ATTENTIONAL BIAS FOR THREAT INFORMATION AND ANXIETY SENSITIVITY IN A NONCLINICAL SAMPLE

BY

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A Thesis
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Abstract

This study investigated the effects of Anxiety Sensitivity (AS) on performance of the Stroop task using several distinct word categories. Participants (N=112) were chosen from the Psychology participant pool and individually administered the following tests: the Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986), the ASI-R (Taylor & Cox, 1998), the State-Trait Anxiety Inventory (Spielberger, Gorsuch, Luschene, Vagg, & Jacobs, 1983), and the Panic Attack Questionnaire (Norton, Dorward, & Cox, 1986). All participants also completed 9 conditions in the Stroop task where they were presented pages with 48 words presented in colors, with the task normally to name the color of ink that words were presented in, rather than reading the words. The conditions included words chosen to represent the following word categories: neutral, positive, depressive, physical threat, cognitive threat, and social threat. In addition, participants had one condition where they simply read color words presented in black ink, another where they named the color of color patches, and the traditional Stroop condition where they were required to name the color in which color words were presented. Participants were divided into low, medium, and high AS groups based on quartile splits from the ASI-R, and it was predicted that an ASI by word category interaction would occur on the Stroop task with groups differing in the color naming task only on the 3 anxiety threat categories, and not on neutral, positive, or depressive word categories. The dependent variables were either simple reading latencies, or indexes that were meant to control for general reading proficiency (the black color word reading condition) or color naming proficiency (the condition where color patches were named). The results indicated strong support for an emotional Stroop effect (threat related words were associated with slower color naming latencies), but the predicted main effects on ASI level and the ASI by word category interaction were not significant. Results of follow-up analyses using only extreme groups and a discriminant function analysis confirmed these outcomes. These results fail to confirm previous research using clinically-defined groups of participants. The ASI-R allows for factor scores on dimensions related to physical threat, social threat, and cognitive threat. Analysis of the relationship between these factor scores and performance on the related Stroop task categories provided data which suggest no consistent relationship between specific areas of heightened anxiety and Stroop performance on anxiety threat words.

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CHAPTER ONE

INTRODUCTION AND LITERATURE REVIEW

1.1 Overview

The purpose of this study was to investigate attentional processes in nonclinical individuals high in anxiety sensitivity (AS), in order to determine whether a processing bias to threat-related information exists. The objectives of the study were: (a) to explore whether a relationship exists between AS and selective attentional processing of threat-related information, (b) to examine attentional biases to different categories of threat cues (e.g., physical-threat, social-threat, cognitive dyscontrol-threat), (c) to replicate earlier findings that suggest an attentional bias to threat-related material in anxious individuals, (d) to demonstrate that AS may represent a cognitive risk-factor (individual difference variable) in the development of anxiety disorders (in a nonclinical sample), and (e) to increase our understanding as to the nature of AS (i.e., multidimensional nature of AS). This would be of importance given that only one study (Stewart, Conrod, Gignac, & Pihl, 1998, as cited in McNally, Hornig, Hoffman, & Han, 1999) has examined an attentional processing bias (with the Stroop task) and its relationship with AS, and this study had methodological problems. The present study utilized a design that: (a) extends the literature to include an assessment of fear of cognitive dyscontrol threat cues (word list), and (b) assessed both automatic and strategic attentional processing (emotional Stroop task). It is essential that the experimental design be capable of assessing and measuring cognitive biases, the underlying mechanisms responsible for such biases, and where these biases are temporally located along the cognitive processing continuum (i.e., attention, storage, retrieval stages).

Prior to elaborating on the present study a review of the background literature will be presented. First, prominent cognitive theories of psychopathology (anxiety and depression) will be discussed. The theoretical frameworks will explore the relationship between emotions and information processing and will include Beck's Schema Theory of Emotion and Cognition (Beck, 1976, 1987, 1996), Clark's Cognitive Model of Catastrophic Misinterpretation of Bodily Sensations (Clark, 1986, 1988), Bower's Network Model of Mood and Cognition (Bower, 1981), Anxiety Sensitivity Theory (Reiss, Peterson, Gursky, & McNally, 1986; Reiss, 1991), and Cox's Model (Cox, 1996) which combines both AS theory and Clark's (1986, 1988) model. These theoretical frameworks are pertinent in understanding how information is processed and how cognitive biases develop that center around content-specific themes. Next, a section will outline current controversy in the literature regarding cognitive biases and emotional disorders. This section will focus on findings that suggest an attentional bias in the anxiety disorders [MacLeod, Mathews, & Tata, 1986; Mathews & MacLeod, 1985; see MacLeod (1991) for a review], but little support for a memory bias [Mogg, Mathews, & Weinman, 1989; see MacLeod (1991) and Williams, Watts, MacLeod, & Mathews (1988) for reviews]; and by contrast, a memory bias in depression [Blaney, 1986; see MacLeod (1991) and Williams, et al. (1988) for reviews], but little evidence for an attentional bias (Hill & Dutton, 1989; MacLeod, et al., 1986). A brief history of the Stroop color-naming task will be presented, followed by a description of a modified version called the emotional Stroop color-naming paradigm, which was used in the present study. Following this, the rationale and hypotheses for the current study will be presented, followed by the method, procedures, results, and discussion sections.

1.2 Cognitive Theories of Psychopathology

Cognitive theories examine cognitions - the thoughts, expectations, and attitudes - that underlie behavior, both normal and abnormal. These theories focus on how one's reality is influenced by one's expectations and attitudes, and how biased or inaccurate processing of information can give rise to psychological disorders. Prominent cognitive theories strongly suggest that cognitions play an important role in the development and maintenance of psychological disorders. The importance of cognitive factors in the etiology and maintenance of certain psychological disturbances has been well documented (Ingram & Smith, 1984; Smith & Greenberg, 1981). And towards that end, many treatment approaches for emotional disorders (anxiety disorders and depression in particular), are directed at modifying some aspect of the individual's cognitive processing (e.g., Beck, Rush, Shaw, & Emery, 1979; Salkovskis, Clark, & Hackmann, 1991). For example, Beck's cognitive model of emotional disturbances (Beck, 1976; Beck et al., 1979) has been very influential in producing effective treatments of depression and anxiety (e.g., Simons, Murphy, Levine, & Wetzel, 1986; Butler, Fennell, Robson, & Gelder, 1991).

1.2.1 Beck's Schema Theory of Emotion and Cognition

Beck's (1976; 1987) cognitive theory on anxiety and depression is founded on the concept that mental processes are organized around cognitive schemas. Schemas are mental representations about a situation or event that are built up through experience. Schemas are organizational structures of knowledge, information, or beliefs, and they may or may not be accurate representations of a concept (i.e., an event). Schemas differ from person to person, and often play an integral role with regard to psychopathology in how an individual interprets,

attends to, and retrieves specific material. In other words, schemas are the cognitive structures around which mental processes are organized.

The content-specificity hypothesis, originating in Beck's (Beck, 1976) cognitive model predicts that anxiety and depression can be differentiated based on the cognitions one holds regarding the self, the world, and the future. Beck et al. (1979) have suggested that psychological disturbances result when cognitive errors occur regarding the schemata one holds about himself, the world, and the future. The content-specificity hypothesis suggests that different disorders, anxiety disorders and depression in particular, are characterized by different (and specific) automatic thoughts. Beck, Brown, Steer, Eidelson, and Riskind (1987) showed that depressed individuals report thoughts concerning themes of loss, self-depreciation, and pessimism; while anxious individuals report thoughts concerning physical danger and threat.

Anxious individuals are believed to erroneously exaggerate the degree of danger/threat associated with a particular situation and underestimate their ability to cope (Beck & Emery, 1985). Early negative childhood experiences may engender such negative schemas. Recent evidence suggests that selective processing of threatening information, relative to non-threatening information, is initiated at the automatic (and perhaps unconscious) level, and prejudices and/or mediates one's emotional responses to negative stressful life events (MacLeod and Hagan, 1992). Some mediating factors, such as the individual difference variable anxiety sensitivity, may influence these biased schemas, and may contribute to the development and maintenance of anxiety.

As was previously mentioned, anxiety is differentiated from depression in that the

dysfunctional schemata in anxiety are concerned with threat or danger (often future threat or danger) or a hypervigilance to threat, as opposed to thoughts focusing around themes of loss, and pessimism in depression. According to Beck et al. (1987), these schemata are activated by selectively processing schema-congruent information. Thus, these researchers have proposed that the schemas of anxious and depressed individuals [as well as other psychopathological conditions, for example eating disorders (Sebastian, Williamson, & Blouin, 1996)] are biased.

1.2.2 Beck's Revised Cognitive Model

Beck revised his original cognitive model of emotional disorders (Beck, 1996) because the original theory did not adequately explain many experimental findings and clinical phenomena. Of the numerous reasons outlined for the model's revision, three seem particularly relevant to our present discussion: a) the demonstration of a specific vulnerability (diathesis) to unique stressors that are congruent with a particular disorder, b) the sensitization phenomenon (kindling phenomenon), which involves recurrences of a disorder (e.g., depression, panic disorder) in response to (triggered by) increasingly less intense experiences, and c) the relationship between conscious and unconscious processing of information (Beck). A similarity with Cox's (1996) model of AS is demonstrated in Beck's revised theory with the notion of a diathesis (specific vulnerability) to unique triggers that are congruent with a particular disorder.

Beck's (1996) revised theory adds to the original theory of schematic processing, and is similar in style to Bower's (1981) network theory. Beck proposes a network design, where he introduces the idea of modes, which interact in a network of cognitive, affective, motivational, and behavioral systems. First, the primal modes are structures of personality that

are designed to deal with specific demands. These are the most relevant to the study of psychopathology in that they are manifestations of survival reactions that were evolutionarily adaptive, but, in their extreme form, are manifested as psychological disturbances. Second, the notion of charges explains the intensity of activation of these cognitive structures and helps explain changes in normal and abnormal states (Beck).

According to Beck (1996) the activating circumstances originate from the anticipation of the event (i.e., taking a plane for an individual with a phobic fear of flying). These events are processed through the orienting part of the primal mode that relates to fear. When this fear is activated, the other components of the mode are energized. In other words, as the individual approaches the feared stimulus (i.e., the airport), his/her orienting schema indicates that there is danger ahead. This warning is sufficient to activate all the systems in the mode. The affective system produces increasing levels of anxiety; the motivational system signals the person to escape; and the physiological system produces the rapid heart rate, the tight chest, the feeling faint. It is at this point that the individual wishes to escape from the situation, but is able to exert voluntary controls that prevail over the primal reaction and the person is forced onto the airplane. As the plane lands, and the person escapes the feared situation, the anxiety disappears.

Memories play an important role in the cognitive system. Although some memories may not be conscious, they can influence present behavior (i.e., implicit memory tasks) (Williams et al., 1988). One's memories are organized around particular themes, so that when a certain mode is activated the memories congruent with that mode are also activated. Beck's (1996) revised theory, then, may help explain mood-congruent memory biases.

The phenomenon of sensitization (kindling phenomenon) involves recurrences of a disorder (i.e., depression), or a severe reaction, that is triggered by progressively less intense experiences (Segal, Williams, Teasdale, & Gemar, 1996). So now, a relatively mild (but congruent) stressor may trigger an intense reaction (or recurrence of the disorder) if there has been a succession of stressors. One explanation offered by Beck (1996) is the build up of energy in a mode. The mode may be silent at first, but then, with incremental charges (of energy) brought on by successive related experiences, the mode reaches its threshold for activation. The mode may be subliminally (implicitly), but constantly, charged so that it is able to become fully activated following a relatively minor stressful event (kindling phenomenon). For some anxiety conditions, a reduction of the intensity of the charge in the mode may occur with the use of conscious strategies; for example, panic attacks may be disrupted by having the person engage in distraction (e.g., thinking about something else).

The sensitization phenomenon may play an important role in maintaining anxiety disorders and depression. Following many stressful events, it doesn't take a particularly major stressor (although congruent) to trigger the mode that, when activated, leads to the cognitive content congruent with the disorder, which leads to the reactions/symptoms of the disorder.

In summary, the concept of the mode model can account for: (a) the regularity and similarity of symptoms in anxiety and other disorders; (b) the homogeneity of the cognitive content of these disorders; (c) the lower threshold for forming these symptoms in susceptible people (risk factor or diathesis); and (d) the increasing sensitization to activating events (Beck, 1996). The model also suggests that information may be processed implicitly (outside of awareness). This model may appear to have some similarities to Bower's network theory

(1981) in regard to the spread of activation across a network, but Beck suggests that the model is more closely related to Mischel and Shoda's (1995) model of cognitive-affective networks.

