ATTENTIONAL BIASING IN RAPE-RELATED POSTTRAUMATIC STRESS DISORDER

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To the Associate Vice President for Research and Dean of the Graduate School:

I am submitting herewith a dissertation written by Bonnie Lambourn-Kavcic entitled "Attentional Biasing in Rape-Related Posttraumatic Stress Disorder." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy with a major in Counseling Psychology.

Linda Rubin, Ph.D., Major Professor

We have read this dissertation
and we recommend its acceptance

Accepted

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ABSTRACT

Attentional Biasing in Rape-Related

Posttraumatic Stress Disorder

by

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Three groups, rape-related posttraumatic stress disorder (RPTSD)(n = 10), other trauma-related posttraumatic stress disorder (OPTSD)(n = 10), and nontraumatized controls (NC)(n = 13) participated in this study that examined the relationship between attentional biasing and subliminally presented stimuli and the relationship between attentional biasing and hemispheric specialization using emotional Stroop stimuli (high threat, general threat, positive, neutral words). The expectation that preattentive biasing would be exhibited by RPTSD individuals with high-threat words was not supported; the amount of interference (the measure of attentional biasing) with RPTSD subjects did not differ significantly from OPTSD and NC subjects with high threat stimuli. As predicted, the amount of interference exhibited at the subliminal level for the RPTSD subjects was less than for the high threat words at the supraliminal level. Further, the amount of interference exhibited with subliminally presented stimuli was approximately the same across the different word categories suggesting a more global pattern of processing at the subliminal level. A robust Stroop interference effect with high threat words presented

supraliminally in the RPTSD group was consistent with previous findings. Comparison of the two PTSD groups (individuals in both groups had been raped) demonstrated that not only specificity of concern but current concern is involved in attentional biasing in PTSD. As expected, lateralized presentations of emotional Stroop stimuli indicated that for the RPTSD group only, there was significant interference with high threat words when processed in the right hemisphere. This finding suggests that the right hemisphere plays a dominant role in attentional biasing. Results of the study were considered in terms of the value of the nonintrospective emotional Stroop task in the evaluation of attentional biasing and hemispheric asymmetries in the assessment of individuals with emotional disorders and in evaluating the effectiveness of treatment interventions.

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CHAPTER 1

INTRODUCTION

This study investigated the relationship between attentional biases and processing of emotional information in posttraumatic stress disorder (PTSD) rape victims. Two different aspects of attentional biasing were addressed. The first part of the study focused on the nature of attentional biasing of emotional information presented at a nonconscious level. The second part addressed laterality aspects of attentional biasing of emotional information in PTSD rape victims. What follows is a brief overview of rape and PTSD, attentional biasing, and the specific issue of attentional biasing of emotional information at a nonconscious level and of attentional biasing as it relates to hemispheric asymmetries. A review of literature relevant to the issues that were investigated and the hypotheses that guided the study are presented next. Methodological procedures, results, statistical analyses, and a discussion of the findings complete the study.

The myth of rape as a rare event or an infrequent crime has been challenged by documentation that would indicate otherwise (Foa & Riggs, 1993; Frazier & Burnett, 1994; Koss, Heise, & Russo, 1994; Lonsway & Fitzgerald, 1994). It has been estimated that 12.1 million adult women have been forcibly raped during their lifetime and that over 680 thousand adult women have been forcibly raped during a one year period (Kilpatrick, Edmunds, & Seymour, 1992). In the United States, the Federal Bureau of Investigation estimates that a woman is raped every six minutes and as many as one in four women may become a victim of rape during her lifetime (Lonsway & Fitzgerald, 1994). Because

of the underreporting of rape to the police, it is thought that prevalence of rape is more widespread than what has been documented (Foa & Riggs, 1993; Koss et al., 1994).

Given the nature of rape, defined as the nonconsensual oral, anal, or vaginal penetration, obtained by force, by threat of bodily harm, or when the victim is incapable of giving consent (Mogg, 1993), it not surprising that the harmful and often debilitating effects are pervasive and persistent, lasting years for many rape victims (Herman, 1992; Resick, 1993; van der Kolk, 1989, 1995). Initial investigations related to rape focused on specific psychological reactions associated with the rape, such as anxiety, depression, and sexual dysfunction (Foa & Riggs, 1993). However, following the lead of Burgess and Holstrom (1974), who conceptualized the psychological reactions following rape in terms of a "rape trauma syndrome" (Herman, 1992), investigators, during the mid-1980's, began to study post-rape symptomology in terms of posttraumatic stress disorder.

In 1980, the American Psychiatric Association classified posttraumatic stress disorder, a syndrome associated with exposure to extreme traumatic life experiences, in the Diagnostic Statistical Manual of Mental Disorders, 3rd Edition (DSM-III, American Psychiatric Association [APA], 1980) as an anxiety disorder (Dancu, Riggs, Hearst-Ikeda, Shoyer, & Foa, 1996; Foa & Riggs, 1993; Foa, Riggs, & Gershuny, 1995; van der Kolk, 1996). Characteristic symptoms resulting from extremely traumatic events, according to the DSM-III and later editions, DSM-III-R (APA, 1987) and DSM-IV (APA, 1994), include: (a) persistent reexperiencing of the traumatic event as evidenced by intrusive thoughts, nightmares, and flashbacks (i.e., reexperiencing of the trauma is accompanied

by the intense psychological distress and physiological reactivity of the original trauma), (b) persistent avoidance of stimuli associated with the trauma including thoughts, feelings, conversation, or other stimuli that may serve to trigger an intense response, numbing characterized by feelings of detachment, reduced ability to feel emotions, and a general withdrawal of areas of previous interest, and (c) persistent increased arousal including sleep disturbances, hypervigilance, and an exaggerated startle response. The development of PTSD as a diagnosis has dispelled the notion that PTSD results from neurotic symptoms associated with a genetically based irrationality; it confirms that PTSD results from an individual's inability to cope with life experiences that have become overwhelming (van der Kolk, 1996). In other words, PTSD involves a recognizable external traumatic event that may be associated with the symptomology presented with PTSD (Foa, Steketee, & Rothbaum, 1989).

Given the prevalence of rape within the United States, it is not surprising that rape victims may be the largest group of people exhibiting PTSD symptoms (Foa & Riggs, 1993). Initial symptoms observed in those who have been raped, including reexperiencing, avoidance reactions, and increased arousal, are consistent with the DSM-III diagnostic criteria for PTSD (Steketee & Foa, 1987). For most rape victims, over time, the initial PTSD symptoms subside without the development of psychiatric disorders (Burge, 1988; Stekette & Foa, 1987; van der Kolk, 1996). In contrast to those rape victims whose symptoms subside with time, there is a substantial number whose symptoms remain, who develop emotional disorders, and whose lives become fixated

upon and dominated by the traumatic event. With these individuals, the traumatic experience and priority focusing of attention on those environmental stimuli associated with the trauma eventually come to a point of not only interfering with the ability to pay attention to both new and familiar situations (van der Kolk, 1996), but is also at the expense of not noticing other more relevant stimuli within the environment (Cassidy, McNally, & Zeitlin, 1992; Foa, Feske, Murdock, Kozak, & McNally, 1991). This tendency to attend to emotionally salient stimuli is referred to as attentional biasing.

Attentional biasing toward trauma related stimuli among those with PTSD is but one area of impaired cognitive functioning exhibited by those with this emotional disorder (van der Kolk, 1987, 1996; Williams, Watt, MacLeod, & Matthews, 1997); attentional biasing has been consistently demonstrated by research (Kaspi, McNally, & Amir, 1995; McNally, English, & Lipke, 1993; McNally, Kaspi, Riemann, & Zeitlin, 1990). Research examining attentional biasing in different psychopathological conditions has been advanced using the emotional Stroop task (See Chapter 2 for a discussion of the emotional Stroop task). Using emotional Stroop stimuli, for example, the attentional biasing phenomenon was found to occur only during the presentation of information relevant to the specific condition: panic disorder (McNally, Amir, Louro, Lukach, Riemann, & Calamari, 1994), specific phobias (Watts, McKenna, Sharrock, & Trezise, 1986), combat related PTSD (McNally et al., 1993), and rape related PTSD (Cassidy et al., 1992).

Attentional biasing has been shown to occur not only in the processing of stimuli presented within the conscious awareness of an individual, but also with emotional information that is presented out of awareness, or at a nonconscious level (MacLeod & Rutherford, 1992). The intrusive phenomenon, characteristic of PTSD, may be better understood in terms of attentional biasing toward trauma related stimuli at a nonconscious level in PTSD individuals. Although processing bias at the nonconscious level has been examined in depression, clinical anxiety, and high trait anxiety normal individuals (MacLeod & Rutherford, 1992; Mogg, Bradley, Williams, & Mathews, 1993; Mogg, Kentish, & Bradley, 1993; Richards & French, 1990), no comparable research has been conducted, to this researcher's knowledge, with a PTSD population. Therefore, the first part of the current study investigated the nature of processing bias in PTSD with stimuli presented subliminally, outside of conscious awareness of the individual.

Although research focusing on hemispheric asymmetries is abundant, the latter part of this study investigated hemispheric lateralization for the processing of emotional information using a lateralized version of the emotional Stroop task. It is generally understood that in the intact brain, the left hemisphere shows an advantage for language processing and the right hemisphere shows an advantage for the perception and expression of emotion (Clarke, 1994; van der Kolk, 1996). Research with certain clinical populations has demonstrated the existence of a relationship between abnormalities of cerebral laterality and specific clinical features. For example, in most cases, right hemisphere dysfunction has been associated with affective disorders and left hemisphere

dysfunction has been associated with schizophrenia (for review, Bruder, 1995). With PTSD individuals, research found that, during induced flashbacks with PTSD individuals, the right hemisphere showed significant activation; in contrast, the left hemisphere showed little activation (Rauch, van der Kolk, Alpert et al., 1996). A more detailed discussion concerning laterality and emotion will be included in the following chapter.

Greater advancement in understanding cognitive features that influence the development and maintenance of PTSD is necessary to generate or refine assessment and specific treatment strategies for this particular disorder. As noted earlier, one cognitive component that is hypothesized to impact the perpetuation of the vicious cycle associated with PTSD is attentional biasing. The purpose of this study was to discover more about the nature of biasing processes or mechanisms that underlie attentional dysfunction in PTSD by exploring the relationship between attentional biasing and subliminally presented material and also by exploring laterality issues with respect to attentional dysfunction.

CHAPTER 2

LITERATURE REVIEW

Rape and Posttraumatic Stress Disorder

The effects of rape include not only psychological distress, but also have a sociocultural impact and somatic consequences (Koss, Heise, & Russo, 1994). The sociocultural impact and somatic consequences are beyond the scope of this review; the focus of this review will be on the psychological impact of rape on women victims. In the immediate aftermath of rape, almost every victim experiences psychological distress (Resick, 1993; van der Kolk, 1987, 1996). For some victims, the distress subsides with time, but for approximately one quarter of the women raped, the negative effects persist for several years. After many years, sexual assault victims are more likely to have received psychiatric diagnoses, including major depression, alcohol abuse/dependence, drug abuse/dependence, generalized anxiety, obsessive-compulsive disorder, and posttraumatic stress disorder (Koss et al., 1994).

Earlier studies on rape focused on the symptomology presented following rape. According to Steketee and Foa (1987, for review), the most frequently observed psychological symptoms following rape are fear and anxiety, depression, and sexual dysfunction; however, other symptoms may include fatigue, suicide attempts, hostility, somatic complaints, sleep disturbance, poor concentration and memory, guilt, poor self-

esteem and obsessive-compulsive symptoms. Again, symptoms subside over time for some individuals. For instance, depression, a common response, tends to subside within three months. Anxiety, the most prominent symptom, may continue over a longer period of time. Social and sexual functioning, although disrupted immediately following the rape, tend to return to pre-rape levels within a few months; residual sexual dysfunction may persist up to 18 months following the rape (Stekette & Foa, 1987).

Following the lead of Burgess and Holstrom (1974), who conceptualized the psychological reactions following rape in terms of a "rape trauma syndrome," investigators, during the mid 1980's, began to study post-rape symptomology in terms of posttraumatic stress disorder (Herman, 1992; van der Kolk, 1996). Psychological effects in the immediate aftermath of rape (i.e., intrusive thoughts, nightmares, or flashbacks; hyperarousal and an exaggerated startle response; attempts to avoid thoughts of or cues associated with the rape; depression; and anxiety) are consistent with the DSM-III diagnostic criteria for posttraumatic stress disorder (PTSD) (Koss et al., 1994; Steketee & Foa, 1987).

