image is emotional to you.

*please note that these questions were asked for every picture

Camera User-Friendliness Survey

Please use the following scale to answer the 4 questions below:

1	2	3	4
Not at all easy	Somewhat easy	Moderately easy	Very Eas y

1. How easy was it to take pictures?	1	2	3	4
2. How easy was it to adjust the zoom?	1	2	3	4
3. How easy was it to delete pictures?	1	2	3	4
4. How easy was it to review your pictures?	1	2	3	4

5. How was the battery life? Poor Average Good

6. What problems, if any, did you encounter with the camera?

____

____

____

7. What suggestions, if any, do you have to enhance the ease of use with the camera and capturing emotional and unemotional photographs?

____

____

____

Mood Induction Procedure

Negative Mood Induction played with Beethoven's string quartet op. 131 and positive mood priming played with Vivaldi's ''Spring'' concerto of the ''Four Seasons,'' op. 12 for 5 minutes.

Instructions: Participants are told to "relax, make themselves comfortable, and focus their attention on the instructions they are about to hear. They are then told to imagine a situation that would leave them feeling either happy (if in positive mood priming condition) or sad (if in negative mood priming). They are told that they could imagine situations that were real or hypothetical but that in either case they should generate vivid imagery of the events."

"I would like for you to begin imagining a situation that would make you feel [happy or sad]. Imagine the situation as vividly as you can. Picture the events happening to you. See all the details of the situation. Picture in your "mind's eye" the surroundings as clearly as possible. See the people or objects; hear the sounds; experience the event happening to you. Now write down everything you see, hear and are experiencing.

Think the thoughts you would actually think in the situation. What are you thinking? Feel the same [happy or sad] feelings you would feel. What are you feeling?

Let yourself react as if you were actually there."

Photograph Tracking Sheet ID: ___________

*enter photo numbers in boxes and brief description

Please note that if you return the camera with pictures that are unclear and/or inappropriate, you will be asked to take the pictures again!!!!

Positive	Negative	Neutral	Neutral

Total= Total= Total=

Are all my pictures clear? If no, please take picture(s) again

Do any of them look blurry? Can I tell what my picture is by glancing at it?

If yes to any, please take picture(s) again.

Have I followed all the rules for taking pictures (not photographing people other than self, no violence, nudity, etc.)?

If no, please take picture(s) again.

As a reminder, you must include 64 DIFFERENT pictures, so make sure you do not include the same picture twice.

***For flash, you move the cursor to the right (once to turn on, once again for different**

flash setting, and then again to the right to turn it off).

Please contact Tamara at tefoxwor@uncg.edu when you are finished. Remember, you have a week to take these pictures.

ID: ___________ Date: ____________

Form: __________

Please draw a line below indicating how you feel AT THIS MOMENT.

Happy

____

0 10 20 30 40 50 60 70 80 90 100

not at all very much so

Sad

____

0 10 20 30 40 50 60 70 80 90 100

not at all very much so

Anxious

____

0 10 20 30 40 50 60 70 80 90 100

not at all very much so

Negative Positive

____

0 10 20 30 40 50 60 70 80 90 100