1.2.3 Bower's Network Model of Cognition and Emotion

Bower (1981) proposed an alternative cognitive network model to explain the relationship between cognition and emotion. According to Bower, emotions are represented by related nodes that are linked together in an associative network in memory. Each node contains a memory for an emotion. A distinction should be made as to whether it is the memory for an emotion or an emotional memory. The former (i.e., sadness) would imply no particular episodic memory being attached, whereas the latter would suggest a specific experience with temporal and location contexts/components. A node for one emotion will be linked to other nodes that contain similar emotional memories. Activation of an emotion node, through the experience of a mood (i.e., anxiety), spreads to other mood-related nodes, which are related in terms of semantic meaning/memory. The more the nodes are related to each other based on past experiences (nodes build up over time and past experience), the more readily the connected nodes will be activated. The model predicts the facilitation of attentional and recall processes for mood-congruent information. Support for this model has been demonstrated with mood-induction studies (Clark & Teasdale, 1982). Biased processing is believed to account for the development and maintenance of emotional disorders. Activation of related nodes is viewed as automatic. The concept of "automaticity" has become an enigmatic topic, stimulating recent debates.

Two recent and important findings are readily predicted from this model, and they

relate to automaticity and the underlying mechanisms responsible for facilitation and interference. The Stroop (1935) task has played an important role in cognitive psychology over the years. The robust nature of the paradigm has allowed for the investigation of selective attention, automaticity, word-reading, and color-naming processes (MacLeod, 1991). This paradigm provides a theoretical framework on how individuals manage conflicting stimuli and task demands, it provides a prolific testing ground for ideas concerning automaticity, and it may enable us to discover the underlying causal mechanisms responsible for the attention process - or how attention works.

Contrary to previous research, Sharma and McKenna (1998) suggested that Stroop interference may be multidimensional in nature, as opposed to a unitary phenomenon. The authors suggested four components to the Stroop effect: (1) lexical component, (2) semantic-relatedness, (3) response-set membership, and (4) semantic-relevance. This study examined the response output (vocal versus manual) on the four components of the Stroop effect. Vocal responses produce greater Stroop effect/interference, due presumably to the lexical effect, where a word in a lexicon will take longer to color-name and thus increase interference (which the authors found in the vocal but not the maual response output). Pathways can be traced out for each of the two dimensions of the stimulus - the color and the word. The pathway for the color involves activation of the concept nodes in the semantic system, followed by the activation of word nodes in the lexical system, and then there is a vocal output. The pathway for the word (when reading the word which is to be ignored) mainly activates the nodes in the lexical system and then there is vocal output. However, there might be some activation of the semantic system. "Thus, there are three sites at which interference can occur - the lexical

system, the vocal output systems, and possibly the semantic system. Words cannot interfere with colors in the semantic system due to the dominance rule; thus, interference could occur in the lexical or the vocal output system" (Sharma & McKenna, 1998, p. 1035). Increased activation will increase the time needed to correctly color-name the ink in which the word is printed. Sharma and McKenna, suggested that interference is located mainly in the lexical system. The lexical effect disappears with manual response output (pathway for color-naming doesn't enter the lexical system, it goes directly from semantic system to manual output), and therefore less Stroop interference is shown with manual response output. These findings are included to illustrate the current diverse nature of Stroop task research.

Recently, MacLeod (1998) published a key paper in which he raised three crucial issues to understanding the nature of the Stroop effect and how these relate to attention. First, to what extent does the amount of practice one has with the two main dimensions of the Stroop effect - color and word - effect the interference to be observed; this point is particularly interesting, considering that if one is to view automaticity as a continuum (e.g., Logan, 1985), then it would appear vital to see whether automaticity changes with practice. Second, to what extent does integrating the two main dimensions of the Stroop effect - color and word- influence the magnitude of the Stroop interference effect. Third, what is the relation between facilitation and interference, and are these two effects controlled by the same, or independent underlying mechanisms? Contrary to virtually all existing literature, MacLeod (1991) suggested that facilitation and interference may be controlled by distinct mechanisms.

Neither Beck's schema model (1976; 1987) nor Bower's network model (1981) can fully explain the findings that (a) anxious individuals demonstrate an attentional bias to threat

information relative to non-threat information, but no memory bias, although there is some support for implicit memory bias [explicit memory bias has been demonstrated with general threat words, McCabe (1999), but there were methodological problems], whereas (b) depressed individuals show a memory bias (explicit) but no attentional bias for depressive-relevant information. The theories would predict mood-congruent effects for both an attentional bias and a memory bias for mood-congruent information in both anxiety and depression. Perhaps there are two distinct/independent underlying causal mechanisms, one responsible for attentional processing and Stroop interference (attentional bias), and the other for memory biases, a point we will return to later in the discussion.

Both Beck's (1976) and Bower's (1981) theories predict that anxiety and depression are jointly characterized by mood-congruent biases that operate throughout all the stages of cognitive processing - attention, integration, storage, elaboration, and memory (retrieval). Maladaptive schemas not only bias an individual's attention towards mood-congruent material, but also facilitate the processing of that information. Mood-congruent information is attended to, encoded, and stored more readily than incongruent material. According to Beck (1976), the maladaptive schemas of depressed and anxious people enhance the recall of mood-congruent material. Controversy exists in this area, in that attentional biases are seen predominantly in anxious individuals (e.g., MacLeod et al., 1986; Mathews, 1990; Mogg, Bradley, & Williams, 1993), while retrieval/memory biases are demonstrated in depressed individuals (see Blaney, 1986; Watkins, Vache, Verney, Muller, & Mathews, 1996). This controversy will be discussed further in a following section.

Following this overview of Beck's (1976, 1987, 1996) and Bower's (1981) theories,

the questions still remain: why do anxious individuals demonstrate an attentional bias for threat-related information, but generally do not show a memory bias for such material? And what underlying mechanisms are responsible for the observed attentional bias of processing threat-related information, compared to non-threatening information? To answer questions like these, we will consider anxiety sensitivity (AS) as an individual difference variable (risk factor or diathesis) in the development of anxiety disorders. We will discuss Clark's Cognitive Model of Catastrophic Misinterpretation of Bodily Sensations (1986, 1988), and then attempt to combine certain aspects of AS theory and Clark's theory in order to explain why AS might represent a risk-factor to the development of anxiety disorders, panic disorder in particular.

1.2.3.1 Anxiety Sensitivity and Psychopathology

Anxiety sensitivity (AS) represents an individual difference variable consisting of beliefs that the experience of anxiety or anxiety symptoms may be harmful or threatening (Reiss, Peterson, Gursky, & McNally, 1986). In order to more fully understand the mechanisms responsible for the observed relationship between AS and emotional disturbances it is important to examine the nature of the AS construct. Reiss (1991) suggested that AS relates to beliefs about anxiety and represents a personality factor that biases some individuals toward the development of anxiety disorders. Contrary to viewing AS as a personality risk factor, recent investigations have suggested that AS may be viewed as a cognitive risk factor for anxiety disorders (panic disorder in particular). McNally (1994) suggested that pre-existing beliefs or schemas about specific bodily sensations (i.e., a rapid heart rate) may predispose individuals to respond apprehensively to them and thereby panic, and that this is conceivable in relation to the AS hypothesis (p. 116). McNally's view of AS as a disposition

assumes that individuals can be high in AS, but never have experienced a panic attack. It is the fear of anxiety symptoms "based on beliefs" about certain bodily sensations that predisposes individuals to respond with panic, not a history of panic. The logic from McNally et al. (1999) goes as follows: elevated levels of AS, longitudinally lead to panic attacks (Schmidt, Lerew, & Jackson, 1997), and panic attacks are required criteria for panic disorder, and therefore, perhaps the cognitive risk factors for panic attacks are the same as those for panic disorder.

AS could serve as a valuable construct in understanding a variety of psychiatric disorders. Given its implication as a cognitive risk factor in the development of anxiety disorders, it is important to investigate its relationship with cognitive processing. AS, as an individual difference variable, is a fundamental fear that can exacerbate other fears, and in the case of panic disorder may serve as a psychological risk factor. AS is elevated in the anxiety disorders, particularly panic disorder, and to a lesser degree in depression. Research and theoretical implications of AS are founded on at least three assumptions: "(a) it concerns anxiety-related sensations, (b) it refers to a belief system, and (c) it is a predisposition rather than a correlate of panic attacks and panic disorder" (Cox, Borger, & Enns, 1999, p. 116). The construct of AS is also consistent with the current DSM-IV (Diagnostic and statistical manual of mental disorders, 4th edition, American Psychiatric Association, 1994) definition of panic disorder in which the fear of panic attacks due to the perceived consequences is part of the diagnostic criteria. All AS research assesses AS by means of the Anxiety Sensitivity Index (ASI; Reiss et al., 1986).

Interestingly, I found only two studies in which attentional processing biases were investigated using a nonclinical sample, and the measure of the ASI to assess anxiety, and the

emotional Stroop task to assess selective attention to threat stimuli (McNally et al., 1999; Stewart et al., 1998, as cited in McNally et al., 1999). Stewart et al. reported participants high in AS demonstrated greater Stroop interference for threat-relevant information than did participants low in AS. However, in the Stewart et al. study, the researchers did not exclude participants who had experienced panic attacks. In fact, in the high AS group, 50% of the male participants had reported having panic attacks. We will address this issue and it's implications further, in the Discussion section.

1.2.3.2 Clark's Cognitive Model

AS theory and Clark's (1986; 1988) cognitive model of panic attacks share similarities. Clark suggests that panic attacks result from the catastrophic misinterpretation of certain bodily sensations. Individuals perceive these sensations as much more dangerous/harmful than they really are. For example, an individual may misinterpret a rapid heartbeat as a sign of an impending heart attack. However, researchers like McNally (1994) have differentiated between AS theory and Clark's catastrophic misinterpretation theory by suggesting that AS is a fear of arousal or anxiety, and not a misinterpretation of symptoms/sensations associated with anxiety that are perceived as a sign of imminent catastrophe. McNally claims that "the anxiety sensitivity hypothesis does not require that patients misconstrue anxiety as something else (e.g., impending heart attack) for panic to be highly aversive" (p. 116).

In Clark's model (1986, 1988) it is not clear what underlying mechanism(s) is responsible for the catastrophic misinterpretation cognitive process (other than perhaps some type of personality factor), and AS could possible by a mediating factor. Cox (1996) has

attempted to combine some aspects of Clark's cognitive process of catastrophic misinterpretation and the AS model. According to Cox, AS is viewed as a multidimensional construct consisting of lower-order facets that are hierarchically arranged. Congruence between a lower-order facet of AS and a trigger stimulus is required before the catastrophic cognitive process described by Clark is initiated. Assuming this hierarchical structure of the construct of AS, the lower-order facets (factors) most frequently identified are: (a) fear of cardio/respiratory symptoms, (b) fear of publicly observable anxiety symptoms, and (c) fear of cognitive dyscontrol (Cox, Taylor, Borger, Fuentes, & Ross, 1996; Taylor & Cox, 1998b). Thus, a person with a fear of cardiac symptoms may panic in response to heart palpitations, but not to a feeling of depersonalization, which could be a congruent trigger for a person with a fear of cognitive dyscontrol. Thus, Cox's (1996) model suggests that AS is a multidimensional construct, generally consisting of three factors, and can compliment Clark's cognitive catastrophic misinterpretation theory, rather than refute it. The present study hopes to contribute to the understanding of the nature of AS.

1.3 Information Processing and Emotions

Controversy exists in the current cognitive literature about patterns of cognitive biases with respect to anxiety and depression. It has been demonstrated that anxious individuals selectively attend to threat-relevant information, while depressed subjects selectively remember depression-relevant information. Thus, depressed persons show mood-congruent memory biases in explicit memory tasks (see Blaney, 1986; MacLeod, 1991; Watkins et al., 1996), but no mood-congruent biases in tasks assessing attention (e.g., Hill & Dutton, 1989; MacLeod et al., 1986). Anxious persons, on the other hand, appear to selectively attend to

mood-congruent material (e.g., Kaspi, McNally, & Amir, 1995; MacLeod et al., 1986; Mathews, 1990; Mathews & MacLeod, 1986; McNally, 1994, pp. 123-132; McNally et al., 1994; Mogg et al., 1993), but there is little evidence to suggest that anxious persons show such mood-congruent memory biases in explicit memory tasks (see Dalgleish & Watts, 1990; Mathews, 1990; Mogg et al., 1989; and Williams et al., 1988 for a review); however, recent research has demonstrated some evidence for memory biases (mainly implicit) in anxious individuals (e.g., Amir, McNally, Riemann, & Clements, 1996; Amir, McNally, & Wiegartz, 1996; Cloitre & Liebowitz, 1991; Cloitre, Shear, Cancienne, & Zeitlin, 1994; McNally, 1994, pp. 123-132).

To account for the discrepancies shown in information processing biases in anxiety and depression, Williams, et al. (1988) developed a model in which they suggested that cognitive biases may operate at different stages of processing in anxiety and depression: integration and elaboration. Integration occurs at the early, and automatic, stages of processing where the organization of schemas (mental representations) are activated; and mood-congruent schemas are more readily accessible and, therefore, will be selectively encoded in anxious individuals. Anxious person's cognitive resources are automatically drawn to negative and threatening information, perhaps even before that information has entered awareness/consciousness (e.g., Mathew & MacLeod, 1985). Elaboration occurs later in processing and is a strategic process where connections are made between related schemas, and activated, and old associations are strengthened and new ones formed. Through elaboration, a schema for mood-congruent information is more readily retrieved (Graf and Mandler, 1984). In the Williams et al (1988) model, anxiety is associated with integration and mood-congruent information is selectively

attended to early in processing. But depression is related to elaboration, and hence the bias occurs in the memory/retrieval stage, later in processing.