According to the DSM-IV (APA,1994), community-based studies reveal a lifetime prevalence of PTSD ranging from 1% to 14% with the variability attributed to differing methodologies used in data collection and to different population samples. The DSM-IV also reported that studies of at-risk individuals (e.g., combat veterans, criminal violence, or natural disaster) have prevalence rates ranging from 3% to 58%. More specific to rape, Kilpatrick, Saunders, Vernon et al. (1987), in a longitudinal study, found

that of the women sampled, 57% met the diagnostic criteria for PTSD at some time after the rape. They also found that after an average of 17 years post-rape, 16% of the women met the diagnostic criteria for PTSD at the time of the study. Rothbaum, Foa, Riggs, Murdock, and Walsh (1992) found that most rape victims evaluated at trauma centers immediately after the rape meet the diagnostic criteria for PTSD. They also found that, 12 days following the assault, 94% of rape victims met the diagnostic criteria and were clinically depressed; after 3 months, 47% continued to meet the diagnostic criteria. Rothbaum et al., (1992) reported that those who developed PTSD were more severely distressed initially and improved little after one month; those who did not develop PTSD continued to improve after the one month period.

Kessler, Sonnega, Bromet, Hughes, and Nelson (1995) estimated that the prevalence of PTSD within the United States is 7.8% with women being more than twice as likely as men to have PTSD. Among both men and women, the trauma (defined as the most upsetting life event) most likely to be associated with PTSD was rape. Sixty-five percent of men and 45.9% of women who reported rape as the most traumatic event developed PTSD. Reports of rape by 9.2% of the women in the Kessler et al. survey are consistent with the suggestion that rape victims may be the largest group of people exhibiting PTSD symptoms (Foa & Riggs, 1993; Steketee & Foa, 1987).

Using two different samples of rape victims, Foa et al. (1991) examined the prevalence of specific PTSD symptoms (using DSM-III, [1980] symptoms for one group and DSM-III-R [1987] symptoms for the other group), found a similar pattern of

symptoms; the most prevalent symptom at the end of three months was fear; the least prevalent was guilt. Although reporting fewer symptoms overall, non-PTSD rape victims in the Foa et al. study reported symptoms of fear associated with the trauma, hypervigilence, and avoidance. The symptoms that distinguished the PTSD victims from the non-PTSD victims in the two samples were the lack of numbing/avoidance symptoms in the non-PTSD group.

Foa, Riggs, and Gershuny (1995) examined the importance of numbing symptoms in PTSD and found evidence that numbing symptoms are particularly important in identifying PTSD individuals. Foa et al. (1995) noted that symptoms of numbing (i.e., loss of interest in activities, detachment from others, and restricted affect) in the DSM-III-R (1987) were grouped with symptoms of effortful avoidance of trauma-related situations and thoughts. However, a principal-components factor analysis of subjects' PTSD symptoms resulted in numbing symptoms and effortful avoidance loading on two separate factors; numbing comprised a distinct symptom cluster. These results were explained in terms of Foa and Riggs' (1993) proposal that when effortful avoidance strategies fail in relieving distress associated with intrusive traumatic memories and arousal, a "shutting down" of the affective system takes place (i.e., numbing symptoms). The lack of numbing symptoms in the non-PTSD group led Foa et al. to suggest that there may be two different response patterns associated with posttrauma: one with numbing symptoms that are characteristic of PTSD and another without numbing symptoms characteristic of phobic reactions.

As evidenced by the previous discussion of symptomology associated with rape, the aftereffects can be pervasive, devastating, and long lasting. A pattern of reaction to the rape trauma appears to develop in which individuals find, that despite attempts to avoid emotionally arousing environmental stimuli, their attention is drawn toward the stimuli that they seek to avoid (Foa et al., 1995). Unsuccessful attempts to divert attention from stimuli associated with the trauma result in distressing emotional arousal, and, when attempts to avoid the arousal fail, a numbing response to "shut down" takes place (Foa et al., 1995; Foa & Riggs, 1993; van der Kolk, 1987, 1996). A vicious cycle that van der Kolk (1987) refers to as a biphasic response to trauma evolves which is characterized by the individual's alternating between periods of arousal and periods of numbing. This vicious cycle is thought not to be the by-product of the disorder. It is, rather, thought to play a role not only in the causation of the PTSD but also in the maintenance of the PTSD (Foa & Riggs, 1993; van der Kolk, 1996; Williams, Mathews, & MacLeod, 1996; Williams, Watts, MacLeod, & Mathews, 1988, 1997).

Selective Attention and Attentional Biasing

Typically, an individual attends to only a small portion of the vast number and variety of environmental stimuli with which he/she is presented at any given moment. Because all of the information presented cannot be processed simultaneously, the individual is continually engaged in a process of sifting through the input stimuli and selectively attending to the most relevant information for a given situation without excluding any crucial information (Medin & Ross, 1997). For instance, selection or

biased attention is the cognitive phenomenon operating when, in a crowded restaurant, an individual is able to ignore the noise of other restaurant patrons and listen to the friend across the table; the individual is engaged in the process of selective attention.

Most individuals have the ability to pay attention to or focus on stimuli in the environment that are relevant and ignore those that are irrelevant (selective attention) enabling the individual to properly organize and coordinate information from the environment. Difficulty arises with the breakdown of the attentional system. The attentional system may break down in several ways. One type of attentional system breakdown is characterized by the inability to focus or maintain attention as seen in attention deficit disorder; another is characterized by the inability to ignore certain stimuli or to shift attention away from one stimulus to more relevant stimuli. The latter attentional breakdown or dysfunction is commonly observed among those with psychological disorders; attention is biased towards and fixated on stimuli that are representative of their personal concerns. With PTSD, attention is biased toward stimuli associated with the past traumatic event often at the exclusion of attending to more relevant, appropriate environmental stimuli (Cassidy, McNally, & Zeitlin, 1992; Foa, Feske, Murdock, Kozak, & McNally, 1991; van der Kolk, 1996). This type of attentional dysfunction may play a role in maintaining the PTSD (Williams et al., 1988).

Models of PTSD and Attentional Biasing

The earliest explanatory models posited to consider the nature of attentional biasing in emotionally disturbed individuals were Beck, Emery, and Greenberg's (1985)

schema theory and Bower's (1981) network theory. According to these models, knowledge is organized in cognitive structures or memory networks. In PTSD, the preexisting fear schema or fear networks are activated when information consistent with the schema is encountered (even at an nonconscious level). The presence of the fear information serves to focus attention to the stimulus and trigger a fear response.

Lang (1977, 1985) proposed a model of fear in which fear-relevant stimuli are highly organized into fear networks that include the following: (a) information about stimulus cues that elicit fear; (b) information about cognitive, motor, and physiological responses; and (c) meaning of the fear stimuli. The network is activated with relatively few matching cues from the environment. Following Lang's fear network model, Foa, Steketee, and Olasov (1989) suggested that the fear networks in those with PTSD are different because of the nature and intensity of the traumatic events and the meaning given to explain the traumatic events. Chemtob, Roitblatt, Himada, Carlson, and Twentyman (1990) suggested that the fear networks are partially potentiated in PTSD at all times.

More recently, trauma theorists have proposed that there is a failure to successfully process the trauma (Foa, Molnar, & Cashman, 1995; Foa & Kozak, 1989; Foa & Riggs, 1993; van der Kolk, 1996), that cognitive representations of the trauma are often disorganized and fragmented because encoding took place during an extreme state of anxiety (Foa & Riggs, 1993; Tucker, 1990; van der Kolk, 1996). As fragmented, disorganized representations, these cognitive structures remain in a hyperaccessible or

primed state resulting in the repetitive replaying and reexperiencing of the trauma (Cassidy, McNally, & Zeitlin, 1992; Litz & Keane, 1989; Foa & Riggs, 1993; Foa, Steketee, & Rothbaum, 1989; McNally et al., 87; van der Kolk, 1996).

Theorists have suggested that the memory structure's hyperaccessiblitity results from "priming" of the cognitive trauma structures within the network and the subsequent lowered threshold for activation (Foa & Riggs, 1993; Litz & Keane, 1989; Litz, Weathers et al, 1996; van der Kolk, 1989, 1996). A fragmented trauma network, when primed, becomes easily triggered by internal or external trauma-related cues (Litz & Keane, 1989) or during times of acute emotional arousal (Williams, Mathews, & MacLeod, 1996). During the involuntary activation of trauma networks, not only will memories of the traumatic experience be activated but "integrated programs of conditioned emotional responses (e.g., physiological reactivity)" (Litz, Weathers et al, p. 487) or "programs to escape danger" (Foa et al., 1992) will also be activated. The cognitive trauma structure becomes increasingly sensitivity to and selectively attentive to stimuli represented as potentially threatening; the individual exhibits symptoms of hyperarousal and hyprevigilence (Litz et al., 1996; Williams et al., 1988). A circular loop is created in which the individual selectively attends to threatening stimuli in both the internal and external environment, giving priority attention to those stimuli in the environment that represent potential threat. Effort is expended to avoid a fear response as the threatening material is encountered. When efforts to ward off the fear fail, the individual experiences the dreaded fear response taking him/her back to complete the loop by becoming

hypervigilent and selectively attentive to the threat-related stimuli. It is this cycle that serves to maintain the disorder (Mathews & MacLeod, 1994).

Attentional Biasing and the Emotional Stroop Task

Research examining attentional biasing in PTSD victims has been advanced using the emotional Stroop task (Cassidy et al., 1991; Foa et al., 1991; Kaspi et al, 1995; McNally et al., 1993; McNally et al., 1990), a modification of the Stroop color-naming task (Stroop, 1935). The traditional Stroop color-naming task was designed as a color/ word task in which subjects were to name the color of ink in which the name of a color appeared (the word "red" printed in blue ink) while ignoring the meaning of the word. Incongruent (the word "red" printed in blue ink), congruent (the word "blue" printed in blue ink), and neutral ("XIX" printed in blue or a blue color patch) stimuli are presented. When response times for naming the incongruent color-word task were compared to the response times for naming a congruent or neutral stimuli, Stoop, as all researchers since (for review, MacLeod, 1991; Williams et al., 1996), found that it took individuals longer to name the colors of the word printed in an incongruent color than to name the color of a congruent or neutral stimulus. Stroop referred to the difference in response time between the incongruent color-naming conditions and neutral conditions as an interference effect (IE). Differences between congruent and neutral conditions are referred to as a facilitation effect (FE); reaction times noted with congruent conditions are much less than with neutral conditions. The IE, according to MacLeod (1991), can be considered a

failure of attentional processes in that the individual is unable to completely ignore the word; thus, the partial processing of the word results in interference in naming the color.

The traditional Stroop task has been adapted to assess attentional biases often observed in those with mental disorders. The adapted forms, the emotional Stroop procedure, have been designed to reflect the extent to which the presentation of threat-related or emotionally toned words interfere with the color-naming task and has been used as a measure of attentional bias. As Williams et al. (1996) stated, the emotional Stroop was designed to measure the extent to which emotionally toned words "capture attentional resources" (p. 14) and interfere with the task of color-naming. With the emotional Stroop procedure, individuals are asked to name the color in which words of varying emotional significance (i.e., high, moderate, positive, and neutral) or relevance to a particular emotional disorder are printed, while ignoring the meaning of the word. For instance, words of different emotional significance relevant to victims of rape would be "rape" as a high threat word, "death" as a moderate threat word, "security" as a positive word, and "that" as a neutral word. Interference effect with the emotional Stroop procedure is a measure of response time for color-naming differences between emotionally toned threat words and neutral words.

The emotional Stroop procedure has been used to investigate the relationship between emotion and attentional biasing in a variety of psychological pathologies. Williams et al. (1996), in a comprehensive review of the emotional Stroop procedure as a measure of attentional biases in depression and anxiety disorders (generalized anxiety

disorder, panic attacks, specific phobias, social phobias, obsessive-compulsive disorder, and PTSD), noted across diagnoses that the patients showed a significant interference effect, suggesting that attentional biasing is a common phenomenon among these populations. Attentional biasing occurs when presentation of an emotionally toned high threat word results in the automatic activation of cognitive activity that draws the individual's attention to the word. Despite the individual's effort to ignore the cognitive activity, the attention to the word draws attention away from the task of color naming causing a delayed response. Disruption of color naming, however, does not usually occur with emotionally toned words related to a different diagnostic condition or general threat words (Williams et al., 1996). Contrary to the usual findings, Martin, Williams, and Clark's (1991) results indicated disruption for color naming of positive words.

In their overview of the research examining the emotional Stroop interference effect and psychopathology, Williams et al. (1996) noted that one prominent feature to emerge was that the size of the interference effect was much larger for those with PTSD than those with other disorders. Grand mean latency times across clinical conditions, according to Williams et al., were 84 milliseconds (msec) on card presentations and 48 msec on computer or tachistoscopic presentations. Williams et al. cited three studies in which latency times for Vietnam veterans with PTSD were 300 milliseconds (msec; card presentation), 290 msec (card presentation), and 115 msec (computer presentation) and two studies involving rape victim with PTSD found latency times of 200 and 175 msec. Only the Watts et al. (1986) study involving spider phobic individuals approached the

latency time of those with PTSD. The magnitude of the difference has led researchers to suggest the possibility that the exaggerated interference occurs most prominently in those individuals suffering from markedly disturbed cognition (e.g., flashbacks, nightmares; McNally et al., 1994) or that different or additional underlying cognitive mechanisms may be involved in cognitive processing with PTSD individuals (Williams et al., 1996). Studies that have investigated different cognitive aspects of PTSD using the emotional Stroop task will be reviewed in the following section.