The question was raised in McNally, Hornig, Otto, and Pollack (1997): does selective attention to threat information imply selective encoding of that threat material? Attentional bias to threat-related information may not necessarily mean activation of the cognitive representations that relate to these threat cues. The authors examined whether or not anxiety was linked to an encoding bias for threat information, as well as an attentional bias, and found a selective encoding bias in panic disorder patients as well as an attentional bias.

Mood-congruence refers to selectively processing information that is consistent with one's mood. In order to better understand attentional and memory processing biases, we must first identify the underlying processes or mechanisms responsible for mood-congruent processing biases. Varner and Ellis (1998) found that cognitive activity mediates the selective processing that is typical of mood-congruence, but is distinct from arousal (physiological) processes. Although mood-congruence is a very robust and reliable phenomenon (as the literature has demonstrated) the mechanisms that underlie mood-congruence are still unclear. Varner and Ellis suggested viewing emotional state as multidimensional, in that (1) there is a change in physiological arousal, and (2) there is activation of associated cognitive processes (see Mandler, 1992; Schacter & Singer, 1962). Mood-congruence is the result of cognitive processes that are activated as a consequence of the emotional state. This is the prevalent view and is reflected in the work and theories examining emotions and information-processing. An example relates to Bower's (1981) theory where he suggests that moods are comprised of nodes in a semantic network of memory, and that these nodes are related to one

another based on their cognitive content, and activation spreads throughout the node network when mood-congruent information is processed.

The Williams et al (1988) model has implications for the distinction between explicit and implicit memory. Explicit memory is believed to be related to elaborative processing, whereas implicit memory is thought to depend on integration processes (Graf and Mandler, 1984). Explicit memory requires conscious, effortful recollection of stimuli, whereas implicit memory is unconscious by nature, and the subject is unaware that previously presented material has an influence on the present implicit memory task (e.g., word stem completion). Evidence has demonstrated an explicit memory bias in depressed subjects [for reviews, see, MacLeod (1991) and Williams, et al. (1988)], whereas any memory bias for threat information demonstrated in anxious individuals tends to be implicit in nature (e.g., Amir, McNally, Riemann, & Clements, 1996; Amir, McNally, & Wiegartz, 1996; Mathews, Mogg, May, & Eysenck, 1989), and often in response to general-threat words rather than anxiety-threatening (e.g., McCabe, 1999). Perhaps such a memory bias only becomes apparent with a clinical sample, when the individual's functioning is impaired to the point that memory is marred. Mogg et al. (1989) found no increase in recall for mood-congruent information in anxious subjects, with the effect actually going in the opposite direction, where the anxious subjects tended to avoid recall of the threat material (in an explicit memory task). This is likely due to the automatic and integrative type of processing in anxiety. This automatic process plays an important role in attentional tasks.

One way of assessing an attentional bias is through the emotional Stroop task, a modified version of the original Stroop (1935) task, where subjects are asked to color-name

the ink in which a color-incongruent word is written. The emotional Stroop task involves ignoring the meaning of an emotionally salient word, and simply color-naming the ink in which the word is printed. Automatic processing refers to the natural inclination or tendency to read the word; while strategic processes are assessed by the task of color-naming the ink color in which the word is printed. The stimuli are presented in a manner that allows for conscious awareness on the part of the subject. If subjects are conscious of the word stimuli, then they may use strategic processing to color-name the ink. However, masking procedures have been used where the word stimuli are presented at subthreshold levels of consciousness, where the subject is unaware that stimuli have been presented, and anxious individuals have still demonstrated Stroop interference. This consistent finding may indicate that subjects utilize unconscious or automatic processes, as opposed to conscious or strategic processes, to selectively attend to, and possibly encode, threat information (MacLeod & Hagan, 1992; MacLeod & Rutherford, 1992; McNally et al. (1997).

Mogg, Bradley, Williams, and Mathews (1993) found an interference effect with both masked and unmasked stimuli for patients with generalized anxiety disorder. It appears that anxious individuals have an automatic bias for selectively attending to threat-related information that may persist even when subjects are conscious of the threat material. Previous research has also demonstrated an interference effect for general-negative stimuli (i.e., anxious subjects show interference for threat-related information as well as depressive-related information). This finding of an effect for general-negative words conflicts with previous research in the area that suggests an attentional bias only for content-specific threat material (i.e., Mathews & MacLeod, 1985; Mogg et al., 1989). However, a problem arises in that the

negative word lists used in previous work (MacLeod & Rutherford, 1992; Mathews et al., 1989; Watkins et al., 1996) appear to conceptually overlap with both socially-threatening word lists (i.e., judged, unwanted) and depressive-relevant word lists (i.e., depressed, dissatisfied). This problem was addressed in the present study by developing strong sets of anxiety-related words specific to physical, social, and cognitive threat, and by using depressive words (also negative) but not overlapping with the anxiety-threat words.

An important implication of research that utilizes nonclinical samples lies in detecting those individuals who may be at risk to go on to develop anxiety disorders. This idea has both research-oriented as well as theoretical implications. A problem immediately arises in the early detection of those at risk individuals, concerning the type of intervention/treatment that may be required to preclude the development of a clinical anxiety disorder. McNally et al. (1999) noted that patients suffering from panic disorder show elevated AS levels, as well as attentional processing biases favoring threatening information. Although research points to elevated AS levels predicting panic (Schmidt et al., 1997), it is uncertain whether high levels of AS are premorbidly associated with attentional processing biases that may reveal a cognitive risk for panic. Thus, should the current study find that high AS individuals (with no history of panic) demonstrate an attentional bias to threat material that is similar in nature to clinically anxious patients, then support may be provided for the view of AS as a cognitive risk-factor for anxiety disorders, and work with nonclinical samples may be generalized to clinical populations with more certainty. Identification of similarities between clinically anxious patients and normals high in AS would validate the belief that high AS might represent a cognitive risk-factor for anxiety disorders, panic disorder in particular. Future

researchers might consider AS, along with the interpretive, attentional, and memory biases that favor the processing of threatening material, as an important construct within current theoretical frameworks of cognitive processing and psychopathology.

1.4 The Stroop Task

Even after 60 years, research on the Stroop (1935) effect is one of psychology's most replicated and most frequently cited findings (MacLeod, 1991). In the last decade or so, there have been over 500 articles published on the Stroop task. The Stroop effect has been called the "gold standard" of measures of attention and automaticity (MacLeod, 1992). MacLeod stated that "In 1992, it would be virtually impossible to find anyone in cognitive psychology who does not have at least a passing acquaintance with the Stroop effect" (p. 12).

The Stroop (1935) task has played an important role in cognitive psychology over the years. The robust nature of the paradigm has provided researchers with a method to investigate selective attention, automaticity, word-reading, and color-naming processes (MacLeod, 1991). This paradigm provides a theoretical framework on how individuals manage conflicting stimuli and task demands, it provides a prolific testing ground for ideas concerning automaticity, and it may enable us to discover the underlying causal mechanisms responsible for the attention process, or how attention works.

The Stroop (1935) color-naming task asks subjects to name the ink color in which different color words are printed. For example, a subject might be presented with the word BLUE printed in red, and the subject is to say "red". It was with this experiment that Stroop found a major interference effect; it took subjects much longer to color name color-incongruent words, than color-congruent words. This interference effect is now commonly

referred to as the Stroop effect (or Stroop interference).

The Stroop (1935) task taps into fundamental attentional processes. The Stroop paradigm assesses an individual's ability to selectively attend to certain material, while simultaeously inhibiting/ignoring other information. The information that one is to ignore often still demonstrates an influence on performance. It evaluates both automatic and strategic cognitive processing. The process of reading the word is considered an automatic process, and this automatic process interferes with the strategic process of color-naming the word (that is, the conscious, effortful process of ignoring the meaning of the word, and simply naming the color of ink in which the word is printed). In general, virtually everyone who can read shows this interference effect. A basic assumption of most of the theoretical views is that individuals process the word without intending to, and may do this unconsciously. Thus, reading the word is said to be automatic in that individuals cannot help themselves from processing the word content despite instructions not to, and this accounts for the Stroop effect. However, recent research suggests that these automatic processes responsible for the Stroop effect are in fact open to control, and that unconscious cognitive processes such as reading the word are not automatic in the sense that they inevitably activate the semantic/lexical system (Besner & Stolz, 1999a; 1999b).

The Stroop has been presented in several different formats: (a) words printed on cards, (b) words presented on computer monitors, (c) words presented individually, and (d) words presented in block form. Regardless of the presentation style the interference effect is robust. McNally (personal communication, January 25,1998; McNally, Amir, & Lipke, 1996) suggested block presentation as the style of choice, as he has found that the Stroop effect is

even more robust with this type of presentation. Block presentation was used in the present study.

1.4.1 The Emotional Stroop Task

In the last 10 years or so researchers have begun using a modified version of the original Stroop (1935) called the emotional Stroop task. The emotional Stroop includes word stimuli differing in emotional saliency. Words, varying in degree of emotionality, and in degree to which they represent the areas of concern for different disorders/mood-congruence (i.e., physical-threat words, depressive-relevant words) have been used in this experimental paradigm.

Individuals suffering from anxiety disorders have been characterized as having a selective attentional bias for processing threat-related information (for reviews, see MacLeod, 1991; William, et al., 1988). Empirically, this bias has been demonstrated with the emotional Stroop task (Kaspi et al, 1995; Mathews & MacLeod, 1985; McNally et al., 1994). Patients with anxiety disorders demonstrate a greater Stroop interference effect for threat-words as opposed to neutral words. This finding has been replicated in subjects with specific phobias (Watts, McKenna, Sharrock, & Trezise, 1986), social phobia (Hope, Rapee, Heimberg, & Dombeck, 1990), generalized anxiety disorder (GAD; Mathews & MacLeod, 1985; Mogg et al., 1989), panic disorder (PD; McNally, Riemann, & Kim, 1990), and post-traumatic stress disorder (PTSD; Foa, Feske, Murdock, Kozak, & McCarthy, 1991; Kaspi et al., 1995).

McNally and colleagues (1990) demonstrated a Stroop interference effect with words relating to fear, bodily sensations, and catastrophe for panic disorder patients compared to normal controls. In a follow-up study (McNally, Riemann, Louro, Lukach, & Kim, 1992) the

authors addressed some inconsistencies that resulted from the earlier research. Most importantly, they concentrated and controlled for the emotionality hypothesis, which refers to the tendency of anxious individuals to selectively attend to any emotional stimulus (Martin, Williams, & Clark, 1991), and not only to threat-related information. Therefore, in the present study we included positive and non-anxiety negative words (depressive words) in addition to the threat related word lists in order to determine if they produce equivalent Stroop interference in our nonclinical anxious sample, as a means of supporting or refuting the emotionality hypothesis.

These findings give rise to several interesting questions: Does attentional bias favoring threat-related information develop after the experience of panic attacks, or, does this bias exist prior to the onset of panic attacks (or panic disorder)? Perhaps this bias serves/operates as a cognitive risk factor in the development of panic attacks (and finally to panic disorder)? One way of exploring this question is to examine those individuals at risk for developing anxiety disorders (panic disorder in particular), those individuals with high levels of AS.

1.5 Overview of Study and Hypotheses

The present study sought to investigate the relationship between AS and an attentional bias to threat-related information, as assessed by an interference effect on the emotional Stroop color-naming task. Due to the paucity of research on selective attentional biases and the relationship with AS, particularly in nonclinical samples, this investigation seemed timely. To improve on previous methodologies, the present study incorporated counterbalancing procedures, randomization for word, color, and word list presentation, and stringent cutoff points for low and high AS groupings.

In the present study, the hypothesis was for an overall main effect of AS group, with the high AS participants demonstrating longer reading latencies than the medium and low AS groups. To show this is not just a general interference sensitivity, the prediction was that the overall effect would be for the three threat-related word categories, and not for neutral, positive, or depressive categories. The prediction was therefore, that an interaction between AS level and word category would occur.

Individuals with panic attacks did not confound the data of this study, as any participant with a history of panic attacks were excluded. If an attentional bias to threat-related material exists only after the experience of a panic attack, then participants high in AS who have not experienced a panic attack should not demonstrate the attentional bias to threat-related information. If, however, the attentional bias to threat-related information is related to AS levels, then individuals high in AS, but who have never experienced/sufferred a panic attack should demonstrate this attentional bias to threat-related material. In the present study participants answered a number of questionnaires aimed at assessing AS level, panic, and state/trait anxiety. They also completed the emotional Stroop task using nine categories. Across participants the ordering of categories was randomized, and whether questionnaires occurred before or after the Stroop was counterbalanced. This is an improvement in methodology over previous research that did not exclude persons with a history of panic attacks when investigating AS level and Stroop interference (Stewart et al., 1998).