PTSD and the Emotional Stroop Task

McNally, Kaspi, Riemann, and Zeitlin (1990) used the emotional Stroop task as a measure of intrusive cognitive activity, a characteristic symptom of PTSD that manifests itself in the form of involuntary retrieval of disturbing episodic memories (e.g., intrusive thoughts, nightmares, and flashbacks). Vietnam combat veterans with and without PTSD were presented with neutral (e.g., input), positive (e.g., love), obsessive-compulsive (e.g., germs), and PTSD combat (e.g., bodybags) words. McNally et al. found that, in contrast to normal controls, the PTSD individuals took significantly longer to name the color of PTSD combat related words than words in other categories. Based on the assumption that Stroop interference reflects an automatic intrusion of personally disturbing memories during which time the individual's attention shifts to threat words despite efforts to attend to the color naming task, Williams et al. concluded that interference elicited by the combat words may provide a quantitative index of intrusive cognitive activity. Lack of interference for positive words failed to support Martin et al.'s (1991) emotionality

hypothesis which posits that there is a disruption in attention to the color naming task regardless of the emotional valence of stimuli presented. The finding that PTSD veterans, in contrast to non PTSD veterans, exhibited greater interference for combat words suggest that prior exposure to trauma does not produce the interference effect in the absence of PTSD. Additional support for the notion that prior exposure to trauma does not produce the interference effect in the absence of PTSD came from findings that color naming latencies for PTSD words significantly correlated with severity of PTSD symptoms as measured on the Mississippi Scale for Combat-Related Post-traumatic Stress Disorder (M-PTSD; Keane, Caddell & Taylor, 1988), but not for combat exposure as measured by the Combat Exposure Scale (CES; Keane, Fairbank, Caddel, Zimering, Taylor, & Mora, 1989). This correlation suggested that interference for trauma words was related to PTSD, not merely to exposure to trauma.

Foa, Feske, Murdock, Kozak, and McCarthy's (1991) findings paralleled those of McNally et al.'s (1990), finding that prior exposure to trauma was not associated with disruption of attention to the color naming task; they, too, suggested that the disruption was associated with PTSD per se. Foa et al., using PTSD rape victims (n = 15), controlled for the prior exposure to trauma situations by including a group of rape victims without PTSD (n = 13) as well as the normal controls (n = 16). Word categories were: specific threat (rape related), general threat (related to physical harm and death), neutral words, and nonwords. Color naming latencies did not differ for rape victims without PTSD and nontraumatized controls across word categories. Foa et al. also noted that non-

PTSD victims had recently met the diagnostic criteria for PTSD, but with successful treatment, no longer met the diagnostic criteria. As mentioned, the non-PTSD group, in contrast to the PTSD group, exhibited no difference in response latencies between rape words and other words. The lack of interference for rape words suggested, according to the investigators, that intrusive cognitive activity is reduced with successful treatment.

Results consistent with those of Foa et al. were found by Cassidy et al. (1992). Rape victims with PTSD (n = 12) exhibited greater interference for high threat rape-related words than other type words; those with PTSD also exhibited greater interference for the high threat words than rape victims without PTSD (n = 12) and nontraumatized individuals (n = 12). Unlike the non-PTSD rape victims in the Foa et al. study, the non-PTSD victims in the Cassidy et al. study exhibited interference for rape related words, although to a lesser degree than the PTSD individuals. Cassidy et al. suggested that, because those in the non-PTSD group had not received successful treatment, there may have been residual symptoms. Indeed, the non-PTSD group had scored as high as the PTSD group on a measure of avoidance/psychic numbing. The researchers suggested that, "Though such avoidance may diminish reexperiencing symptoms, it may also prevent full recovery" (p. 293); thus, the high level of interference for high threat words may be associated with avoidance. Cassidy et al. also found that rape victims with PTSD showed less interference for moderate threat words than for high threat words; they also showed greater interference for moderate threat words than for neutral words. The investigators concluded that these findings confirmed the hypothesis that interference

parallels threat relevance. An additional finding was that interference for high threat words was significantly correlated to a self-report measure of intrusive cognition.

McNally, English, and Lipke (1993) reviewed research which used the emotional Stroop task with PTSD victims in order to provide evidence for the modified Stroop task as a reliable and valid assessment instrument for the measure of intrusive cognition in a applied clinical setting. In addition to reviewing prior research in this area (Cassidy et al., 1992; Foa et al., 1991; Kaspi & McNally, 1991; McNally et al., 1990), McNally et al. provided data from their clinical practice to support the reliability and validity of the task as an assessment tool for intrusive cognitive activity. McNally et al.'s review yielded the following consistent findings across the studies: (a) color naming latencies for trauma related words occurs in those with PTSD, but not those without; (b) PTSD individuals did not exhibit latencies for words threatening for other anxiety-disordered individuals, for general threat words, or for positive words; (c) interference is related to severity of PTSD symptoms in general, and severity of intrusive symptoms in particular; (d) interference is specific to PTSD and not to a history of trauma; and (e) the interference effect is absent in patients who have been successfully treated for PTSD. The combined findings led the investigators to conclude that there is adequate evidence to support the validity of the emotional Stroop procedure for the assessment of intrusive cognitive activity.

McNally et al. (1993), in addition, replicated McNally et al.'s (1990) study making adaptations to the emotional Stroop procedure to facilitate more convenient stimulus presentation and data collection in an applied clinical setting. McNally et al. (1993) used

a sheet format (8 ½" x 11") for stimulus presentation with each sheet containing stimulus words from one separate category: control stimuli, neutral, positive, obsessive-compulsive, and combat related words. Color naming latencies for 24 Vietnam veterans were recorded at the beginning of the experiment and one week later. Following two to three months of inpatient therapy, patients were rated on a scale tapping the therapist's confidence that the patient had PTSD. Scores on the confidence ratings, scores from M-PTSD administered at the beginning of the experiment, and color naming latencies were intercorrelated. Consistent with McNally's et al. (1990) findings, PTSD patients exhibited interference for combat words, but not for positive, neutral, or words relevant to another anxiety disorder. Correlations yielded a modest, but nonsignificant correlation with therapist confidence ratings strengthening the validity of the interference for trauma words as a measure of intrusive cognition. Lack of correlation with the M-PTSD was inconsistent with McNally et al.'s (1990) findings; however, the restricted range of scores with only PTSD patients may account for the finding. The test-retest reliability coefficient ® = .80, $p < .0001$ supported the stability of the McNally's et al. version of the emotional Stroop as a measure of intrusive cognitive activity. The investigators suggested the possible usefulness of this instrument in not only detecting intrusive cognition in traumatized individuals who deny their symptoms but also in evaluating the effectiveness of therapeutic interventions designed to reduce intrusive phenomena.

Kaspi, McNally, and Amir (1995) sought to clarify the issue of whether the greater interference elicited by trauma related words for PTSD victims was attributable to

the intrusiveness of the trauma words or to their greater emotionality. By using an idiographic stimulus selection procedure, in which the participants themselves rated each of the stimulus words on personal emotional significance, the researchers were able to equate the magnitude of personal emotional significance for positive, negative, and combat words. Using Vietnam combat veterans either with PTSD (n = 30) or without PTSD, participants responded to a computerized version of the emotional Stroop in which positive, obsessive-compulsive, negative, and combat related words were presented either randomly or in blocks. Results were consistent with previous research, PTSD participants exhibited more interference for combat words than for the other word types. The Vietnam veterans without PTSD exhibited similar, but less pronounced, patterns of interference. Despite the idiographic stimulus selection, positive words of equivalent personal significance failed to produce more interference than neutral words, and less than combat words; these findings failed to support the emotionality hypothesis (Martin et al., 1991). By presenting stimuli in both a blocked and random manner, the researchers were able to investigate whether the increased interference for threat words could be attributed to the blocked presentation in which inter-item semantic priming due to rumination about the meaning of the threat words would be possible. The researchers found that presentation of combat words in blocked format may augment interference for combat words; however, the augmentation of interference was not restricted to the PTSD group; the veterans without PTSD exhibited greater interference on combat words that were presented in blocks as well.

As evidenced by the consistent findings across studies, both combat and rape related PTSD individuals, in contrast to non-PTSD victims and normal controls, display color naming latency when presented with threat related Stroop stimuli. Such color naming latencies suggest that stimuli associated with the particular trauma draws attention away from the task of color naming to the high threat emotional stimuli (attentional biasing) resulting in a delayed reaction to color indicating. Generally, the same attentional biasing is not exhibited with the presentation of words related to other anxiety disorders, to general threat words, or to positive words. Interference on the emotional Stroop has been demonstrated to be associated with severity of PTSD symptoms, particularly severity of intrusive symptoms, but has not been associated with prior traumatic exposure. Not only does the emotional Stroop task show promise in the assessment of intrusive cognition, but also shows promise as a practical nonintrospective measure of treatment outcome.

Model of Attentional Biasing

MacLeod (1991), after reviewing theoretical accounts of the Stroop IE, concluded that the Cohen, Dunbar, and McClelland's (1990) connectionistic or parallel distributed processing (PDP) model of the Stroop effect was able to account for the Stoop effect better than other models. "At the core of this model is the idea that processing occurs in the system through activation moving along pathways" (MacLeod, 1991, p. 192). This neural network type system is made up of processing units that reside within each of the interconnected modules. When sensory input reaches a threshold for activation, the

elementary processing units within a module begin to process the information, this activation, in turn is spread along connections that exist both within and between modules. Processing is said to occur by the spreading of activation over the network from one module to another via the connections. Cohen et al. assumed that a process related to a specific task occurs via a sequence of connected modules that form a pathway. So that, with a particular task, in the established pathway, sensory level processing generates appropriate patterns of activation that are spread to relevant intermediate modules in the pathway and finally in the relevant output response modules. The strength of the pathway becomes greater with repeated use and determines the speed and accuracy with which a task is performed.

The preceding description of the Cohen PDP model as presented is quite simplistic; however, when using Cohen's model to account for the Stoop IE and FE, the complexity of the model and the processes involved becomes more evident. Because the Stroop task involves two sources of information, two processing pathways are involved: one for processing color information and the other for processing word information. By comparison, the strength (and consequently, the speed) of the word naming pathway is greater than that of the color naming pathway, by virtue of its greater use, and therefore, is faster and more accurate. In performing the Stroop task, both pathways are simultaneously activated at the elementary sensory input level sending patterns of activation over the network to their respective intermediate units (Medin & Ross, 1997), which, in turn, continues the spread of activation to the response units. The model also

incorporated two task demand input units: one for word-reading and another for color-naming. These task demand units function to allocate attention in accordance with the task demand; task demand for the Stroop is to "name the color." Attention functions to modulate the responsiveness of the processing units in the pathway, either facilitating or inhibiting activation in accordance with the task demand. To understand the IE, it is necessary to know that, despite the allocation of attention to the color naming pathway, the word pathway is partially activated because of its lower threshold for activation and the greater strength of the word pathway. As Cohen et. al (1990) stated, "some information flows along the word pathway even in the absence of the allocation of attention" (p. 342). And although "this flow of information [in the word pathway] is only partial, and is not sufficient to determine which response is made, it is enough to affect the speed with which response is made" (p.342). The IE, then, is due to the stronger (e.g., greater strength of processing) word-reading pathway that eventually interferes with the response of color-naming.

Williams et al. (1996) suggested that, with the variation of three components, Cohen's connectionist model was able to provide a useful framework for understanding the interference effect associated with emotional stimuli. First, they proposed that attentional biasing toward personally relevant themes may arise from a lowered threshold for activation of sensory input units associated with emotional stimuli. Next, they proposed that pathways associated with emotional material are stronger due to repeated exposure to the material. Finally, they proposed that attentional biasing to stimuli

associated with past threat may result from short-term neuromodulatory control of input units associated with that particular threat.

Given that all individuals, nonclinical and clinical, exhibit attentional biasing toward material that is personally relevant, Williams et al. (1996) used the Cohen et al. (1990) model to distinguish between nonclinical biasing and clinical biasing. Both populations, they acknowledge, exercise processing priorities when encountering stimuli of personal relevance. The difference, they explain, is that nonclinical individuals are able to override the tendency toward attentional biasing in particular instances, whereas clinical individuals are unable to do so; the individual can no longer expend the effort required to override the tendency to focus attention on the threatening stimuli. In terms of the Cohen et al. model,

> the task demand units activation gives way to the increased strength of the competing processing pathway. Because this strength from input units denoting current concerns may have been increasing for some time (though compensated for by increases in activation of task demand units), removal of the influence of the task demand units results in an abrupt and catastrophic increase in input from the processing pathways associated with the concern. (Williams et al., 1996, p. 14)

Nonconscious Awareness and Attentional Biasing

Several cognitive theories have proposed that attentional biasing is associated with automatic, preattentive processing that does not involve conscious awareness (Mathews, 1990; Williams et al., 1988). Such models propose that, with anxiety, biasing

occurs automatically prior to the information entering conscious awareness. Studies using the subliminal emotional Stroop stimuli have supported such theories; the biasing of attention toward sources of threat disrupted performance whether or not the individual was consciously aware of the threat stimuli (MacLeod & Hagan, 1992; Mogg et al., 1993). Although no studies have been conducted using subliminal presentation of emotional material with PTSD victims, several have found color naming interference during presentation of subliminal emotional stimuli in depression, clinical anxiety, and high trait anxiety normal individuals (MacLeod & Rutherford, 1992; Mogg et al., 1993; Richards & French, 1990). What follows is a review of studies using the emotional Stroop task to examine subliminal processing of emotional stimuli.

MacLeod and Rutherford (1992), using high trait anxiety students (n = 23) and low trait anxiety students (n = 24), noted that prior to an examination (under high stress conditions) high trait anxiety students tested using 20 msec subliminal threat word presentations (e.g., *stupid* and *incompetent*), showed a significant color naming interference for threat words (difference of 10 msec) compared to nonthreat words (e.g., *hazard* and *hateful*). Low trait anxiety students, in contrast, showed a facilitation effect for threat words compared to nonthreat words prior to the examination (high stress condition). However, under supraliminal conditions (conditions in which stimuli were presented within the conscious awareness of the individual), both groups showed decreased color naming interference with nonthreat words than with threat words. These findings suggest, according to the authors, that anxiety is associated with a pattern of

selective processing at the automatic/nonconscious cognitive level, but differs from the pattern exhibited when consciously mediated strategies are permitted. At the subliminal level, under high stress conditions, high trait anxiety individuals tended to elicit an automatic, selective processing bias favoring high threat information; low trait anxiety individuals, however, elicited no such automatic processing for high threat information. With supraliminal conditions, both groups, under high stress conditions, responded by employing strategies that serve to avoid processing of the threat information. The authors suggested that, compared to clinical populations, the high trait anxiety individuals under stressful conditions demonstrate a similar processing bias for threat information at the subliminal level. However, with supraliminal presentations, whereas high trait anxiety individuals in nonclinical populations are able to employ consciously mediated strategies that modify the nature of automatic selective processing and avoid processing threat information, clinical populations appear to be unable to do so.

A longitudinal study conducted by MacLeod and Hagan (1992) addressed the notion of whether the automatic processing bias (subliminal processing) toward threat information shown in high trait anxiety individuals (nonclinical) during high stress conditions may moderate an individual's emotional responses to stressful life events. Using subliminal and supraliminal conditions, the emotional Stroop was used with 31 females awaiting a colposcopy, a diagnostic procedure designed to detect cervical pathology; none exhibited any psychopathology. Fifteen of the women later received a diagnosis indicating cervical pathology. After two months, the degree of dysphoria (i.e.,

anxiety and depression) experienced by the 15 women was assessed. Results from the initial administration of the emotional Stroop were consistent with those of MacLeod and Rutherford (1992); the selective biasing toward high threat stimuli that resulted in delayed color naming occurred only with the high trait anxiety individuals and the selective biasing with these individuals was restricted to the threat-related stimuli presented at the subliminal level. MacLeod and Hagan suggested that when threat stimuli are presented in a manner in which conscious identification is possible, the high trait anxiety individual, unlike the clinically anxious, is able to employ consciously mediated strategies to overcome the automatic patterns of processing bias. The researchers also found that longer color naming latencies on the masked/subliminal threat word presentations were predictive of the dysphoric responses to the stressful life event.

Mogg, Bradley, Williams, and Mathews (1993) investigated subliminal processing of emotional information in clinical anxiety and depression using the emotional Stroop task. Anxious (n = 19), depressed (n = 18), and normal control (n = 18) individuals were asked to color name words from four different categories: anxiety related, depressed related, categorized, and uncategorized neutral words. Half of the words were presented subliminally and half were presented supraliminally. Anxious individuals showed relatively more color naming interference for negative words in comparison to the other two groups for both subliminal and supraliminal conditions. Results supported the researchers' prediction that there is a preconscious bias for negative information in anxiety patients; color naming latencies for anxiety patients with subliminal presentations

were significantly greater than for the other two groups with subliminal presentations. The lack of biased processing of negative information for depressed individuals was of particular interest to the researchers given that the depressed individuals exhibited a similar level of anxiety as those in the anxious group; this suggests that a high level of anxiety is not sufficient to elicit a preattentive bias. The researchers speculated that the anxiety-related bias may be inhibited by elevated levels of depression and concluded that the preattentive biasing of negative information may be associated with motivational states.

Mogg, Kentish, and Bradley (1993) investigated whether the preattentive bias noted in previous research was primarily a function of the current anxious mood state or whether it was a function of more enduring individual differences in anxiety proneness (state or trait anxiety). The researchers, using a nonclinical population of high and low levels of trait anxiety students (n =46), randomly allocated the students to receive either a stress or relaxation mood induction procedure (MIP) prior to the presentation of subliminal and supraliminal emotional words. Stimuli presented were threat words, positive words, categorized neutral words, and uncategorized neutral words. The three main findings were: (a) in subliminal conditions, high trait anxiety was associated with greater interference of threat stimuli, supporting the hypothesis that processing bias does not depend upon conscious awareness of the threat stimuli; (b) in subliminal conditions, lower state anxiety was associated with a greater interference with positive stimuli, supporting Bower's (1981) mood-congruent, network model of emotion; and (c) in

supraliminal conditions, contrary to expectations, lower state anxiety was associated with greater interference in color naming threat stimuli. To explain this unexpected finding, Mogg et al. proposed that, with material presented out of conscious awareness, there is a mood-congruent processing bias; however, with material presented within conscious awareness, there is a mood-incongruent processing bias. The mood-incongruent biasing at the conscious level, Mogg et al. suggest, possibly reflects the operation of mood regulatory processes in mediating the processing of threat related-information.

In summary, studies using the subliminally presented emotional Stroop stimuli have demonstrated that biasing of attention toward sources of threat disrupts performance whether or not the individual is consciously aware of the threat stimuli (MacLeod & Hagan, 1992; Mogg et al., 1993). Nonclinical high trait anxious individuals consistently show a pattern of biasing toward threatening material when the material is being processed out of conscious awareness (subliminally); this pattern of biasing toward threatening material does not exist with material presented at the conscious level. The biasing pattern is restricted to processing that takes place at the automatic, preconscious level. With clinically anxious individuals, however, the pattern of biased processing of threatening material is not restricted to information presented at the preconscious level; the same biasing pattern extends to the conscious level. Findings from these studies led the authors to conclude that, whereas nonclinical individuals with high trait anxiety are able to employ consciously mediated strategies to modify their automatic patterns of biased processing of threatening material, clinically anxious individuals are unable to do

so. To date, no research using subliminally presented stimuli has been conducted using a PTSD population.

Laterality and Attentional Biasing

The two hemispheres of the brain generally act as a unified whole, yet, research has elucidated differential processing of information in the two cerebral hemispheres. It is generally understood that, in right-handed individuals, the left hemisphere is specialized for verbal/linguistic functions, numerical symbol systems, and complex voluntary movement, and the right hemisphere plays a central role in nonverbal and special functions, attention, and melody (Borod, 1992). Left-hemisphere strategies are described as analytic, linear, serial, detailed, and temporal, and as involving abstract, logical, sequential reasoning; the right hemisphere strategies are described as synthetic, configurational, simultaneous, holistic, and spatial, and as involving concrete, perceptual insight (Borod, 1992).

A variety of procedures (e.g., electrical stimulation, electroencephalography, and imaging) and populations (e.g., brain lesions and split-brain patients) have been used to advance knowledge of hemispheric asymmetry (Clarke, 1994). Behavioral approaches, another type of procedure for studying laterality, involve examination of left-right imbalances in the processing of input from different perceptual channels (Weiten, 1989). When using behavioral approaches, the contralateral innervation of the central nervous system must be considered. Most of a hemisphere's neuronal connections are to the opposite side of the body. Motor and sensory information in the right side of the body is

routed to and from the contralateral hemisphere (left), in contrast, motor and sensory information in the left part of the body is routed to the contralateral hemisphere (right). The differences in specialization of the hemispheres can be detected by measurement of the accuracy or time of responses to stimuli presented to the contralateral and ipsilateral sides (Anderson, 1992).

A great deal of lateralized research has been conducted in the visual domain. Within the visual system, the contralateral innervation of the central nervous system exists, such that, input from the right visual field (RVF) strikes the left side of each eye and is transmitted only to the left hemisphere (LH). Similarly, input from the left visual field (LVF) strikes the right side of each eye and the information is transmitted only to right hemisphere (RH; Weiten, 1989).

A lateralized version of the traditional Stroop task has been used to determine hemispheric differences with respect to Stroop interference. With the traditional Stroop task, it is assumed that there will be a greater interference effect with Stroop stimuli (words) presented in the RVF than in the LVF. This assumption is based on the left hemisphere's superiority in reading; reading of the word interferes more with color naming of stimuli projected to the left hemisphere than in the right hemisphere (MacLeod, 1991; Weekes & Zaidel, 1996). In his review of laterality studies utilizing the traditional Stroop task, MacLeod (1991) concluded that the left hemisphere generally exhibits more interference than the right. Support for MacLeod's conclusion, however, is not universal (Weekes & Zaidel, 1996).

Emotional hemispheric asymmetries, although not as clear cut as asymmetries involving cognitive functions, have also been observed in the perception and expression of emotion (Borod, 1992). Two different schools of thought relating to hemispheric specialization and emotion have emerged; however, support for either of the two remains inconsistent (Hellige, 1993). One school proposes that the right hemisphere is involved in the expression and perception of all emotions, regardless of valence (right hemisphere hypothesis). The other school proposes differential lateralization for positive and negative emotion with greater left hemispheric involvement in the processing of positive emotion and greater right hemispheric involvement in the processing of negative emotion (valence hypothesis; Bulman-Fleming & Bryden, 1994; Hellige, 1993). Two versions of the valence hypothesis exist. The first maintains that both hemispheres are involved in the processing of both perception and expression of emotion with the right hemisphere more active in processing negative emotions and the left more active in processing positive emotions. The second maintains hemispheric asymmetry for the expression and/or experience of emotions with right hemispheric dominance for the perception of emotion regardless of valence (Borod, 1992).

In reviewing literature focused on the importance of emotional valence and hemispheric asymmetries, Hellige (1993) suggested that neither of the previously mentioned hypotheses has received consistent support. However, in support of the right hemisphere hypothesis, Hellige noted that the right, rather than the left hemisphere, is generally superior in the perception of both positive and negative emotions from faces

and voices and, perhaps in the production of appropriate emotional behaviors. Evidence for right hemisphere specializations for emotion, irrespective of valence (right hemisphere hypothesis), comes from studies involving right hemisphere damaged individuals, who are likely to exhibit dysfunction in recognition of intonation in speech. Such dysfunction is not the case for left hemisphere damaged individual. Additionally, right hemisphere damaged individuals display more difficulty in the identification of positive or negative emotion in a face than left hemisphere damage individuals. Evidence for the right hemisphere hypothesis also comes from neurologically intact individuals who show a right hemisphere advantage for identifying either positive or negative emotions in faces (Hellige, 1993).

With respect to support for the valence hypothesis, Hellige (1993) noted that the frontal lobes of the hemispheres are sensitive to the valence of experienced emotion. In particular, the left hemisphere shows more activation when positive emotions are being experienced; the right hemisphere shows more activation with the experience of negative emotions. Davidson (1995) recently reviewed his and his colleagues findings from their EEG studies that provided evidence for asymmetric activation in the frontal lobes. Davidson conceptualized happy emotions in terms of approach behavior and sad emotions in terms of withdrawal behavior. Across Davidson and his colleagues' studies, consistent evidence emerged providing evidence of greater left frontal hemispheric activity with emotions characterized as playing a role in approach behavior (happiness)

and greater right frontal hemispheric activity with emotions characterized as withdrawal behavior (sadness).

Hemispheric asymmetries have been demonstrated to exist in such clinical conditions as schizophrenia and affective disorders (Bruder, 1995). Reviewing both perceptual and EEG studies, Bruder found general support for the hypothesis that right hemisphere dysfunction is associated with affective disorders and left hemisphere dysfunction is associated with schizophrenia.