To test further the content-specificity hypothesis, participants were divided into groups based on ASI-R factor scores which included the three factors of cardiac/respiratory symptoms, publicly observable symptoms, and cognitive-dyscontrol symptoms, for the three

threat categories of physical-threat, social-threat, and cognitive-threat. They were then compared on their Stroop performance on words chosen to represent these threat categories. It was predicted that high factor scores on specific dimensions would lead to increasing Stroop interference on that dimension only.

CHAPTER TWO

METHOD

2.1 Participants

Participants

Participants were university students (N = 112) recruited from the university subject pool and received course credit in Introductory Psychology for their participation. Two restrictions applied: English had to be their first language, and they could not be color-blind.

From the original 112 participants, five had experienced "out of the blue" panic, and met the criteria for exclusion used in previous work (McNally et al., 1999). The criteria used by McNally included the following: 1) participants must have experienced an "out of the blue" (unexpected) panic attack, 2) participants were required to give severity ratings on each of the American Psychiatric Association's diagnostic and statistical manual of mental disorders (DSM-IV; 1994) panic symptoms on a 5-point scale ranging from 0 (not at all) to 4 (extreme). Participants had to give severity ratings of "at least" 2 (moderate), to "at least" 4 of the symptoms, and 3) following DSM criteria, participants were asked if they had experienced fear of subsequent panic attacks for at least a month following the unexpected panic attack. Participants who met all of the above criteria were classified as having a history of spontaneous panic, and were therefore excluded from the study. This method for ruling out individuals with a history of spontaneous panic is conservative because questionnaires assessing panic generally tend to produce more false positives than false negatives (Norton, Cox, & Doward, 1992).

The remaining 107 participants (53 men, 54 women) had a mean age of 19.37 years

(SD = 1.67), and almost all were single (97.2%).

2.2 Measures

Measures

The Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986), the Anxiety Sensitivity Index - Revised (ASI-R; Taylor & Cox, 1998a), the State-Trait Anxiety Inventory (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983), and the Panic Attack Questionnaire (PAQ; Norton, Dorward, & Cox, 1986) were administered to all participants.

The Anxiety Sensitivity Index. The Anxiety Sensitivity Index (ASI; Reiss et al., 1986) is a 16-item measure which assesses fear of anxiety symptoms, and has consistently demonstrated good reliability and validity (for a review, see McNally, 1994, 1996). The ASI assesses three lower-order facets comprising the AS construct: (a) fear of physical/somatic symptoms (e.g., "It scares me when my heart beats rapidly"), (b) fear of publicly observable symptoms (e.g., "It embarrasses me when my stomach growls"), and (c) fear of cognitive dyscontrol (e.g., "When I cannot keep my mind on a task, I worry that I might be going crazy"). Participants rate each item on a 5-point Likert scale, ranging from 0 = very little to 4 = very much.

Anxiety Sensitivity Index - Revised. The Anxiety Sensitivity Index - Revised (ASI-R; Taylor & Cox, 1998a) is a revised version of the original ASI, consisting of 42 items with the same rating scale. While retaining the original 16 items, the ASI-R incorporates items that reflect the multifactorial nature of AS. Several items have been added that accurately reflect the three factors previously identified as comprising AS.

The State-Trait Anxiety Inventory. The State-Trait Anxiety Inventory (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) is a 20-item measure that assesses trait anxiety (e.g., "I feel nervous and restless"). The STAI-T includes several reverse-scored items that attempt to control for response biases. Items are scored on a 4-point Likert scale from 1 = almost never to 4 = almost always.

Panic Attack Questionnaire. The Panic Attack Questionnaire (PAQ; Norton, Dorward, & Cox, 1986) is a reliable measure of frequency of panic attacks. Participants were asked if they had experienced a panic attack in the last year, and if so, how many attacks, ranging from 1 to more than 10. The PAQ was administered to determine if any of the participants were currently, or had in the past, experienced panic attack symptoms. Any participant who had experienced panic attack symptomatology were excluded from further analyses. This procedure also included McNally et al's (1999) exclusionary criteria for panickers.

2.3 Procedure

The Emotional Stroop task

The emotional Stroop paradigm was used to present participants with words (word lists) varying in degree of emotional saliency. Six types of word lists were employed in the present study: (1) neutral words (e.g., shelves, broom), (2) depressive words (e.g., depressed, uninterested), (3) positive words (e.g., smiling, confident), (4) physically-threatening words (e.g., suffocate, coronary), (5) socially-threatening words (e.g., trembling, blushing), and (6) cognitive dyscontrol-threatening words (e.g., insane, crazy). The positive and depressive affect words were included to control for the mere affectivity of the material, related to Martin

et al.'s (1991) identification of the emotionality hypothesis. The depressive word list may be particularly relevant in controlling for a general negative-affect factor, such as neuroticism, which may account for interference effects found on the emotional Stroop task.

Stimuli

The words used as experimental stimuli in the color-naming trials were drawn from a pool provided by previous researchers (MacLeod & Mathews, 1988; MacLeod & Rutherford, 1992; MacLeod, et al., 1986; McNally, Foa & Donnell, 1989; Watkins et al., 1996), with the exception of the cognitive dyscontrol-threat words. This word list was developed specifically for the present study. All word lists were matched for word length and word frequency.

The neutral words included: SHELVES, BROOM, SWITCH, ORNAMENT, MATTRESS, CHIMNEY, WARDROBE, GROCERIES, TOWEL, SWEEP, CURTAIN, and LAMP. The positive words included: DEVOTED, SMILING, PASSION, ELATED, MERRY, GENEROUS, APPLAUSE, FORTUNATE, EXCELLENT, CONFIDENT, MIRACLE, and SERENE. The depressive words included: SAD, WORTHLESS, GUILTY, DEPRESSED, DISSATISFIED, UNINTERESTED, HELPLESS, DISCOURAGED, FAILURE, CRITICISM, UNMOTIVATED, and REJECTION. The physically threatening words included: PARALYSED, CATASTROPHE, BREATHLESS, CORONARY, PALPITATION, FATAL, CARDIAC, SUFFOCATE, PANIC, HARM, DYING, and CHOKING. These words are directly related to the concerns of panic disorder patients, or have been used in previous research (MacLeod et al., 1986; Mathews & MacLeod, 1985; McNally et al, 1994). The socially threatening words included: TREMBLING, SHAKY, FLUSHED, BLUSHING, NAUSEOUS, EMBARRASSED, FIDGETY, SWEATING,

FAINT, STUTTER, JITTERY, and DIZZY.

The cognitive dyscontrol-threatening word list was developed specifically for this study, and included: INSANE, CONFUSED, CRAZY, UNREAL, DERANGED, DEMENTIA, DISTRACTED, BERSERK, DISORIENTED, FORGETFUL, SPACEY, and HALLUCINATE. These words were generated by five experts in the field (anxiety, anxiety sensitivity, and verbal learning) specifically for the present study. The word list was subsequently rated by two independent judges (Steve Taylor and Richard Zinbarg) who assessed the extent to which the words reflected the fear of cognitive dyscontrol factor of AS. The judges rated the word list on a 7-point Likert scale, with 1 = strongly disagree, through 7 = strongly agree. Only those words that achieved a rating of 5 or higher by both judges were retained for the present study.

Controls and Procedure

A counterbalancing technique and several controls and were included. For counterbalancing, one half of the participants completed the questionnaires prior to the Stroop task, while the other half completed the questionnaires following the Stroop task. Several forms of randomization were used: (1) word randomization, (2) color randomization, and (3) category (list) randomization for each person, relating to the order in which each of the category word lists was presented to each of the participants (i.e., positive, social-threat, depressive, physical-threat). A restriction applied where no ink color was repeated more than two consecutive times per card. In addition, positive and depressive word categories never followed each other, and social-threat and physical-threat word categories never followed each other. As previously mentioned, in addition to mean reading latencies, two proportional

interference indices were calculated (relative to either the baseline or black color-word reading condition).

Apparatus

The Stroop task. The words appeared in .8 cm upper case letters, in block form on laminated cards, 28 cm X 22 cm, and appeared in the colors red, blue, green, and yellow, consistent with previous research (MacLeod & Hagan, 1992; MacLeod & Rutherford, 1992; Mathews & MacLeod, 1985; Mogg et al., 1989). Twelve words were presented on each card, with every word being presented in each of the four colors, resulting in a total of 48 words per card (block). Response time (reading latency) was recorded (to the 1/100 of second) by a stopwatch. The participants received their training/instructions from one graduate student across all sessions. The graduate student was present at all times during each session, in order to check the accuracy of the participant's responses and to record errors. The number of errors committed was a global measurement, involving putting check marks beside the card (word list) on which participants made errors, with one check for each error made. The present study, as in previous work, demonstrated that not many errors were committed, and if so, they were corrected before the experimenter could correct the participant.

As one of the control conditions, we administered the original Stroop (1935) color-naming task to all participants. Participants were asked to color-name the ink in which color-congruent and color-incongruent words were printed. For example, the word BLUE printed in "red", the participant is to say "red". Including this paradigm allowed yet another interference index, so we would be able to compare response time (reading latency) on emotional words (threat-words), to the reaction time on non-emotional/original Stroop words. The participants

were told to name the colors in which the word was printed, as quickly and as accurately as possible, while ignoring the word content (see Appendix A).

Participants were tested individually. The instructions advised the participants that some cards contained words and some cards contained non-words (i.e., XXX's), and that they were to name the color of the non-words in the same fashion as words. The practice card consisted of words (i.e., incongruent and congruent color words) and non-words (i.e., XXX's) and participants were instructed to name the color in which each were printed. This card served as the practice block in order to familiarize the participants with the Stroop task.

Prior to the color-naming of emotionally salient word categories, participants were presented with the following cards in the same order on every trial: 1) black color-word reading, 2) practice, 3) baseline, 4) original Stroop. In the first card presented the participants were simply asked to read aloud color-words all printed in black ink, which was simply a measure of reading speed. The second card was the practice card which was previously explained to familiarize participants with the Stroop task. Third, the baseline card which consisted entirely of XXX's printed in each of the four colors of ink was presented. Again, the participants were required to name the color in which the XXX's were printed. This card provided us with a baseline for one of the proportional Stroop interference indices. The original Stroop card was then presented, and participants were simply asked to color-name the ink in which the incongruent color words were printed.

Cards 1 through 6 consisted of the emotionally salient word lists (i.e., neutral, positive, depresive, physical-threat, social-threat, and cognitive-threat), and these cards were randomized, and counterbalanced with presentation coming either before or after the

completion of the self-report inventories. For example, Card Order 1, may require that questionnaires be completed prior to the Stroop task, and that word lists be presented in the following order: positive, neutral, depressive, social-threat, cognitive-threat, and physical-threat. As was previously mentioned, positive and depressive words did not follow each other, and social-threat and physical-threat words did not follow each other. Also no color was repeated more than two consecutive times. We reasoned that if the same color was not repeated more than twice consecutively, a biased pattern of responding based on ink color should not be problematic.

A simple response time (reading latency) was recorded for each of the word lists, as well as two proportional Stroop interference indices. There are several ways one can compute a proportional index. It may be calculated by a comparison of reaction times on each of the word categories to any one of the following control conditions: (a) a baseline condition (e.g., XXX's in different colors, very much like a color-patch condition), (b) a neutral word condition (e.g., neutral words in different colors), or (c) to color-word reading speed. The present study computed two proportional interference indices: (1) comparing reading latency of emotional category words (CW) to baseline condition (B), and (2) comparing reading latency of emotional category words (CW) to the black color-word reading condition (Black RT). The following formulae was used: (1) (CW- B)/ B, and (2) (CW-Black RT)/Black RT. These indices provided us with two measures of the Stroop interference effect - that is, how much the word content interfered with the color-naming task, while controlling for the individual differences of color-naming ability, and reading speed ability.

CHAPTER THREE

RESULTS

3.1 Design

In this study participants answered questionnaires that allowed us to create groups of individuals differing in anxiety sensitivity (AS). They also completed a variety of Stroop tasks where the word categories used varied but contained some conditions with anxiety terms and others with non-anxiety-related words. The dependent variables used were a simple latency measure based on reading times, or two indices which attempted to correct for individual differences in speed of processing and reading time. Because the indices were all based on the latency measure, a multivariate analysis with all indices entered would be inappropriate. As a result separate analyses were done on each dependent variable.

The basic design for the study involved a single independent variable, AS grouping. A second independent variable, Counterbalancing (whether questionnaires were administered before or after Stroop testing), was evaluated in some preliminary analyses. Since there were no significant main effects or interactions from these analyses, the reporting which follows did not include this variable in the analysis to aid in simplifying the presentation. In addition, an independent variable was constructed from the various conditions to simplify the analyses and to provide for more power in testing the main hypotheses. To review, there were 9 conditions in the Stroop task: the original Stroop, black color-words, color patches (baseline), neutral words, positive words, depressive words, physical-threat, social-threat, and cognitive dyscontrol-threat words. The independent variable was defined by combining threat words (physical-threat, social-threat, and cognitive-threat), and non-threat words (neutral, positive,

and depressive) into high versus low threat conditons.

The primary analyses used the ASI-R to separate participants into groups of High (upper quartile), Medium (middle two quartiles), and Low (lowest quartile) AS participants. The design was therefore a 3 (AS Group: low, medium, high) X 2 (Word Threat: high, low) mixed design, where AS Group was between groups (between-subjects factor) and Word Threat, a within-subject variable. Because others (Cox, Fuentes, Ross, Borger, & Taylor, 1996) have focused on extreme groups in their research on anxiety sensitivity, I also conducted analyses drawing two extreme groups of high and low AS persons using the criterion of being at least one standard deviation above or below the ASI-R mean for the full sample. With this extreme group analysis the design became a 2 (AS Group: high, low) X 2 (Word Threat: high, low) mixed design.

3.2 Descriptive Statistical Analyses

Participants' mean scores on all measures are presented in Table 1. Even with the exclusion of the "spontaneous panickers", we had more than sufficient power to run the analyses which follow (Cohen, 1988). The mean ASI score is especially low for individuals suffering from clinical anxiety disorders, which is to be expected; however, it is also somewhat low compared with previous research utilizing nonclinical samples (Cox, Borger, & Enns, 1999, p. 120). The state and trait anxiety measures also represent mean scores that are slightly below the norm for nonclinical samples.

Table 2 presents intercorrelations between the measures used in the present study. As Table 2 indicates, the original ASI, and the ASI-R are very strongly correlated ($r = 0.91$, $p < 0.0001$); and as such, a decision was made to utilize the ASI-R (which also includes the

original 16-items from the ASI) for data analyses.

Briefly, we see from Table 2 that the ASI, and the ASI-R, are very strongly correlated with the AS Factors culled from the the ASI-R, (r = .84, and .97, respectively, with $p <$ 0.0001). The correlations between the ASI and the ASI-R with hypochondriasis are somewhat stronger than have been reported elsewhere (Cox, Borger, Enns, 1999, pp. 135-137), while the correlations with state and trait anxiety are very close to what previous research has demonstrated, they may be only slightly higher.

Table 3 presents the mean reading latencies for each of the 9 Stroop conditions (column 1) as well as index scores based on baseline (column 2) and black reading time (column 3). A one-way Repeated Measures ANOVA on the means in Table 3 confirmed the differences evident in that Table. First, black reading time (i.e., reading color words in black print) was quickest, followed by the baseline condition of naming the color of color patches. Relative to these two conditions, all word conditions produce a Stroop-like effect which is strongest for the original Stroop. Past findings of an emotional Stroop effect (MacLeod et al., 1986; see MacLeod, 1991, for a review) were confirmed in these data; latencies for the three threat categories were consistently above latencies for neutral words, and for physical-threat and social-threat word conditions, were also consistently above positive and depressive words.

Columns 2 and 3 are basically parallel to data in column 1, showing that the Stroop effects continue even when corrections are made for either word reading time (column 3) or color naming time (column 2).

Table 4 presents intercorrelations between the latency measures for the nine word

categories used in the study. As is evident from Table 4, all word categories were very strongly intercorrelated. This finding demonstrates multicollinearity, and thus, produces concern about a nonorthogonal design for our analyses. Tables 5 and 6 show intercorrelations for the two proportional indices that were calculated to ensure that individual differences in speed of color processing, and reading time were controlled for. Table 5 represents an index based on baseline (reading color patches), and Table 6 used black color words as a base. While intercorrelations of these index scores are somewhat lower than the simple latency measures, correlations are generally high and suggest multicollinearity problems with these measures as well.

3.3 Inferential Analyses of Main Hypotheses.

Participants were divided into low, medium, and high AS groups on the basis of quartiles, using the ASI-R (42-item) scale. The low AS group consisted of those participants who scored 23 (25th percentile) and below (n = 30), the medium AS group consisted of those who scored between 24 and 50 (middle 50%) (n = 50), and the high AS group consited of those participants who scored 51 (75th percentile) and above (n = 27).

In the present study our main hypothesis was to investigate the effect of anxiety provoking information (threat) on three levels of AS in a 3 (AS Group: low, medium, high) X 2 (Word Threat: high, low) Repeated Measures mixed design. The second hypothesis examined the effect of anxiety provoking information (threat) on Extreme Groups of AS, which only include high and low AS participants (one standard deviation above and below the mean of the ASI-R), in a 2 (AS Group: high, low) X 2 (Word Threat: high, low) Repeated Measures design.

Supplementary analyses will be presented last, regarding the effect of three levels (low, medium, high) of AS Factors on anxiety provoking (threat) information, in a 3 (AS Factor: cardiac/respiratory symptoms, publicly observable symptoms, cognitive-dyscontrol symptoms) X 3 (Anxiety Word Categories: physical-threat, social-threat, cognitive-threat) Repeated Measures group design.

The first two designs were a simplification of the analyses to one basic design with three separate, but related DVs , those being reading latency, baseline proportional index, and black reading time proportional index. The following are the results of those simplified designs, and Tables 7 - 12 display the means for each of our hypotheses. As we shall see, there are big differences across Stroop threat word categories, and that the evidence demonstrates strong support for the general idea of an emotional Stroop effect (with respect to the first two hypotheses).

With respect to my first and main hypothesis, on the between-subjects factor of AS level, with three groupings of AS (low, medium, and high), we found no main effect for AS level (F (2, 104) = 1.70, $p > .05$). Secondly, there was a within-subjects main effect for Threat (F (1, 104) = 79.48, $p < .0001$). And finally, there was no interaction of AS by Threat (F (2, 104) = 0.13, $p > .05$). Table 7 presents the means for reading latency for each of the three AS groups on anxious and non-anxious word categories. This analysis was carried out using reading latency as our DV.

Using the baseline proportional index scores, similar results emerged. With regard to our between-subjects factor there was no main effect for AS level (F (2, 104) = 0.62, $p > .05$). There was a within-subjects main effect for Threat (F (1, 104) = 92.57, $p < .0001$). And

finally, there was no interaction of AS by Threat (F (2, 104) = 0.50, p > .05). Table 8 presents means for each AS level on anxious and non-anxious word categories by baseline index.

Using the black reading proportional index scores similar results emerged. For the between-subjects factor of AS level there was no main effect (F (2, 104) = 1.41, p >.05). However, the within-subjects factor of Threat showed a main effect (F (1, 104) = 74.79, p < .0001). And again, no interaction was demonstrated for AS by Threat (F (2, 104) = 0.15, p > .05). Table 9 presents the means for each level of AS for anxious and non-anxious word categories, as a black reading proportional index score.

Extreme Groups Analyses

In order to determine whether or not our main hypothesis could be confirmed post hoc, we trimmed the data be creating extreme AS groupings. In order to generate extreme groups, we used the cutoff criteria of one standard deviation above and below the mean on the ASI-R total score, a commonly used cutoff procedure in the literature (see Cox, Borger, Taylor, Fuentes, & Ross, 1999). As can be seen from Table 1 the ASI-R mean was 37.38 (SD = 18.18) for the entire sample. The low AS group was therefore comprised of those participants who scored less than or equal to 19, while the high AS group consisted of those participants who scored greater than or equal to 55. The low AS group consisted of 14 participants (10 men, and 4 women), while the high AS group was comprised of 17 participants (4 men, and 13 women).

With regard to this second hypothesis, which was really an extension of the main hypothesis, we hoped to demonstrate findings of either a main effect for AS level, or illustrate an AS by Threat Word interaction. Following this intention the statistical procedure of

Extreme Groups analyses, a Repeated Measures ANOVA with a 2 (AS Group: high, low) X 2 (Threat word: high, low) design was used. For our between-subjects factor, a main effect of AS level was demonstrated (F (1, 29) = 8.57, p = .007). For our within-subjects factor a main effect of Threat was shown (F (1, 29) = 26.49, p < .0001). However, again, no interaction for AS by Threat was found (F (1, 29) = 0.48, p > .05). Table 10 presents means for each AS level, on anxious and non-anxious word categories, by reading latencies.

By using the baseline proportional index score, for the between-subjects factor no main effect for AS level was found (F (1, 29) = 0.43, p > .05). For the within-subjects factor, a main effect of Threat was shown (F (1, 29) = 32.21, p < .0001). And again, no interaction was demonstrated for AS by Threat (F (1, 29) = 0.08, p > .05). Table 11 presents the means for each AS level on anxious and non-anxious word categories, by baseline proportional index score.

By using the black reading proportional index score for the between-subjects factor, no main effect for AS level was found (F (1, 29) = 1.31, p > .05). For the within-subjects factor a main effect of Threat was demonstrated (F (1, 29) = 27.68, p < .0001). And, finally again, no interaction for AS by Threat was shown (F (1, 29) = 0.10, p > .05). Table 12 presents means for each AS level on anxious and non-anxious word categories, by black reading proportional index score.

Discriminant Analyses

The problem of multicollinearity arises when correlations among the dependent variables (DVs) are strong; one DV is a near-linear combination of the other DVs. The DV provides us with information that is redundant to the information provided from one or more

of the other DVs. Thus, it is illogical to include all of the DVs in the analysis, with some exceptions (Tabachnick & Fidell, 1989, p. 380).

Because of the concern about multicollinearity among the dependent variables, and as recommended by Tabachnick and Fiddell (1989, Chapter 11), a series of discriminant analyses were undertaken supplementary to the main ANOVAs. In these analyses the former dependent variables become predictors and membership is what is predicted. The first of these was done on the reading latency measures, the second on the index based on color patch naming, and the third on the index based on reading color words in black ink. In none of the three discriminant analyses was there a statistically reliable discriminant function, indicating that AS group membership could not be predicted by a linear combination of the performances on the word categories. Since this outcome confirms the inability to find main effects or interactions in the ANOVA tests, the discriminant analyses are not reported here in detail.

Supplementary Analyses

In order to determine whether or not the content-specificity hypothesis, which suggests that individuals will demonstrate longer color-naming latencies for word categories that are congruent with their area of worry or concern, is in fact a valid one, we examined the three AS factor scores in terms of low, medium, and high, for each factor and compared each level of factor on means for our threat-relevant words. We included reading latency, baseline proportional index, and black reading time proportional index for these comparisons. For example, one would expect an individual whose factor score was high on the cardiac factor to exhibit selective attentional bias to physical threat words, as compared with other types of threat.

Factor analysis, in the present study replicated the three factors of AS using principal component analysis with varimax rotation, previously identified elswhere (Taylor & Cox, 1998b), which were identified as 1) fear of cardiac/respiratory symptoms, 2) fear of publicly observable symptoms, and 3) fear of cognitive dyscontrol symptoms. As was previously mentioned, participants were divided into low, medium, and high groups on the basis of the three AS factors culled from factor analysis on the ASI-R (23-items) scale.

To review, each of the three AS factors was divided into low, medium, and high, based on quartiles, and these were then compared with means on our threat-relevant word categories (e.g., physical-threat, social-threat, cognitive-threat). As was mentioned, this was done to determine if there was evidence for the content-specificity hypothesis.

The low cardiac group consisted of those participants who scored 4 (25th percentile) and below (n = 37), the medium cardiac group consisted of those whose factor scores ranged between 5 and 9 (n = 39), and the high cardiac group consisted of those participants whose factor scores were equal to 10 (75th percentile) and above (n = 31).

The low publicly observable group consisted of those participants whose factor scores were equal to 7 (25th percentile) and below (n = 30), the medium publicly observable group consisted of those whose factor scores ranged between 8 and 13 (n = 46), and the high publicly observable group consisted of those participants whose factor scores were equal to 14 (75th percentile) and above (n = 31).

The low cognitive dyscontrol group consisted of those participants whose factor scores were equal to 0 (25th percentile) (n = 38), the medium cognitive dyscontrol group consisted of those whose factor scores ranged between 1 and 3 (n = 38), and the high

cognitive dyscontrol group consisted of those participants whose factor scores were equal to 4 (75th percentile) and above (n = 31).

This design was a 3 (AS Factor: low, medium, high) X 3 (Threat Words: physical-threat, social-threat, cognitive-threat) ANOVA. This procedure was performed three times, once for each AS factor which included cardio, publicly observable, and cognitive dyscontrol on three levels, low, medium, and high. The results demonstrated that on the cardio factor (low, medium, and high), there was a between-subjects main effect for the physical-threat word category (F (2, 104) = 3.79, $p < .05$). In using both multiple range tests of Least significant differences, and Tukey's Honest significant difference, both tests showed that the high cardio group's score was significantly different than either the medium, or low cardio groups. In other words, it took the high cardio participants longer to color-name physical-threat words. Social-threat (F (2, 104) = 2.60, $p = .079$) and cognitive-threat (F (2, 104) = 2.84, $p = .062$) word categories were not significant; however, they bordered on significance (e.g., there was a trend there for the high cardio group).