Little research concerning evidence for hemispheric asymmetries in PTSD exits. Schiffer, Teicher, and Papanicolaou (1995), in a EEG auditory evoked potential study, found evidence for hemispheric asymmetry in individuals with a history of childhood trauma (these individuals were not identified having PTSD). Electrical activity was recorded during the recall of neutral memories and recall of traumatic memories. During the recall of neutral memories, there was a significant left dominant asymmetry; however, during the recall of traumatic memories, there was a marked shift to the right. Normal control individuals displayed neither a significant asymmetry during either task nor a significant shift between tasks. Using positron emission tomography and script-driven imagery, Rauch, van der Kolk, Alpert, Orr, Savage, Fischman, Jenike, and Pitman (1996) noted marked right hemispheric activation during the inducement of flashbacks; in contrast, the left hemisphere exhibited minimal activity. In accounting for these findings, both Schiffer et al. and Rauch et al. suggested that trauma may lead to a fragmentation or a lack of consolidation of the traumatic information into memory.

Rauch et al. further speculated that traumatic memories may be preferentially stored in the right hemisphere.

In summary, two different schools of thought relating to hemispheric specialization and the processing of emotional information exists (Borod, 1992; Hellige, 1993): the right hemisphere hypothesis which proposes that the right hemisphere is involved in the expression and perception of all emotions regardless of valence and the valence hypothesis which proposes right hemispheric specialization of negative emotional information and left hemispheric specialization of positive emotional information. As reviewed, the two studies relating to hemispheric asymmetries and the processing of traumatic information (Schiffer et al., 1995; Rauch et al., 1996) both indicated greater involvement of the right hemisphere in the processing of traumatic information and suggested that the processing of the traumatic information was incomplete leading to a fragmentation or lack of consolidation of the information into memory.

Summary of the Literature

With the conceptualization of the psychological reactions to rape as a "trauma syndrome" (Burgess & Holstrom, 1974), came the study of post-rape symptomology in terms of posttraumatic stress disorder (PTSD). In efforts to understand the development and maintenance of PTSD, researchers have more recently investigated the emotional phenomenon associated with the disorder within different cognitive frameworks (Foa & Riggs, 1993; Mathews & MacLeod, 1994; Williams et al., 1988, 1996). Those who take a cognitive approach to understanding emotions have proposed that there is a failure to

successfully process the traumatic event resulting in fragmented, disorganized cognitive representations of the trauma (Foa & Riggs, 1993; Tucker, 1990; van der Kolk, 1996). As fragmented cognitive representations, the cognitive structures remain hyperaccessible, resulting in the repetitive replaying and reexperiencing of the trauma frequently seen in PTSD (Cassidy et al., 1992; Litz & Keane, 1989; Litz et al., 1996; van der Kolk, 1989, 1996). Not only do the cognitive structures remain hyperaccessible but they become increasingly sensitive to and preoccupied with stimuli in the environment associated with the trauma (Litz & Keane, 1989; Williams et al., 1996). Central to many cognitive theories is the notion that the sensitivity and preoccupation arises from biases in attention (Williams et al., 1996).

The classical Stroop task (Stroop, 1935) has been adapted for use in the investigation of the relationship between emotional disorders and biases in attention (for review, Williams et al., 1996). Adaptations of the classical Stoop task, using emotionally toned words associated with past traumatic events, has consistently demonstrated that stimuli associated with the particular trauma draws attention away from and interferes with the task of color naming resulting in delayed reactions (Cassidy et al., 1992; Foa et al., 1991; Kaspi & McNally, 1991; Kaspi et al., 1995; McNally et al., 1990, 1993). Williams et al. (1996) noted that the magnitude of interference is much greater in PTSD than with other emotional disorders.

Research using different versions of the emotional Stroop task has provided evidence of a selective biasing of threatening information when the information is

presented out of the individual's conscious awareness (subliminally) (MacLeod & Rutherford, 1992; Mogg et al., 1993). Different patterns of processing were demonstrated to occur between subliminal and supraliminal presentations, leading the investigators to suggest that bias selection of subliminal threatening stimuli occurs automatically. Further, investigators hypothesized that when threatening stimuli are presented supraliminally, individuals are able to modify the automatic selective biasing by employing consciously mediated strategies (MacLeod & Rutherford, 1992; Mogg et al., 1993; Williams et al., 1988).

Attentional biasing with respect to the differential processing of the two hemispheres was also reviewed. Two different schools of thought relating to hemispheric specialization and the processing of emotional information exist (Borod, 1992; Hellige, 1993). First, the right hemisphere hypothesis, proposes that the right hemisphere is involved in the expression and perception of all emotions regardless of valence. Second, the valence hypothesis proposes right hemispheric specialization of negative emotional information and left hemispheric specialization of positive emotional information. The two studies previously cited relating to hemispheric asymmetries and the processing of traumatic information (Rauch et al., 1996; Schiffer et al., 1995) indicated greater involvement of the right hemisphere in the processing of traumatic information.

Purpose of Study

The purpose of this study was to investigate cognitive functioning in rape-related posttraumatic stress disorder victims. Greater advancement in understanding cognitive features that influence the development and maintenance of PTSD is necessary to generate or refine assessment and specific treatment strategies for this particular disorder. As noted earlier, one cognitive component that is hypothesized to impact the perpetuation of the vicious cycle associated with PTSD is attentional biasing. The purpose of this study was to discover more about the nature of biasing processes or mechanisms that underlie attentional dysfunction in PTSD by exploring the relationship between attentional biasing and subliminally presented material and also by exploring laterality issues with respect to attentional dysfunction.

Hypotheses

This study examined four hypothesis. The first focused on the relationship between attentional biasing and nonconscious processing of threat-related information in PTSD individuals. The first hypothesis was generated from research previously done with clinically anxious (Mogg et al., 1993) and nonclinical, high trait anxiety individuals (Mogg et al., 1993) that found attentional biasing toward threatening information when the information is presented out of conscious awareness. Using the emotional Stroop task, it was expected that, with subliminal presentations of threat stimuli, PTSD individuals but not normal controls would exhibit an interference effect. Confirmation of

the hypothesis would suggest that, with PTSD individuals, attentional biasing occurs automatically, without awareness.

The second hypothesis was based on the assumption that when threatening stimuli are presented supraliminally, clinical individuals are unable to modify the automatic selective biasing by employing consciously mediated strategies (MacLeod & Rutherford, 1992; Mogg et al., 1993; Williams et al., 1988). The expectation was that, for the PTSD individuals, the magnitude of the interference effect for the subliminal, high threat Stroop stimuli would be smaller than for supraliminal high threat Stroop presentations. If this hypothesis were confirmed then it would support the notion that PTSD individuals are unable to employ consciously mediated strategies, thus showing greater interference effect at the supraliminal than subliminal level.

The third and fourth hypotheses were generated from studies related to hemispheric asymmetries and the processing of traumatic information. Both the Rauch et al. (1996) and the Schiffer et al. (1995) studies found greater involvement of the right hemisphere in the processing of traumatic information. Using lateralized emotional Stroop stimuli, it was expected that there would be a greater interference effect with LVF-right hemisphere presentations of threat related stimuli than with RVF-left hemisphere presentations. Confirmation of this hypothesis would suggest greater right hemisphere involvement in the processing of threatening stimuli with rape-related PTSD. The fourth

hypothesis was generated to provide support for one of the two schools of thought concerning hemispheric specialization and processing of emotional information. Support for the right hemisphere hypothesis would be evidenced if the interference effect for all stimuli, regardless of valence, was greater in the right hemisphere but not in the left (see third hypothesis). On the other hand, support for the valence hypothesis would be evidenced if the interference for positive stimuli was greater in the RVF-left hemisphere and if interference for negative stimuli was greater in the LVF-right hemisphere. Therefore, this part of the study (i.e., third and fourth hypotheses) would contribute evidence for one of the models of emotional hemispheric asymmetries.

Research Questions

This study was guided by the following hypotheses:

(1) With subliminal presentations of rape-related threat stimuli, PTSD individuals but not non-PTSD and normal controls (NC) individuals would exhibit an interference effect.

(2) For PTSD individuals, the magnitude of the interference effect for subliminal presentations of rape related threat stimuli would be smaller than for supraliminal Stroop presentations.

(3) Using lateralized presentations of the emotional Stroop task, it was predicted that for PTSD individuals, but not for non-PTSD and NCs, there would be a greater interference effect with LVF-right hemisphere presentations of rape-related threat stimuli than with RVF-left hemisphere presentations.

(4) The right hemisphere hypothesis would be supported if the interference effect for all stimuli, regardless of valence, occurred with LVF-right hemisphere presentations but not with RVF-left hemisphere presentations.

CHAPTER 3

METHOD

Participants

Female participants were recruited from the Dallas-Fort Worth area (n = 28) and Rochester, NY (n = 5). As data were collected from the different rape crisis agencies, one of the groups that emerged differed from that originally sought. Groups that were originally sought were: (1) rape-related Posttraumatic Stress Disorder (RPTSD), (2) rape without PTSD (NPTSD), and (3) nonraped control (NC). No subjects met the criteria for the NPTSD group. Instead, what unexpectedly emerged was a group who had been raped, but who indicated on the Postraumatic Stress Diagnostic Scale that their PTSD symptomology was associated with trauma other than that of rape (OPTSD). Other types of trauma included: witnessing non-sexual assault of a family member, torture, a life-threatening illness, non-sexual assault by a family member, and childhood sexual abuse. Statistical analyses were performed on data from the three groups: RPTSD, OPTSD, and NC.

Participants were assigned to one of these three different groups: a group which included rape victims who meet the diagnostic criteria of posttraumatic stress disorder as determined by the Posttraumatic Stress Disorder Diagnostic Scale ($\underline{n}$ = 10), a group which included rape victims whose PTSD symptomology was associated with trauma other than

rape (OPTSD) (n = 10), or a group which included nontraumatized control university students (NC) (n = 13). To control for trauma associated with the rape of a close friend or relative (secondary trauma), participants included in the NC group had no close friend or relative who was a victim of rape. PTSD participants and NPTSD participants were recruited from agencies focused on the treatment of sexually abused women. Participants in the NC group were recruited from a university community in the Southwest. All participants had English as their primary language, had normal or corrected vision and normal color vision, no active psychotic processes, no existing or history of neurological impairments, and were right handed.

Instruments

Demographic/Screening Questionnaire. A demographic/screening questionnaire (Appendix A, for rape victims; Appendix B, for non-rape controls) contained questions that provided information related to the participant's age, educational level, income level, primary language, ethnicity, religious preference, and rape information. In addition, questions related to handedness, language preference, and potential medical or neurological problems that could have influenced performance on the computerized emotional Stroop task were included.

Ishihara Pseudo-isochromatic Color Plates. The Ishihara Pseudo-isochromatic Color Plates (1982; Appendix C) is a standardized test designed to screen for red-green color vision. The test includes 15 plates in which the individual is to identify the embedded number on each plate. Scores range from 0 - 15. Incorrect responses to four

or less plates indicate normal color vision. Incorrect responses to five or more plates indicate defective red-green vision.

Post Traumatic Stress Disorder Diagnostic Scale. The Post Traumatic Stress Disorder Diagnostic Scale (PDS; Foa, Riggs, Dancu, & Rothbaum, 1993; Appendix D) is a standardized self-report instrument designed to diagnose PTSD and to assess the severity of PTSD symptoms. The measure includes 49 items that correspond to the symptoms of PTSD in the DSM-III-R (APA, 1987). On a four point scale, ranging from zero (not at all) to three (very much), the individual rates the severity of each symptom in the past month. Scores range from 0 to 51. The PDS provides a PTSD diagnosis if the individual rates at least one reexperiencing, three avoidance, and two arousal symptoms with a rating of one or more. Evidence for the PDS diagnostic validity was provided by the 94% agreement with the Structured Clinical Interview for DSM-III-R (Spitzer, Williams, & Gibbons, 1987) three months post assault (Foa et al., 1993). The sum of the severity ratings on the 17 items serves as the PTSD severity measure. Two scales of the Impact of Events Scale (Horowitz, Wilner, & Alvarez, 1979) were strongly correlated with the PDS: Intrusion, $r = .73$ and Avoidance, $r = .63$. The correlation with Kilpatrick's Rape Aftermath Symptom Test was $r = .79$ (Foa, Molnar, & Cashman, 1995). PDS rating scale showed a one month test-retest reliability of .80 (Foa et al., 1993).

Emotional Stroop Stimuli. In the this study, emotional Stroop stimuli were used, consisting of four different word categories, with five words within each category: high threat (i.e., sex, rape, aids, shame, penis), general threat (i.e., cry, fear, pain, death, panic),

positive (i.e., joy, nice, kind, happy, peace), and neutral (i.e., for, what, that, since, still). Words in each of the categories were chosen following consultation with specialists in the area of psychological trauma. The neutral words served as a control condition for the high threat, general threat, and positive words. Words for each category were matched with respect to the number of letters in the word and were limited to five letters in each word to control for visual acuity in the lateralized presentations. All words were presented in red, blue and green ink, in helvetica, font size 30 on a black background. A 486 IBM personal computer was used to display all stimuli on a 16" VGA color monitor. The software program MEL (Micro Experimental Laboratory; Schneider, 1988) was used to control stimulus presentations and record response latencies.