For the publicly observably factor, there were no significant findings whatsoever, even with social-threat which was the category we were hoping to find an effect for (F (2, 104) = .87, $p > .05$).

For the cognitive dyscontrol factor a between-subjects main effect on physical-threat words was demonstrated (F (2, 104) = 4.48, $p = .01$); however, it was not in the anticipated direction. In other words, the medium cognitive dyscontrol group displayed the longest color-naming latencies for physical-threat words. This was the case with both multiple range tests, least significant differences, and Tukey's honest significant difference.

In addition, there was a between-subjects factor main effect on social-threat words (E (2, 104) = 4.00, p = .02), and again this represented the medium cognitive group displaying the highest mean on social-threat. This was supported again by both least significant differences, and Tukey's honest significant difference.

Finally, on cognitive-threat words, we did not find significance for the cognitive-dyscontrol factor. However, the between-subjects factor main effect for cognitive-threat words did approach significance (E (2, 104) = 2.89, p = .06). Again the highest mean scores for cognitive-threat were on the medium cognitive-dyscontrol group. This difference between groups was supported by the least significant differences multiple range test; however, there were no group differences with the more stringent Tukey's honest significant difference test.

Thus, we don't have the specificity that we had hoped for, and there may be two explanations for this. The first involves the fact that we don't get the constant low, medium, high difference that was expected, or we don't get this in the direction that was anticipated. Secondly, there does not appear to be any specificity between the AS factors and the threat-relevant word categories. We do not see the pattern of scores that would fit with the content specificity hypothesis.

CHAPTER FOUR

DISCUSSION

4.1 Discussion

The primary goal of this research was to demonstrate differential processing on the emotional Stroop task as a function of differences in AS, in a nonclinical sample. The results provide strong support for the general idea of an emotional Stroop effect. There are considerable reading latency differences across Stroop word conditions, with those containing anxiety-relevant information, showing greater interference than word sets based on neutral, positive, or depressive word sets. However, there was no main effect of AS on reading latency, and most importantly, no word category by AS interaction. Emotionally charged threat words do demonstrate an interference effect (a Stroop effect), but it is no where near as strong as the interference effect demonstrated on the original Stroop task.

The present study incorporated two procedures that are rarely (if ever) included in attentional-processing studies that utilize the emotional Stroop task, and have been recommended for inclusion from experts in the field (e.g., MacLeod, 1998). The procedures pertain to inclusion of the original Stroop task, as well as the black color word reading card, where participants are merely asked to read color names printed in black. Not only does this card supply us with an index of relative reading speed for each participant, but it also begins to examine the relationship between reading color words, all in one incongruent color (black), and the processes and underlying mechanisms involved, in effortful and strategic color-naming of words printed in different colors. Interestingly, the analysis outcomes for both the index based on reading black words and on naming color patches provided identical outcomes to

that based on simple reading latency.

The findings of the present study are contradictory to what research has found with clinical anxiety and performance on the emotional Stroop task. Generally, it has been demonstrated that those clinical individuals high in levels of anxiety show an AS level by reading latency interaction, which is reported as a selective attentional bias to threat-related words. With respect to the AS by reading latency for threat-relevant material interaction, in the present study this was not the case.

An abundance of evidence exists for selective attentional bias to threat-relevant information using clinically anxious individuals (e.g., Kaspi, McNally, & Amir, 1995; MacLeod et al., 1986; Mathews & MacLeod, 1985; McNally et al., 1993). One major difference with the present study is that we used nonclinical individuals for participants. Although our high AS group displayed elevated ASI scores, they were still significantly lower than any of the clinical high AS groups reported in the previous studies. Perhaps it is not until we reach very elevated levels of AS, similar to what one would find in a clinically anxious group, that we observe attentional biases for threat-relevant words on the emotional Stroop.

As was previously noted, one study did use a nonclinical sample in order to test the hypothesis of whether elevated levels of AS would correspond to an attentional bias to threat-relevant words on the emotional Stroop (Stewart et al., 1998, as cited in McNally, Hornig, Hoffman, & Han, 1999). Stewart and colleagues did report that high AS participants demonstrated a greater Stroop interference effect to threat words, compared to the low AS group. However, there is one very critical limitation to their study, and that is that they did not exclude individuals who had experienced panic attacks. In fact, in the high AS group 50% of

the males had reported having had panic attacks. In the present study we excluded individuals who had experienced "out of the blue" or unexpected panic attacks, according to McNally et al.'s (1999) exclusionary criteria. Since only 5 of 112 participants were excluded by this criterion, it is possible that overall AS differences between Stewart et al. and the present study best accounts for the difference in findings. In doing so we created a much cleaner and truer picture of a nonclinical sample.

Means from Table 3 particularly, comparing the depressive word and cognitive-threat word categories, suggests the possiblity that some higher-order factor such as neuroticism (N) may account for a substantial portion of the variance on threat-relevant word category reading latencies (interference). The category of depressive words was included strictly to control for this possibility. However, reading latency and index scores were not consistently related to either depressive words or the three types of anxiety-related words chosen.

McNally et al. (1999) provide us with a possible explanation for our lack of significant results with respect to attentional bias to threat-relevant words in high AS nonclinical individuals. Although individuals may be described by a risk factor (AS) for an anxiety disorder (e.g., panic disorder), but are not presently clinically disordered, these people may be protected by factors that obstruct the development of the disorder. The lack of information-processing biases, or as McNally et al. call them, the presence of "positivity biases" (p. 59), may work to nullify the effect of increased AS levels in those people who would otherwise be at risk for the development of panic disorder. Other studies have demonstrated that higher intelligence serves as a protective variable against the development of anxiety disorders, such as post-traumatic stress disorder (PTSD) in Vietnam combat veterans (Macklin et al., 1998;

McNally & Shin, 1995).

The emotional Stroop is now a task that is commonly used to investigate clinical disorders (see Williams, Mathews, & MacLeod, 1996 for a review). MacLeod and Hodder (1998) have presented research on the emotional Stroop effect and the cognitive perspective, gaining much influence in explaining clinical disorders. However, MacLeod and Hodder never found an increase in interference due to priming, in nonclinical samples (just as we didn't in the present study). I allude to this paper, because in a way we had primed participants in our study, in the sense that if they scored very high on the ASI-R, then that would suggest that there should be some predilection to selectively attend to threat-relevant word categories, that are based on the three factor structure of AS. I am in no way assuming that we "primed" our participants in the customary/traditional manner; however, if participants report elevated AS levels then they should, logically, selectively attend to the threat-word categories that comprise the construct of AS. MacLeod and Hodder could not replicate the emotional "chronic priming" Stroop effect with nonclinical subjects either, that had been demonstrated by McKenna and Sharma (1998). I refer to this study only to add more support for our null findings, with regard to nonclinical samples.

Perhaps we must make use of "priming" techniques such as mood-induction for nonclinical participants who exhibit elevated AS levels, before they will demonstrate any significant Stroop interference effect. In other words, our participants may have not been sufficiently "primed" to exhibit a Stroop interference effect for threat-relevant words.

It appears that the emotional Stroop effect (interference) is easily demonstrated in clinical samples. When it comes to nonclinical samples, this effect is not so easily

demonstrated. McNally et al. (1999) found absolutely no evidence of a Stroop effect in nonclinical participants who exhibited elevated levels of AS. Conversely, in the Stewart et al. (1998) study evidence was reported for a Stroop effect in nonclinical participants, but it was in this study that the investigators did not exclude "spontaneous panickers", therefore, it may not have been a clean and true nonclinical sample.

With respect to future studies in this area, recent research suggests that the Stroop effect is generally easy to demonstrate, but extremely difficult to explain, decipher, and interpret (Durgin, 2000). For many years now, the Stroop effect has been explained in elementary ways; that it was the involuntary, inadvertent, effortless, or automatic process of reading the word, which appeared to be a natural inclination, that interfered with the effortful and strategic process of color-naming words (color-incongruent, or in the emotional Stroop, emotionally salient words). The automaticity perspective has been the approach generally taken to explain the Stroop interference effect that has been demonstrated for decades past; however current and innovative research suggests this theory may not be valid.

Durgin's (2000) complex study discusses alternative explanations for the Stroop interference effect. The research is far too intricate and profound to go into a lengthy discussion at this point, but I will try to highlight some of the key issues he addresses. Durgin sees the Stroop interference effect as arising from response compatibility of extraneous information rather than automatic processing. As he points out, "One promising account of Stroop interference supposes that it is due to response competition, which, when the response is verbal, gives verbal inputs a privileged position" (p. 121). When the response is visual (e.g., pointing to the matching color patch, in which the word is printed) rather than verbal,

response time is quicker, and incongruent visual information is more strongly distracting than responding to verbal material than vice versa. Accounts of Stroop interference being controlled by automaticity of verbal processing of the word itself, appear to be getting more powerless in light of recent research. Although there is a natural inclination to read the word, pointing to matching color patches (in Durgin's study) is not likely to represent an automatic response. Even though our study did not produce a significant Stroop interference effect as a function of AS level, Durgin's work provides us with another possible explanation (just like networking theories, schema theories) for the interference effect. It may be that participants simply do not respond to irrelevant stimuli, getting at the response compatibility issue, rather than considering reading and encoding the words as an automatic process. Future researchers may want to consider response compatibility when attempting to provide an explanation for the Stroop effect.

A new domain of research regarding the automaticity perspective is emerging from the works of Besner and Stolz (1999a, 1999b). Besner and Stolz, like several recent researchers, argue that the automaticity approach may be antiquated and invalid. Previous arguments supporting the automaticity perspective suggested that skilled readers are "unable to prevent lexical and semantic analyses of words" (Besner & Stolz, 1999a), and that the most common result of this was the Stroop effect. As these researchers point out, while it may be true that this occurs "sometimes", it appears unlikely that this process is automatic, in that these systems are "inevitably" triggered by word presentation. With respect to our study, these systems (lexical and semantic) may not have been triggered for a multitude of reasons, a couple being, that the participants were not high enough in AS level to selectively encode and

attend to the threat-relevant word categories, or perhaps our lack of evidence for a Stroop effect, based on AS level, was the result of the type of words themselves. For instance, the neutral words (e.g., SHELVES, BROOM) may be more concrete than the threat-related words (e.g. EMBARRASSED, INSANE), which appear more abstract; and this might have had an effect on whether or not the lexical and the semantic systems were activated, with little or no activation leading to our findings. Clinically anxious patients, may, due to increased levels of anxiety and/or increased levels of AS be able to activate their lexical and semantic systems with less effort/less cues, and the more activation, the greater the Stroop effect. In addition, the interference effect can be manipulated or eliminated (Besner & Stolz, 1999a; 1999b), thus, how can automaticity account for this effect? Since the interference effect can be contextually manipulated during experiments, the automaticity perspective may not be the best possible explanation or interpretation of the Stroop effect.

MacLeod (1998) has written a poignant, and crucial article, in which he speaks of critical issues in explaining and interpreting the Stroop effect, and mechanisms of attention. This task, provides a theoretical framework, from which to work, to see how we deal with conflicting stimuli, and task demands; and it is also a great area in which to study hypotheses on automaticty, and how we learn about automaticity (see Besner & Stolz, 1999b). I will briefly touch on some of the issues MacLeod considers vital. Basically, they relate to the practice effect and the Stroop, the idea of an integrated versus separated Stroop task, and finally, whether interference and facilitation are indeed controlled by one underlying cognitive mechanism, or are they distinct processes, independent of one another.

Practice and Training Effect

To what extent does one's experience or practice with the word and the color influence the interference observed? This is one area in which we could test new theories, models, hypotheses, and explanations for automaticity as a continuum, which would be extremely interesting, not to mention timely. (MacLeod, 1998; MacLeod & Dunbar, 1988; Shiffrin, 1988). Although, our high AS group had practice with the type of emotionally salient words on the three threat-related word lists, as a function of their familiarity with words congruent with their area of concern/worry, a possible explanation for us not getting the interaction we had predicted is that perhaps these nonclinical people have not had "enough" practice with experiences of panic (not panic attacks, merely feeling all the panic symptoms endorsed on the ASI-R). Their age could have possibly figured into this framework as well, considering they were all univerisity students and haven't had as much time as older individuals to experience panic symptoms. And clinically anxious patients tend to be significantly older than our nonclinical sample.

Integration and Interference Effect

To what extent does the degree of congruency or incongruency influence the extent of interference? How do we selectively attend to the two dimensions of color and word? Do we have this natural inclination to read the word (perhaps unconsciously); or do we use strategic processes to color-name words? These questions have been remarked on with the Besner and Stolz (1999a; 1999b) studies, and some comments were made regarding our sample and findings at that time. In addition, we must remember that when one reads, many intracognitive resources are used up. That is, speed of color-naming and color-reading could possibly have

had an effect on all AS groups, and that was precisely why we computed two indices to control for both these potential problems.

Facilitation and Interference

MacLeod (1998) makes some novel and meaningful suggestions, in this area, and this domain is always open to new recommendations for future research. MacLeod suggests that facilitation and interference may stem from distinct/different underlying cognitive mechanisms, a suggestion that runs contrary to virtually all current theories.