There were two experimental sessions, one with foveally presented (in the center of the screen) subliminal and supraliminal emotional Stroop stimuli and one with laterally presented supraliminal emotional Stroop stimuli. Each experimental procedure consisted of 120 experimental trials. In the first, there was one block of 60 subliminal stimuli (4 word categories x 5 words x 3 colors) and 1 block of 60 supraliminal stimuli (4 word categories x 5 words x 3 colors). The second experimental procedure consisted of 60 stimuli presented in the LVF and 60 stimuli presented in the RVF. A total of 240 experimental stimuli were presented to each participant.

Prior to the presentation of the experimental trials, 24 practice trials were presented to establish the use of appropriate fingers in indicating the correct response (e.g., index finger with red color). Practice trials consisted of a colored circle presented

foveally in one of the three colors (red, blue, green) presented on a black background. Before each of the two experimental procedures, there was an additional practice block of 12 stimuli that paralleled the experimental tasks that followed; this practice block served to familiarize participants with the task.

Subliminal stimulus presentations were similar to those used by Greenwald , Drain, and Abrams (1996). The subliminal methodology consists of successive presentations of prime and target stimuli. For the subliminal stimuli in the first experimental session, prime words (i.e., emotional Stroop words) were preceded and followed by visual masking; this procedure makes the prime words impossible to see for most people. The sequence of the masking procedure follows: first, the premask, consisting of a string of consonants (i.e., GKQY) was presented for 100 milliseconds (msec); next, a word from one of the four emotional Stroop categories (prime word) was presented for 50 msec; then, the postmask (string of consonants) was presented for 17 msec. Immediately following the postmask, the target stimuli, a string of consonants the same length as prime, appeared on the screen in one of the three colors (red, green, or blue). The target was presented in the center of the screen for 120 msec.

In supraliminal presentations, each of the emotional Stroop words (4 categories, 5 words, and 3 colors) was foveally presented in a randomized order. The stimulus remained remain on the screen for 120 msec. The task of the individual was to identify the color in which the word was presented.

In the lateralized presentations, words from the different categories were presented two centimeters to the left and right of the fixation point "+" so that from a viewing distance of 1 meter the inner edge of the word stimulus were two degrees from the fixation point. Location of the words were counterbalanced so that half of the word presentations were to the left (LVF) and half to the right (RVF) of the fixation point.

Procedures

Directors of the rape crisis agencies were approached for the purpose of enlisting their assistance in the recruitment of rape victims with and without PTSD for the study. Individual therapists and group leaders within agencies were given an introduction sheet (Appendix E) and asked to read a section from the introduction sheet to potential participants. The introduction sheet explained the purpose of the study, possible risks of participation, the assurance of confidentiality, the individual's right to withdraw from the study at any point, and the monetary reward ($5.00) for participation in the study. Following the introduction, potential participants were given a written announcement of the study (Appendix F) that included instructions on how to volunteer for the study and how to contact the examiner for an appointment. A similar procedure was used in the recruitment of university students who were awarded extra credit in their class for participation in the experiment. An introduction sheet (Appendix G), explaining the purpose of the study, possible risks, assurance of confidentiality, and the right to withdraw from participation, was distributed to university instructors for them to read to the class. A written announcement (Appendix H) was then distributed to students in the

class that included the criteria for participation and instructions on how to contact the examiner to make an appointment for participation.

The experimental procedure was performed at the individual agencies and on the university campus. Participants, upon arrival, were informed of the contents of the consent form (Appendix I): the purpose of the study, possible risks of participation, the assurance of confidentiality, and the individual's right to withdraw from the study at any point. After an explanation of the experimental procedures and signature of a consent form, each participant was asked to complete the demographic/screening questionnaire related to handedness, primary language, and potential medical or neurological problems. Each participant was screened for color blindness using the Ishihara Pseudo-isochromatic Color Plates (1982). Once the participant's appropriateness (i.e., right-handed, English as a first language, normal color vision) for the study was established, the participant was seated at the computer in a comfortable chair and instructed in the use of the numeric key pad: one of the three colors in which the words or string of consonants appeared was assigned to a key on the numeric key pad. Following instructions on the key pad, she was asked to place her chin in a chin-rest, placed one meter from the computer screen; the chin-rest served to maintain a constant distance between the head and the computer monitor screen. The chin-rest also stabilized the head during the lateralized computer presentations. Once the participant was comfortably situated, she was instructed to fix her gaze on a fixation point, "+", at the center of the computer screen, and asked to place her fingers on the numeric key pad. The Compaq 486 microcomputer presented a block

of 24 practice trials in which the participant practiced the use of the appropriate finger in indicating the correct response on the key pad (e.g., "1" indicated the color red, "2" indicated the color green, and "3" indicate the color blue). The first set of practice trials was initiated by the presentation of the fixation point on the screen followed by the central presentation of a string of consonants (FKQW) in one of the three different colors (i.e., red, green, and blue); participants indicated the color of the consonants as quickly and accurately as possible by pressing the appropriate key on the numeric key pad. Practice continued until the participant accurately identified 80% of the colors in which the string of consonants appeared by key pressing.

Once correct responding was established, participants continued with two consecutive experimental sessions, each consisting of 12 practice trials and 120 experimental trials. Between the two sessions, there was a short break. In all the sessions, for each trial, participants were required to identify the color of the string of consonants or the color of the words by pressing one of the three numbers on the key pad. The response fingers associated with the particular color (i.e., index, middle, and ring finger) and hands used for responding (i.e., left and right) was counterbalanced across participants for both experimental sessions. The order of the experimental sessions was fixed to avoid priming; the experimental session with subliminal and supraliminal presentations was first and the experimental session with the lateralized presentation of the emotional Stroop stimuli second.

The first experimental session consisted of two blocks of stimulus presentations: the first block with 60 subliminal presentations, the second block with 60 supraliminal presentations. In the first experimental session, for the first block of subliminal stimuli, participants were told to pay attention to the presentations of the string of consonants presented in white (premask, prime, postmasks) and to the target stimuli; they were also told to identify the color of the target as quickly and accurately as possible by pressing the appropriate key. The second block consisted of 60 supraliminal presentations in which the participants responded to the centrally presented emotional Stroop stimuli. Two blocks of trials (subliminal and supraliminal), were presented in a fixed order: subliminal stimuli were presented first, supraliminal stimuli were second.

In the second experimental session, participants were asked to maintain their gaze on the fixation point (i.e., not moving their eyes to the right or the left). Participants were required to name the color in which the different emotionally valanced words appeared on the computer screen while ignoring the meaning of the word. Stimuli were presented for 120 milliseconds in equal numbers into each visual field.

Total time for each trial varied between two and one half seconds and five seconds. Each trial began with the centrally presented fixation point ("+"), which remained on the screen for 500 msec. Following termination of the fixation point, during an interval of between 500 and 1500 msec, the stimulus was presented for 120 msec. In first experimental session the stimuli replaced the fixation point. In the second experimental session, the fixation point remained on the screen along with the 120 msec

presentation of stimuli in the LVF or RVF. Participants had three seconds in which to respond, if there was no response in the given time, the trial was considered incorrect. An interval of one second elapsed between the response and initiation of a next trial. Eye movements were monitored by the experimenter, a reminder mid-way through the session that the eyes were to remain on the fixation point was offered.

Time required to complete the computerized task was approximately twenty minutes. The experimenter remained in the room throughout the experimental procedure. Following administration of the emotional Stoop task, individuals were assessed for PTSD using the PDS. Debriefing then followed: participants were told that a portion of the words presented during the computerized task were presented subliminally or out of their conscious awareness. Prior to the participants leaving, each was given the opportunity to receive a brief summary of the results of the study by putting their name and address on a card. Each of the participants in the control group was thanked for her participation in the experiment and was assured that the experimenter would notify the professor of her participation in the experiment so that extra credit could be awarded. For participants in the other two groups, each was thanked for her participation and a monetary award of five dollars was given.

CHAPTER 4

RESULTS

Demographic Data

Descriptive statistics for demographic variables are presented in Tables 1 and 2 for the three groups: Posttraumatic Stress Disorder (RPTSD), Other Posttraumatic Stress Disorder (OPTSD), and Nonrape Control (NC). The groups were compared on a number of demographic variables using chi-square contingency analyses or Analysis of Variance (ANOVA). Comparison of the three groups yielded no statistically significant differences with respect to income, age, marital status, ethnicity, religion, and age. The three groups did, however, differ significantly with respect to education [(F (2,30) = 10.95, p = .0003] with the NC group having a significantly greater mean number of years of education (15.85 years) than either the OPTSD group or the NC group (14.10, 12.00 respectively).

Stroop Stimuli

Accuracy scores and reaction times (RTs) for emotional Stroop stimuli were submitted to a mixed factorial Analysis of Covariance (ANCOVA). Since analyses of the demographic data indicated that there was a significant difference in education between the three groups, Education was used as a covariate. While all the responses were used with accuracy scores analyses, only correct responses of less than 2 seconds were used in the statistical analysis of RTs. Overall, accuracy scores were high (M = 95 %) and

Table 1

Demographic Information Concerning Age, Income, and Educational Level

Variable		Group RPTSD	OPTSD	NC	F	p
Age	M	35.30	36.10	29.00	3.07	0.06
	SD	6.09	8.17	8.25		
Income	M	8812.50	17857.14	22772.73	1.96	0.16
	SD	4199.50	16446.16	18864.47		
Education	M	12.00	14.10	15.85	10.95	0.03*
	SD	2.11	1.45	2.15		

Note: RPTSD = Rape Posttraumatic Stress Disorder; OPTSD = Other Posttraumatic Stress Disorder; NC = Nontrauma Control.

*p< .05

analyses did not showed any significant differences; therefore, accuracy scores will not be reported for each study. All post-hoc analyses were carried out using the Tukey honest significant difference (HSD) test and a family-wise Type I error rate of .05. Geisser-Greenhouse adjustments (Geisser & Greenhouse, 1959) for degrees of freedom were used for the Word category factor due to the inherent violations of the repeated measures assumption of independence.

Table 2

Frequencies, Proportions and X^2 Concerning Ethnicity, Marital Status, and Religion

	Group							
	RPTSD		OPTSD		NC			
Variable	f	%	f	%	f	%	X^2	p
Ethnic Status								
Hispanic	1	3.0	1	3.0	1	3.0	6.24	.40
Black	3	9.0	0	0.0	1	3.0		
Caucasian	6	18.2	9	27.3	10	30.3		
Other	0		0		1	3.0		
Religious Affiliation								
Catholic	0	0.0	0	0.0	3	9.0	10.90	.09
Protestant	4	12.1	7	21.2	8	24.2		
Other	1	3.0	1	3.0	1	3.0		
None	5	15.2	1	3.0	1	3.0		
Marital Status								
Single	3	9.0	1	9.0	7	21.2	12.43	.13
Married	2	6.0	4	12.1	5	15.2		
Divorced	3	9.0	5	15.2	1	3.0		

Table 2 continued.

	Group					
	RPTSD		OPTSD		NC	
Variable	f	%	f	%	f	%
Widowed	1	3.0	0	0.0	0	0.0
Separated	1	3.0	1	00.0	0	0.0

Note: RPTSD = Rape Posttraumatic Stress Disorder; OPTSD = Other Posttraumatic Stress Disorder; NC = Nontrauma Control.

Subliminal Stroop Stimuli

For subliminally presented emotional Stroop stimuli, RTs were entered into a 3 X 4 mixed factorial ANCOVA with Group (OPTSD, OPTSD, NC) as the between-subjects factor, Word category (high threat, general threat, positive, neutral) as the within-subjects factor, and Education as a covariate. Mean RTs and standard deviations for the three groups and across all Word categories are presented in Table 3; the ANCOVA summary table is presented in Table 4. As seen from Table 4, the ANCOVA did not show any statistically significant results. Therefore, the first hypothesis stating that with subliminal presentations of rape-related threat stimuli, RPTSD individuals but not OPTSD and NC individuals would exhibit an interference effect, was not confirmed. Although there was a Stroop interference effect (i.e., the difference in mean RTs between

high threat and neutral words) of 23 msec for the RPTSD, the interference effect did not differ significantly from either of the other two groups.

Table 3

Mean Reaction Time and Standard Deviations in Milliseconds for the Three Groups on High Threat, General Threat, Positive, and Neutral Stimuli, Subliminal Foveal Conditions

		Group			
Word Category		RPTSD	OPTSD	NC	Mean
High Threat	M	638.20	558.89	492.11	563.07
	SD	178.34	120.14	95.34	
General Threat	M	665.10	577.92	500.73	581.25
	SD	161.94	122.01	105.20	
Positive	M	648.75	565.96	495.88	570.20
	SD	188.22	99.92	85.50	
Neutral	M	615.18	569.53	515.49	566.73
	SD	150.40	107.21	140.11	
Mean		641.81	568.08	501.06	

Note: RPTSD = Rape Posttraumatic Stress Disorder; OPTSD = Other Posttraumatic Stress Disorder; NC = Nontrauma Control.