General Comments

It's improbable that our lack of evidence supporting our main hypothesis was attributable to low statistical power. In other words, even smaller correlations such as .22 qualified as significant at the .05 level, due to the sufficient number of participants.

4.2 Limitations and Areas for Future Research

Many of our findings reiterate the importance of choosing distinct and unique emotionally salient word categories, when investigating the emotional Stroop task and the interference effect. Each and every word category should be unique, unto itself, thereby tapping into one specific area of concern/worry (e.g., physical-threat words versus social-threat words). The reliance of many current studies on word lists used in previous work (e.g., MacLeod et al, 1986), may be questionable, in that they don't really reflect the word category they say they're tapping into. Future research may wish to design word lists, that better capture the specificity of their area of concern or study, and not rely so heavily, or merely accept as the "gold standard", word lists of previous research. Our findings strongly suggest that this is a serious limitation with research involving the emotional Stroop task.

McNally et al. (1999) used random, intermixed word presentations for threat, positive, and neutral words. Our study improved on this methodology by presenting each word category separately in block formation. From personal communication with McNally (January 25, 1998), he suggested that block presentation of threat and non-threat words leads to a better chance of getting an effect. Block presentation has been shown to provoke more threat-word interference in patients with anxiety disorders (McNally, Amir, & Lipke, 1996). However, even after following this advice, and presenting our word categories in block formation, we still could not support our main hypothesis.

Contributions of inhibitory mechanisms as mediating variables should be considered in future research. Inhibition here, broadly refers to cognitive processes such as suppression of distractors (word meaning) in selective attention tasks (Stroop). This relates to the idea of automaticity (reading the word) and effortful processing (color-naming).

Because all of our questionnaires were self-report, shared method variance might have increased the magnitude of the correlations between the ASI and the other measures.

Attentional bias to threat-relevant material may only be associated with panic disorder and not emerge with only panic, or elevated levels of AS. The processing biases involved in the emotional Stroop, may appear only with a full-blown case of panic disorder. There are those who believe that information-processing biases, particularly attentional bias to threat, are what comprises the clinical state of panic disorder (or other anxiety disorders). These processing-biases tend to disappear with the remission of the clinical anxiety disorder (McNally et al., 1999).

With respect to the content-specificity hypothesis, our findings did not demonstrate

specificity in categories high in threat information, in relation to the three AS factors, however, more specificity was demonstrated with the factors than with the overall construct of AS.This is a very timely an important area for future research to investigate.

All of our findings suggest that the emotional Stroop task is based on a non-specific general mechanism of some kind. This would be another exciting area for future research.

The ideal method of addressing this controversial issue (of nonclinical versus clinical Stroop findings), would be to identify people who display these attentional biases to threat-relevant information but who have never panicked (up to this point, what we did in our study), and then follow them longitudinally to determine whether or not they subsequently panic at higher rates (or developed a clinical anxiety disorder), compared to the individuals who do not show these attentional biases.

Mood-induction studies with respect to the emotional Stroop task, as in a priming experiment, is another interesting path future researchers may wish to take. Although, mood-congruence is a reliable phenomenon (as the literature has shown) the underlying cognitive mechanisms for mood-congruence are still unclear (Varner & Ellis, 1998). They suggest viewing an emotional state as multidimensional, where there is a change in physiological arousal, and there is activation of related cognitive processes (see Mandler, 1992; Schacter & Singer, 1962). Mood-congruence is a consequence of cognitive processes being activated as a result of an emotional state. This is the prevailing view and is demonstrated in research and theories investigating emotions and information-processing. This relates to Bower's (1981) theory in which he suggests that moods consist of nodes in a semantic network of memory, and the nodes are associated with each other based on their cognitive content, and when

mood-congruent information is presented and processed, activation spreads throughout the nodal network.

In conclusion, we failed to support our main hypothesis , that AS level would produce an effect on color-naming latencies of threat-relevant word categories, compared to non-threat word categories. We found little convincing evidence that AS predicts selective attentional bias to threat-relevant words in a nonclinical sample who had never experienced spontaneous panic. There is still a great need for future research to focus on AS and its relationship with attentional bias to threat in nonclinical samples.

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Appendix A

Emotional Stroop Instructions

Emotional Stroop Task Instructions

Name the colors of the words as quickly and as accurately as possible, and ignore the word content or the word itself, and try not to make any mistakes.

If you make a mistake, I will say MISTAKE, and you should immediately correct yourself and name the color of the word you made the mistake on, and then as quickly as possible continue on with the next word.

Name the colors of the words down columns, starting with the first column and moving across to the last column, in a left to right manner.

Some cards will have words on them, and some will have non-words on them. Name the color of non-words in the same fashion as the words.

Any questions? OK, are you ready to begin?

Appendix B

Randomized Stroop Recording Forms

Counterbalancing of order of card presentation

		List 1	List 2	List 3	List 4	List 5	List 6	List 7	List 8	List 9	List 10	List 11	List 12
		Questionnaire Before Stroop						Questionnaire After Stroop					
Card	1	A-neut	F-cthrt	B-pos	D-pthrt	C-dep	B-sthrt	A-neut	F-cthrt	E-pos	D-pthrt	C-dep	B-sthrt
Order	2	B-sthrt	A-neut	F-cthrt	E-pos	D-pthrt	C-dep	B-sthrt	A-neut	F-cthrt	E-pos	D-pthrt	C-dep
	3	C-dep	B-sthrt	A-neut	F-cthrt	E-pos	D-pthrt	C-dep	B-sthrt	A-neut	F-cthrt	E-pos	D-pthrt
	4	D-pthrt	C-dep	B-sthrt	A-neut	F-cthrt	E-pos	D-pthrt	C-dep	B-sthrt	A-neut	F-cthrt	E-pos
	5	E-pos	D-thrt	C-dep	B-sthrt	A-neut	F-cthrt	E-pos	D-thrt	C-dep	B-sthrt	A-neut	F-cthrt
	6	F-cthrt	E-pos	D-pthrt	C-dep	B-sthrt	A-neut	F-cthrt	E-pos	D-pthrt	C-dep	B-sthrt	A-neut

FACTORS

Anxiety Tests (2) X Word Category (6)

1. Before Stroop
2. After Stroop

	Catd Label
1. Neutral (neut)	A
2. Positive (pos)	E
3. Depressive (dep)	C
4. Physical-threat (pthrt)	D
5. Social-threat (sthrt)	B
6. Cognitive dyscontrol-threat (cthrt)	F

Notes: 1. Positive and Negative word lists do not follow each other
2. Social-threat and Physical-threat do not follow each other

Appendix C

Anxiety Sensitivity Index

Reiss-Epstein-Gursky A.S.I.

Circle the *one* phrase that best represents the extent to which you agree with the item. If any of the items concern something that is not part of your experience (e.g., "It scares me when I feel shaky" for someone who has never trembled or had the "shakes"), answer on the basis of how you think you might feel *if you had* such an experience. Otherwise, answer all items on the basis of your own experience.

1. It is important to me not to appear nervous.

   Very Little A Little Some Much Very Much

2. When I cannot keep my mind on a task, I worry that I might be going crazy.

   Very Little A Little Some Much Very Much

3. It scares me when I feel "shaky" (trembling).

   Very Little A Little Some Much Very Much

4. It scares me when I feel faint.

   Very Little A Little Some Much Very Much

5. It is important to me to stay in control of my emotions.

   Very Little A Little Some Much Very Much

6. It scares me when my heart beats rapidly.

   Very Little A Little Some Much Very Much

7. It embarrasses me when my stomach growls.

   Very Little A Little Some Much Very Much

8. It scares me when I am nauseous.

Very Little A Little Some Much Very Much

9. When I notice that my heart is beating rapidly, I worry that I might have a heart attack.

Very Little A Little Some Much Very Much

10. It scares me when I become short of breath.

Very Little A Little Some Much Very Much

11. When my stomach is upset, I worry that I might be seriously ill.

Very Little A Little Some Much Very Much

12. It scares me when I am unable to keep my mind on a task.

Very Little A Little Some Much Very Much

13. Other people notice when I feel shaky.

Very Little A Little Some Much Very Much

14. Unusual body sensations scare me.

Very Little A Little Some Much Very Much

15. When I am nervous, I worry that I might be mentally ill.

Very Little A Little Some Much Very Much

16. It scares me when I am nervous.

Very Little A Little Some Much Very Much

Appendix D

Anxiety Sensitivity Index - Revised

Please circle the number that best corresponds to how much you agree with each item. If any of the items concern something that is not part of your experience (for example, "It scares me when I feel shaky" for someone who has never trembled or felt shaky) answer on the basis of how you expect you think you might feel if you had such an experience. Otherwise, answer all items on the basis of your own experience. Be careful to circle only one number for each item and please answer all items.

	Very Little	A little	Some	Much	Very much
1. It is important for me not to appear nervous	0	1	2	3	4
2. When I cannot keep my mind on a task, I worry that I might be going crazy	0	1	2	3	4
3. It scares me when I feel "shaky" (trembling)	0	1	2	3	4
4. It scares me when I feel faint	0	1	2	3	4
5. It is important to me to stay in control of my emotions	0	1	2	3	4
6. It scares me when my heart beats rapidly	0	1	2	3	4
7. It embarrasses me when my stomach growls	0	1	2	3	4
8. It scares me when I am nauseous	0	1	2	3	4
9. When I notice that my heart is beating rapidly, I worry that I might have a heart attack	0	1	2	3	4
10. It scares me when I become short of breath	0	1	2	3	4
11. When my stomach is upset, I worry that I might be seriously ill	0	1	2	3	4
12. It scares me when I am unable to keep my mind on a task	0	1	2	3	4
13. Other people notice when I feel shaky	0	1	2	3	4
14. Unusual body sensations scare me	0	1	2	3	4
15. When I am nervous, I worry that I might be mentally ill	0	1	2	3	4
16. It scares me when I am nervous	0	1	2	3	4
17. When my head is pounding, I worry I could have a stroke	0	1	2	3	4
18. When I tremble in the presence of others, I fear what people might think of me	0	1	2	3	4
19. When I feel like I'm not getting enough air, I get scared that I might suffocate	0	1	2	3	4
20. When I get diarrhea, I worry that I might have something wrong with me	0	1	2	3	4
21. When my chest feels tight, I get scared that I won't be able to breathe properly	0	1	2	3	4
22. When my breathing becomes irregular, I fear that something bad will happen	0	1	2	3	4

	Very Little	A little	Some	Much	Very much
23. It frightens me when my surroundings seem strange or unreal	0	1	2	3	4
24. Smothering sensations scare me	0	1	2	3	4
25. When I feel pain in my chest, I worry that I'm going to have a heart attack	0	1	2	3	4
26. I believe it would be awful to vomit in public	0	1	2	3	4
27. It scares me when my body feels strange or different in some way	0	1	2	3	4
28. I worry that other people will notice my anxiety	0	1	2	3	4
29. When I feel "spacey" or spaced out I worry that I may be mentally ill	0	1	2	3	4
30. It scare me when I blush in front of people	0	1	2	3	4
31. When I feel a strong pain in my stomach, I worry it could be cancer	0	1	2	3	4
32. When I have trouble swallowing, I worry that I could choke	0	1	2	3	4
33. When I notice my heart skipping a beat, I worry that there is something seriously wrong with me	0	1	2	3	4
34. It scares me when I feel tingling or prickling sensations in my hands	0	1	2	3	4
35. When I feel dizzy, I worry there is something wrong with my brain	0	1	2	3	4
36. When I begin to sweat in a social situation, I fear people will think negatively of me	0	1	2	3	4
37. When my thoughts seem to speed up, I worry that I might be going crazy	0	1	2	3	4
38. When my throat feels tight, I worry that I could choke to death	0	1	2	3	4
39. When my face feels numb, I worry that I might be having a stroke	0	1	2	3	4
40. When I have trouble thinking clearly, I worry that there is something wrong with me	0	1	2	3	4
41. I think it would be horrible for me to faint in public	0	1	2	3	4
42. When my mind goes blank, I worry there is something terribly wrong with me	0	1	2	3	4

Appendix E

State -Trait Anxiety Inventory

(STAI- State Version)

STAI-S

Part One DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the of the statement to indicate how you feel ***right now***, that is ***at this moment***. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

1=Not At All 2=Somewhat 3=Moderately So 4=Very Much So

1.	I feel calm	1	2	3	4
2.	I feel secure	1	2	3	4
3.	I am tense	1	2	3	4
4.	I feel strained	1	2	3	4
5.	I feel at ease	1	2	3	4
6.	I feel upset	1	2	3	4
7.	I am presently worrying over possible misfortunes	1	2	3	4
8.	I feel satisfied	1	2	3	4
9.	I feel frightened	1	2	3	4
10.	I feel comfortable	1	2	3	4
11.	I feel self-confident	1	2	3	4
12.	I feel nervous	1	2	3	4
13.	I am jittery	1	2	3	4
14.	I feel indecisive	1	2	3	4
15.	I am relaxed	1	2	3	4
16.	I feel content	1	2	3	4
17.	I am worried	1	2	3	4
18.	I feel confused	1	2	3	4
19.	I feel steady	1	2	3	4
20.	I feel pleasant	1	2	3	4