Table 4

ANCOVA Summary Table for RTs for the Three Groups on High Threat, General Threat, Positive, and Neutral Stimuli, Subliminal Foveal Conditions

Effect	df Effect	MS Effect	df Error	MS Error	F	p
Group	2	85674.21	29	63115.81	1.36	0.27
Word	3	2003.39	90	2478.22	0.81	0.47
Word/Group	12	2319.96	90	2478.22	0.94	0.46

Supraliminal Foveal Stroop Stimuli

For supraliminal foveally presented emotional Stroop stimuli, RTs were entered into a 3 X 4 mixed factorial ANCOVA with Group (RPTSD, OPTSD, NC) as the between-subjects factor, Word category (high threat, general threat, positive, neutral) as the within-subject factor, and Education as a covariate. RTs and standard deviation for the three groups across Word categories are presented in Table 5; ANCOVA summary table is presented in Table 6. Analysis of RTs revealed a significant main effect of Word category [F (3, 90) = 6.17, p = .01]. Post hoc analyses indicated that the RTs for high threat words (679.83 msec) were significantly longer than for RTs for other Word

categories (general threat, 638.90; positive, 628.11; neutral, 619.50 msec) (see Table 5).

Table 5

Mean Reaction Time and Standard Deviations for the Three Groups on High Threat, General Threat, Positive, and Neutral Stimuli, Supraliminal Foveal Conditions

		Group			
Word Category		RPTSD	OPTSD	NC	Mean
High Threat	M	829.62	682.35	527.53	679.83
	SD	201.76	136.46	108.74	
General Threat	M	742.54	631.05	543.11	638.90
	SD	149.99	154.79	112.56	
Positive	M	731.15	616.30	536.86	628.11
	SD	161.41	163.30	123.13	
Neutral	M	721.55	594.91	542.05	619.50
	SD	124.03	162.57	133.25	
Mean		756.21	631.15	537.39	

Note: RPTSD = Rape Posttraumatic Stress Disorder; OPTSD = Other Posttraumatic Stress Disorder; NC = Nontrauma Control

There was also a significant interaction between Group and Word category [$F(6,90) = 2.68$, $p = .026$], presented in Figure 1. Post-hoc analyses indicated that the

RTs for high threat words were significantly greater (829 msec) than RTs for neutral words (721 msec) for the rape group ($p = .009$). Longer RTs for high threat words (682 msec) than for neutral words (594 msec) were also obtained for the OPTSD group, the difference, however, did not reach a level of significance ($p = .084$). There were also significantly longer RTs for high threat words (829 msec) than for the positive words (731 msec) for the rape group ($p = .03$), but not for other two groups. For NC group, there was no significant difference between high threat words (527 msec) and neutral words (542 msec). In terms of interference effect, the RPTSD group exhibited an interference effect with a magnitude of 108 msec, the OPTSD group showed an

Table 6

ANCOVA Summary Table for RTs for the Three Groups on High Threat, General Threat, Positive, and Neutral Stimuli, Supraliminal Foveal Conditions

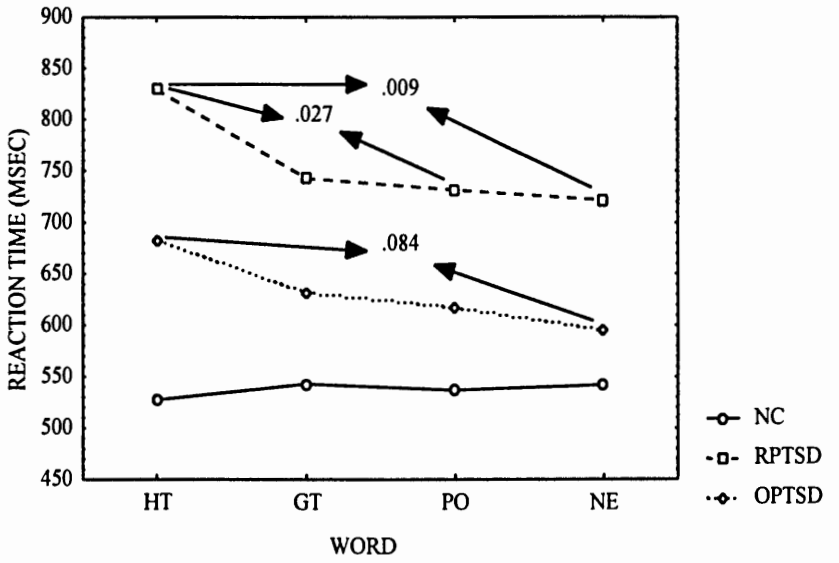
Effect	df Effect	MS Effect	df Error	MS Error	F	p
Group	2	180554.7	29	71103.6	2.54	0.11
Word	3	23178.7	90	3819.4	6.07	0.01*
Word/Group	6	10308.2	90	31395.7	2.70	0.03*

*p<.05

interference effect of 88 msec of interference, while the NC group did not show any interference effect.

Figure 1

Interaction between Group and Word category for supraliminal foveal Stroop stimuli (numbers in the figure represents p-values for comparisons between pairwise means)



Note: HT = high threat, GT = general threat, PO = positive, NE = neutral, NC = non-trauma control, RPTSD = rape related PTSD, OPTSD = other related PTSD

In order to simplify the interaction between Group and Word category factors, an additional analysis was performed on interference scores expressed as a difference in RTs between neutral words and the other three categories of words. The mean interference scores are presented in Table 7 and ANCOVA summary table in Table 8. ANCOVA indicated that there was a statistically significant main effect of Word [$F(2, 60) = 5.70$, $p = .005$]. Post-hoc analyses indicated that there was significantly more interference for high threat (60.30) than for general threat (19.40) or for positive words (8.60).

There was also a statistically significant interaction between Word category and Group [$F(2,60) = 2.65$, $p = .04$] (see Figure 2). Post-hoc analyses indicated that the interaction was primarily due to the different amount of interference between the three groups for the high threat words: the RPTSD group showed the greatest interference of 108 msec for high threat words, OPTSD group showed 87 msec of interference, while NC did not show any interference at all but, rather, a facilitation (-16 msec). The RPTSD group as well as OPTSD group showed a significantly greater amount of interference than the NC group. There was no significant difference in interference between RPTSD and OPTSD group.

In order to test the second hypothesis, which stated that the magnitude of the interference effect for subliminal presentations of rape related threat stimuli would be smaller than for supraliminal Stroop presentations, a repeated measure ANOVA was performed with Task (subliminal, supraliminal) and Word category (high threat, general threat, positive, neutral) as a within subject factors. ANOVA summary table is shown in

Table 9. Analysis revealed a significant main effect of Task [$F(1,9) = 9.57$, $p = .01$]. Post-hoc analyses indicated that the subliminal task was performed significantly faster (642 msec) than the supraliminal task (756 msec). Table 3 shows that there was a 23 msec interference effect for the subliminal task; Table 5 shows that there was a 108 msec of interference effect for supraliminal RPTSD. However, there was no significant

Table 7

Mean Interference Scores and Standard Deviations for the Three Groups on High Threat, General Threat, Positive, and Neutral Stimuli, Supraliminal Foveal Conditions

		Group			
Word Category		RPTSD	OPTSD	NC	Mean
High Threat	M	108.07	87.45	-14.52	60.30
	SD	128.03	47.06	43.14	
General Threat	M	20.99	36.14	1.06	19.40
	SD	129.18	72.32	80.10	
Positive	M	9.60	21.40	-5.19	8.60
	SD	83.87	69.92	58.06	
Mean		46.22	48.33	-6.20	

Note: RPTSD = rape related PTSD, OPTSD = other related PTSD

interaction between Word category and Task; thus, the second hypothesis stating that there should be less interference for subliminal than for supraliminal task was supported.

Table 8

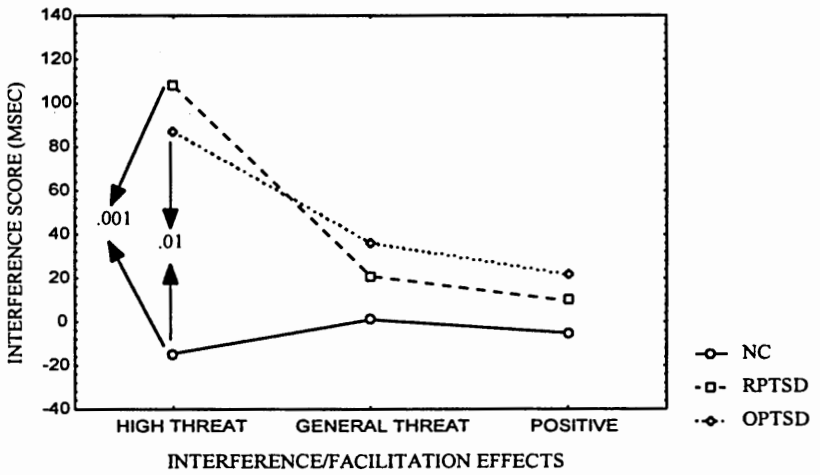
ANOVA Summary Table for Interference Scores for the Three Groups on High Threat, General Threat, Positive, and Neutral Stimuli, Supraliminal Foveal Conditions

Effect	df Effect	MS Effect	df Error	MS Error	F	p
Group	1	22902.42	29	12295.67	1.86	0.17
Word	2	24201.01	60	4243.16	5.70	0.01*
Word/Group	2	11231.71	60	31395.71	2.65	0.04*

*p<.05

Figure 2

Interaction between Group and Word category for supraliminal foveal Stroop stimuli between three groups (numbers in the figure represents p-values for comparisons between pairwise means)



Note: NC = non-trauma control, RPTSD = rape related PTSD, OPTSD = other related PTSD

Table 9

ANOVA Summary Table for RTs for the RPTSD Group on High Threat, General Threat, Positive, and Neutral Stimuli, for Subliminal and Supraliminal Foveal Tasks

Effect	df Effect	MS Effect	df Error	MS Error	F	p
Task	1	261767.41	9	27353.55	9.57	0.01*
Word	3	15080.55	27	5574.47	2.71	0.07
Word/Task	3	13977.79	27	31395.71	2.38	0.11

*p<.05

Lateral Stroop Stimuli

For laterally presented emotional Stroop stimuli, RTs were entered into a 3 X 4 X 2 mixed factorial ANCOVA with Group (RPTSD, OPTSD, NC) as the between-subjects factor and Word category (high threat, general threat, positive, neutral) and Visual field (left visual field - LVF, right visual field - RVF) as the within-subject factors; Education was the covariate. RTs and standard deviations for all three groups across all Word categories for both Visual fields are presented in Table 10.

ANCOVA revealed a only one significant interaction: between Group, Visual field and Word category [$F(6,90) = 2.61$, $p = .033$] (See Table 11). Post-hoc analyses did not indicate any significant pairwise comparisons. However, analyzing only the meaningful

comparison (i.e., comparing RTs for different word categories within one group for both visual fields), the planned comparisons indicated a significant interference effect in the left but not in the right visual field and only for the RPTSD group. In other words, the RPTSD group showed an interference effect (i.e., the difference in RTs between high threat and neutral words) of 73 msec for rape related stimuli presented in the LVF, and only a 10 msec interference effect for those presented in the RVF (see Table 10). These results provided support for the third hypothesis which predicted that for PTSD individuals, but not for non-PTSD and NCs, there would be a greater interference effect with LVF-right hemisphere presentations of rape-related threat stimuli than with RVF-left hemisphere presentations. There was an interference effect with high threat words presented to the LVF but not RVF for the RPTSD group. There was, however, a difference between the two visual fields with respect to the difference in RTs between general threat words and positive words as compared to neutral words. Results of this study did not confirm the last hypothesis that an interference effect for all stimuli, regardless of valence, would occur with LVF-right hemisphere presentations but not with RVF-left hemisphere presentations

Table 10

Mean Reaction Time and Standard Deviations for the Three Groups on High Threat, General Threat, Positive, and Neutral Stimuli, Lateralized Conditions: RVF-LVF

		Group			
RVF		RPTSD	OPTSD	NC	Mean
Word Category					
High Threat	M	778.75	625.78	598.21	667.58
	SD	168.24	136.77	195.61	
General Threat	M	721.18	646.93	564.79	644.30
	SD	111.56	160.32	176.81	
Positive	M	778.16	617.01	573.89	656.35
	SD	181.78	123.80	173.06	
Neutral	M	769.89	618.41	625.05	671.12
	SD	125.57	83.37	209.00	
Mean		762.00	627.03	590.49	
LVF					
Word Category					
High Threat	M	820.82	607.16	581.95	669.98
	SD	134.92	142.76	200.43	
General Threat	M	776.87	625.78	605.76	669.47
	SD	147.15	141.68	189.28	