Appendix F

State-Trait Anxiety Inventory

(STAI- Trait Version)

STAI-T

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

1= Almost Never 2= Sometimes 3= Often 4= Almost Always

21.	I feel pleasant	1	2	3	4
22.	I feel nervous and restless	1	2	3	4
23.	I feel satisfied with myself	1	2	3	4
24.	I wish I could be as happy as others seem to be	1	2	3	4
25.	I feel like a failure	1	2	3	4
26.	I feel rested	1	2	3	4
27.	I am "calm, cool, and collected"	1	2	3	4
28.	I feel that difficulties are piling up so that I cannot overcome them	1	2	3	4
29.	I worry too much over something that really doesn't matter	1	2	3	4
30.	I am happy	1	2	3	4
31.	I have disturbing thoughts	1	2	3	4
32.	I lack self-confidence	1	2	3	4
33.	I feel secure	1	2	3	4
34.	I make decisions easily	1	2	3	4
35.	I feel inadequate	1	2	3	4
36.	I am content	1	2	3	4
37.	Some unimportant thought runs through my mind and it bothers me	1	2	3	4
38.	I take disappointments so keenly that I can't put them out of my mind	1	2	3	4
39.	I am a steady person	1	2	3	4
40.	I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4

Appendix G

Hypochondriasis Scale

(Hypo - ASI-R)

ASI-R-H

	Very Little	A Little	Some	Much	Very Much
1. If I hear a ringing or buzzing in my ears, I worry that there is something seriously wrong with me.	0	1	2	3	4
2. If I found a lump on my body that I hadn't noticed before, I'd worry it was cancer.	0	1	2	3	4
3. When I get spots or blemishes on my body, I worry that I could have a serious disease.	0	1	2	3	4
4. If I noticed that my saliva was very dark, I'd worry that my health was in danger.	0	1	2	3	4
5. When I notice that my face looks pale, I worry that I could be getting sick.	0	1	2	3	4
6. I worry that there is something seriously wrong with me if I notice that my urine has changed color.	0	1	2	3	4
7. If my skin became very dry, I'd worry that there was something wrong with me.	0	1	2	3	4
8. If I found spots on my nails that I hadn't noticed before, I'd worry that I could have a serious disease.	0	1	2	3	4

Appendix H

Panic Attack Questionnaire - Revised

PAQ-R

A panic attack is the sudden onset of intense apprehension, fear, or terror, often associated with feelings of impending doom. Some of the most common symptoms experienced during an attack are: dizziness, shortness of breath, chest pain or discomfort, and trembling or shaking.

1. Have YOU ever had one or more panic attacks? YES ____ NO ____

a) If YES, in the PAST YEAR approximately how many panic attacks have you had? (please circle):

1 2 3 4 5 6 7 8 9 10 more than 10

If more than 10, how many? _____

b) In the PAST FOUR WEEKS how many panic attacks have you had?

0 1 2 3 4 5 6 7 8 9 10 more than 10

If more than 10, how many? _____

c) What age were you when you had your first panic attack? ____

2. Please indicate how severely you experience each of the following symptoms WHEN YOU ARE HAVING a panic attack:

	DOES NOT OCCUR	MILD	MODERATE	SEVERE	VERY SEVERE
a) difficulty breathing	0	1	2	3	4
b) heart pounding	0	1	2	3	4
c) chest pain/discomfort	0	1	2	3	4
d) choking/smothering sensations	0	1	2	3	4
e) dizziness	0	1	2	3	4
f) feelings of unreality	0	1	2	3	4
g) tingling in hands/feet	0	1	2	3	4
h) hot and cold flashes	0	1	2	3	4

	DOES NOT OCCUR	MILD	MODERATE	SEVERE	VERY SEVERE
I) sweating	0	1	2	3	4
j) faintness	0	1	2	3	4
k) trembling or shaking	0	1	2	3	4
l) fears of death or serious illness	0	1	2	3	4
m) fear of going crazy	0	1	2	3	4
n) fear of doing something uncontrolled	0	1	2	3	4
o) feeling of nausea	0	1	2	3	4
p) visual difficulties eg. blurring	0	1	2	3	4
q) auditory difficulties eg. ringing in ears	0	1	2	3	4
r) difficulty concentrating	0	1	2	3	4
s) rapid heartbeat	0	1	2	3	4
t) fear of causing a scene	0	1	2	3	4
u) thought of escape from scene of panic attack	0	1	2	3	4
v) flushing/blushing	0	1	2	3	4
w) fear of drawing attention to oneself	0	1	2	3	4
x) mouth feels dry	0	1	2	3	4
y) feelings of helplessness	0	1	2	3	4

z) other symptoms (please describe): _____

_____

3. Sometimes panic attacks can occur unexpectedly or "out of the blue". Have you ever had such an attack? YES ____ NO ____

a) If YES, in the PAST YEAR approximately how many of these "unexpected" panic attacks have you had? (please circle):

1 2 3 4 5 6 7 8 9 10 more than 10

If more than 10, how many? ____

b) In the PAST FOUR WEEKS how many of these "unexpected" panic attacks have you had?

0 1 2 3 4 5 6 7 8 9 10 more than 10

If more than 10, how many? ____

4. Have you experienced "fear" of subsequent attacks for at least ONE MONTH after a panic attack? YES ____ NO ____

5. How much distress do the panic attacks cause in your life?

None At All	Mildly Distressing	Moderately Distressing	Very Distressing	Extremely Distressing
1	2	3	4	5

6. To what degree have the panic attacks caused you to change or restrict your lifestyle (eg. everyday activities, places you go)?

No Change	Some Change	Moderate Amount of Change	Quite a Bit of Change	Extreme Change
1	2	3	4	5

7. Are you currently, or have you in the past, received treatment specifically for your anxiety problems?

YES ___ NO ___

Table 1
Means and Standard Deviations for All Measures (N = 107)

Measure	Mean	SD
Anxiety Sensitivity Index- Original (16-items)	17.66	7.92
Anxiety Sensitivity Index- Revised (42-items)	37.38	18.18
State-Trait Anxiety Inventory- State version	31.66	9.19
State-Trait Anxiety Inventory- Trait version	37.76	8.30
ASI-Revised Hypochondriasis Scale (8-items)	8.93	5.42

Table 2
Intercorrelations Between Anxiety Measures (N = 107)

Variable	1	2	3	4	5	6
1. ASI - Original Scale (16-items)	--	.91**	.84**	.45**	.34**	.34**
2. ASI-Revised (42-items)		--	.97**	.57**	.36**	.42**
3. ASI-R Factor Scores (23-items)			--	.54**	.33**	.42**
4. Hypochondriasis (ASI-R-Hypo)				--	.07	.30*
5. STAI-State Anxiety Inventory					--	.63**
6. STAI-Trait Anxiety Inventory						

Note: ASI refers to Anxiety ~~Sensitivity~~ Index
** $p < 0.0001$, * $p < 0.05$.

Table 3
Mean Reading Latencies and Two Index Scores
For Each of the Nine Stroop Conditions (N = 107)

Word Category	Mean Reading Latencies (RT)	Mean Index Score For Baseline	Mean Index Score For Black Reading Time
Black Reading	19.18	-.17	n/a
Baseline	23.53	n/a	.24
Original Stroop	40.83	.75	1.16
Neutral	25.05	.07	.32
Positive	27.08	.16	.43
Depressive	27.53	.18	.45
Physical-threat	29.36	.26	.55
Social-threat	28.79	.24	.52
Cognitive-threat	27.13	.16	.43

Note: Baseline Index was calculated in the following manner: (CW - Baseline)/Baseline; and Black Reading Time Index was calculated by: (CW - Black reading time)/Black reading time. There is no figure in the spaces for black reading time, or baseline under the index in which that word condition was used as a base.

Table 4
Intercorrelations Between Reading Latencies
On Nine Word Categories (N = 107)

Word Category	1	2	3	4	5	6	7	8	9
1. Neutral	--	.76**	.54**	.74**	.78**	.64**	.75**	.72**	.78**
2. Baseline		--	.54**	.72**	.71**	.63**	.68**	.60**	.67**
3. Black RT (read)			--	.44**	.45**	.32*	.36**	.42**	.43**
4. Depressive				--	.79**	.64**	.74**	.72**	.73**
5. Positive					--	.64**	.76**	.73**	.72**
6. Original Stroop						--	.72**	.67**	.62**
7. Physical Threat							--	.73**	.72**
8. Social Threat								--	.72**
9. Cognitive Threat									--

Note: All Reading Latencies are significant at $p < 0.0001$ (**); with the exception of Black RT and Original Stroop where $p < 0.001$(*).

Table 5
Intercorrelations Between Baseline Proportional Index
And Word Categories (N = 107)

Word Categories	1	2	3	4	5	6	7	8
1. Neutral (N-B)/B	--	.31*	.47**	.57**	.39**	.53**	.55**	.62**
2. Black Reading (Black-B)/B		--	.14	.21*	.10	.05	.24*	.22*
3. Depressive (D-B)/B			--	.60**	.41**	.55**	.54**	.52**
4. Positive (P-B)/B				--	.43**	.56**	.58**	.49**
5. Original Stroop (Original-B)/B					--	.53**	.51**	.42**
6. Physical Threat (PT-B)/B						--	.57**	.50**
7. Social Threat (ST-B)/B							--	.56**
8. Cognitive Threat (CT-B)/B								--

Note: ** $p < 0.0001$, * $p < 0.05$

Table 6
Intercorrelations Between Black RT Proportional Index
And Word Categories (N = 107)

Word Category	1	2	3	4	5	6
1. Neutral (N-Black RT)/Black RT	--	.71***	.74***	.75***	.69***	.76***
2. Depressive (D-Black RT)/Black RT		--	.82***	.76***	.71***	.73***
3. Positive (P-Black RT)/Black RT			--	.77***	.73***	.71***
4. Physical Threat (Pthrt-Black RT)/Black RT				--	.74***	.73***
5. Social Threat (Sthrt-Black RT)/Black RT					--	.71***
6. Cognitive Threat (Cthrt-Black RT)/Black RT						--

Note: All correlations were significant at the $p < 0.0001$ (***) level.

Table 7
Reading Latencies on 3 AS Levels
On Anxious and Non-Anxious Word Categories (N = 107)

	Means	
AS Level	Anxious Words	Non-Anxious Words
Low AS	81.57	76.17
Medium AS	86.69	81.24
High AS	86.79	80.62

Note: The Anxious Words consist of a summation of physical-threat, social-threat, and cognitive-threat; the Non-Anxious Words consist of a summation of neutral, positive, and depressive words. All reading latency means are in seconds.

Table 8
Baseline Proportional Index for 3 AS Levels
On Anxious and Non-Anxious Words (N = 107)

	Means	
AS Level	Anxious Words	Non-Anxious Words
Low AS	.71	.44
Medium AS	.60	.38
High AS	.69	.42

Note: Anxious Words are a summation of all our threat word indices; while Non-Anxious Words are a summation of non-threat word indices. Baseline proportional index is noted here (CW - B)/B.

Table 9
Black Reading Time Index Scores for 3 AS Levels
On Anxious and Non-Anxious Words (N = 107)

	Means	
AS Level	Anxious Words	Non-Anxious Words
Low AS	1.63	1.31
Medium AS	1.53	1.25
High AS	1.33	1.01

Note: Anxious Words are a summation of our threat word index; while Non-Anxious Words are a summation of our non-threat word index. Black Reading Time proportional index is noted here (CW - Black RT)/Black RT.

Table 10
Reading Latencies on Extreme AS Groups
On Anxious and Non-Anxious Word Categories (N = 31)

	Means	
AS Level	Anxious Words	Non-Anxious Words
Low AS	80.06	74.92
High AS	90.91	84.18

Note: Anxious Words are a summation of physical-threat, social-threat, and cognitive-threat; while Non-Anxious Words are a summation of neutral, positive, and depressive words.

Table 11
Baseline Proportional Index Scores on Extreme AS Groups
On Anxious and Non-Anxious Words (N = 31)

	Means	
AS Level	Anxious Words	Non-Anxious Words
Low AS	.56	.31
High AS	.66	.38

Note: Anxious Words are a summation of our threat word index; while Non-Anxious Words are a summation of our non-threat word index. Baseline index: (CW - B)/B.

Table 12
Black Reading Time Proportional Index on Extreme AS Groups
On Anxious and Non-Anxious Word Categories (N = 31)

	Means	
AS Level	Anxious Words	Non-Anxious Words
Low AS	1.48	1.18
High AS	1.23	.90

Note: Anxious Words are a summation of our threat word index; while Non-Anxious Words are a summation of our non-threat word index. Black Reading Time Index: (CW - Black RT)/Black RT.