Table 10 continued

Positive	M	719.02	631.51	577.55	636.69
	SD	126.67	143.11	179.42	
Neutral	M	748.36	640.55	592.87	660.59
	SD	113.98	143.08	190.81	
Mean		766.27	626.25	589.53	

Note: RVF = right visual field, LVF = left visual field, NC = non-trauma control, RPTSD = rape-related PTSD, OPTSD = other-related PTSD

Table 11

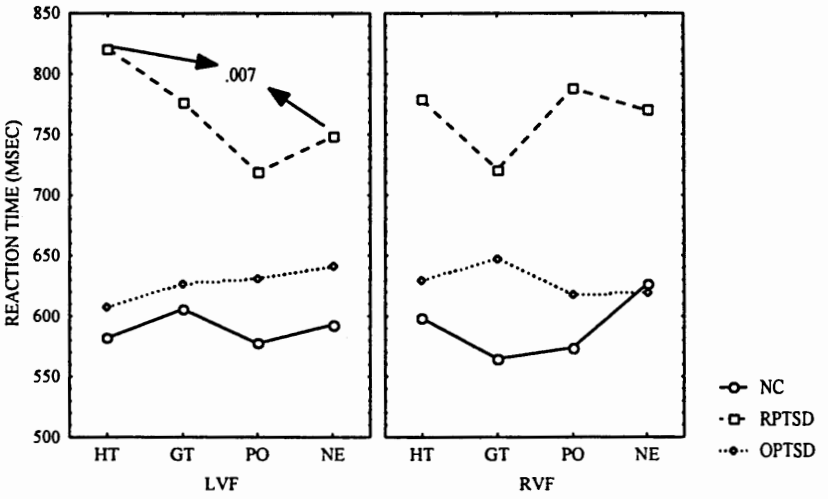
ANCOVA Summary Table for RTs for the Three Groups on High Threat, General Threat, Positive, and Neutral Stimuli, Supraliminal Lateralized Conditions

Effect	df Effect	MS Effect	df Error	MS Error	F	p
Group	2	369100.1	29	184475.6	2.01	0.15
VF	1	6.7	30	4358.2	0.01	0.99
Word	3	4480.5	90	31395.7	1.11	0.35
Group/VF	2	68.1	30	4358.2	0.01	0.98
Group/Word	6	6256.9	90	4061.1	1.54	0.18
VF/Word	3	5642.6	90	3839.4	1.47	0.23
Group/VF/Word	6	10033.1	90	3839.4	2.61	0.03*

Note: VF = visual field,; *p<.05

Figure 3

Interaction between Group, Visual field, and Word category (numbers in the figure represent p values for pairwise comparisons of means)



Note: RVF = right visual field, LVF = left visual field, NC = non-trauma control, RPTSD = rape-related PTSD, OPTSD = other related PTSD, HT = high threat, GT = general threat, PO = positive, NE = neutral

CHAPTER 5

DISCUSSION

Among the impaired cognitive features that are thought to play a role in the development and maintenance of Posttraumatic Stress Disorder (PTSD), is that of attentional biasing. Attentional biasing, the inability to ignore certain stimuli or to shift attention away from stimuli within the environment (internal or external) that have become associated with the traumatic event, was the focus of the current study. Two of the hypotheses that guided this study related to the notion that attentional biasing occurs in the absence of awareness and that processing of threat-related information occurs at an automatic, preconscious level (Mathews, 1990; Williams et al., 1988). Data from the current study, however, did not provide supportive evidence for attentional biasing toward threatening information in rape-related PTSD presented out of conscious awareness. Interference, as measured by the emotional Stroop task, with this clinical population did not reach a level of significance.

In the only other study using a version of the emotional Stoop task to examine the processing of preconscious material in clinical populations [depression and generalized anxiety disorder (GAD)], Mogg et al. (1993) found significant interference with general negative information presented subliminally with GAD patients. Mogg et al., however, found no such biasing with depressed patients when threatening, personally relevant

information was presented subliminally. Differential processing of information of personal concern between the two clinical groups in the Mogg et al. study plus findings from the current study suggest that a preattentive bias for processing of information related to personal concern may be psychopathology dependent; depressed and rape-related PTSD individuals exhibit no preattentive processing bias while GAD individuals do.

It should be noted, however, that an interference effect of 10 msec in the Mogg et al. study was found to be significant; whereas, an interference effect of 23 msec in the current study was not significant. The large degree of variability in responding in the RPTSD (rape-related posttraumatic stress disorder) group plus the relatively small sample size may account for the lack of significant findings.

The second hypothesis concerning subliminal presentations of emotional Stroop, stating that for RPTSD the magnitude of the color naming interference for subliminal presentations of rape-related threat stimuli would be smaller than for supraliminal Stroop presentations, was confirmed. Greater interference was associated with the supraliminal rather than the subliminal presentations. Mathews and MacLeod's notion of global processing at the subliminal level may explain these findings. Mathews and MacLeod's (1994) proposal that "early automatic (preattentive) analysis of emotional information is relatively global, and perhaps confined to classifying a stimulus as potentially threatening, but that subsequent processing becomes increasingly selective, favoring information that matches current concern" (p. 45).

Additional support for global processing at the subliminal level comes from findings in the current study that the amount of interference exhibited by rape-related PTSD when responding to different word categories (high threat, general threat, positive) of stimuli was approximately the same for each of the three groups (see Table 3). These findings parallel those found by Mogg et al. (1993). In each of the two negative word categories, Mogg et al. observed that the amount of interference exhibited by clinically anxious individuals at the preconscious level was approximately the same for each of the two negative word categories. For positive words, however, Mogg found no evidence of a processing bias with subliminal presentations.

Data from the supraliminally presented emotional Stroop stimuli showed a very robust Stroop interference effect that is in accordance with the two rape-PTSD studies (Cassidy et al., 1992; Foa et al., 1991) as well as with PTSD studies not specific to rape (Cassidy et al., 1992; Foa et al., 1991; Kaspi et al., 1995; McNally et al., 1990; McNally et al., 1993). Data provided additional supportive evidence that attentional bias exists in PTSD. RPTSD participants exhibited greater Stroop interference for rape-related, high threat words than for general threat, positive, or neutral words for foveal, supraliminal presentations. In addition, RPTSD participants exhibited greater Stroop interference for the rape-related, high threat words than did those whose PTSD was associated with trauma other than rape (OPTSD) and nonraped control (NC) participants, consistent with the findings of Cassidy et al. (1992) and Foa et al. (1991).

The emergence of a second clinical population (OPTSD) provided for some interesting comparison between the two PTSD groups. Of particular interest is that, despite the fact that participants in both groups had been raped and met the diagnostic criteria for PTSD, only the RPTSD group interference effect for the rape-related words reached a level of significance. Those whose PTSD was related to trauma other than rape, however, exhibited a similar, less pronounced, pattern of interference. The less pronounced interference may suggest that, although traumatized by rape, performance was less disrupted because the words they were to color name were not related to the immediate area of concern. This finding lends supportive evidence for the specificity of concern hypothesis (Cassidy et al., 1992; Foa et al., 1991; McNally et al.,1991; McNally et al., 1993); the cues specific to the individual's immediate concerns are more likely to divert the individual's attention.

Overall, the magnitude of interference effects (108 msec) noted in this study did not reach the level noted in other rape-related PTSD studies using threatening emotional Stroop stimuli (Cassidy et al., 1992 = 175 msec; Foa et al., 1991 = 400). The shorter duration for which the stimuli were displayed on the computer screen may account for this difference. Stimuli were displayed for 120 msec in the current study to accomodate the lateralized presentations; in the Cassidy et al. (1992) study, display time was 1.5 seconds and in the Foa et al. study the display time was until a response was made. The longer display time would more likely lead to either elaboration/rumination or avoidance/suppression, both characteristic symptomology of PTSD; thus, the delayed

response times. Future research may focus on the effects of exposure time on attentional biasing in relation to elaboration/rumination and avoidance/suppression.

Results from lateralized presentations of the emotional Stroop stimuli confirmed the hypothesis that for RPTSD individuals, but not for OPTSD and NCs, there would be a greater interference effect with LVF-right hemisphere presentations of rape-related threat stimuli than with RVF-left hemisphere presentations. In other words, with the RPTSD group, attention was significantly biased toward threatening material when presented to the right hemisphere. In contrast, attentional biasing was not noted when threatening information was presented to either hemisphere in the OPTSD and NC groups. The finding of significant interference for the LVF/ right hemispheric presentations are similar to the results of foveally Stroop stimuli, significant delays in color naming. Interference in the right but not the left hemisphere suggests that the right hemisphere plays a dominant role in attentional biasing in those with rape-related PTSD. Results of this study are consistent with findings of Rauch et al. (1996) who demonstrated through the use of PET imaging technology that there was greater right than left hemispheric activity associated with processing of threaten information in those with PTSD.

Differential processing of information, also known as hemispheric asymmetries, has been recognized in the normal brain with the right hemisphere showing an advantage for nonverbal functions, attention (Borod, 1992), and the evaluating the emotional significance of incoming information (van der Kolk, 1996). Left hemispheric advantage has been associated with verbal/linguistic functions. Recent trauma theorists have

proposed that with traumatic incidents there is a failure to successfully process the trauma with resulting disorganized, fragmented sensory and/or emotional cognitive representations of the traumatic event (Foa et al., 1995; Foa & Kozak, 1989; Foa & Riggs, 1993; van der Kolk, 1996). Based on the findings of their study, Rauch et al. (1996) further proposed that traumatic representations may be preferentially stored and processed in the right hemisphere.

These same trauma theorists proposed that recovery from the trauma requires additional processing of the trauma through repeated imaginal reliving of the trauma. According to Foa and Riggs (1993), repeated exposure to the traumatic event "decreases anxiety associated with these memories (via habituation) and thus enables reevaluation of the meaning representations in memory. The repeated reliving generates a more organized memory record that can be more readily integrated with existing schemas" (p. 296). Van der Kolk (1996), like Foa et al., suggests that the necessary component for recovery from the trauma and its succesful integration is the assignment of meaning to the emotional/sensory cognitive representations; so the trauma is translated into communicable semantic cognitive representations.

What was striking in the Rausch et al. (1996) study was marked inactivity of the left hemisphere, which functions to translate personal experiences into communicable language and the marked activity of the right hemisphere which functions to evaluate the emotional significance of incoming information. The imbalance of hemispheric involvement in the processing of the rape-related stimuli was also evident in the current

study with rape-related PTSD individuals; interference with rape-related PTSD occurred with threatenting material processed in the right hemisphere but not in the left hemisphere. This imbalance (i.e., hemispheric asymmetry) was noted only in the rape-related PTSD group. Additional research is needed to confirm the results of this study; however, if such hemisphere asymmetries exits in attentional biasing of high threat material, then the emotional Stroop task may be an appropriate noninvasive instrument to assess progress in treatment; less interference would reflect less attentional biasing, less hemispheric asymmetry, and would be assoicated with greater recovery from the trauma.

In terms of the right hemisphere emotionality hypothesis positing that the right hemisphere is involved in the expression and perception of all emotions, regardless of valence (Borod, 1992), there was evidence to support the hypothesis but only within the rape-related PTSD individuals. There was no evidence that either of the other two groups showed preferential processing of the emotional lateralized Stroop presentations (positive or negative) in the right hemisphere. A pattern of processing similar to that observed by Cassidy et al. (1992) in their study of rape-related PTSD individuals (foveally presented stimuli) emerged in this study but only occurred only with right hemispheric processing in the rape-related PTSD group. Both positive and negative stimuli, when processed in the right hemisphere, were associated with interference, and, as in the Cassidy et al. study, there was greater interference with negative (high threat) words than for positive words.

Clinical Implications

As noted, futher research is needed to replicate the results of this study. If the finding that no processing biases operate outside of conscious awareness is confirmed, then concern that cognitive and behavioral therapies only modify conscious cognitions and not the underlying preconscious biasing posed by Foa and McNally (1986) and Mogg et al. (1993) is not warranted. Foa and McNally and Mogg et al. suggested that there is little evidence that cognitive and behavioral therapies modify underlying processing biases. They posed the question of whether cognitive therapy is more effective in training people in how to cope with their anxiety symptomology rather than by removing the underlying cognitive biases. The importance of conclusive data related to preconscious processing cannot be overestimated in relation to the development of more effective assessment and treatment strategies with PTSD.

Although assessment of attentional biasing is not currently a common practice within the clinical setting, long-term, it may be that the type (the type of words eliciting the greatest interference) and degree of attentional biasing exhibited by a client may provide valuable information for the therapist in diagnosing and determining the best treatment approach for that particular individual. Implications for the use of the emotional Stroop task within the clinical setting are three fold. First, as McNally et al. (1990) recognized, the Stroop paradigm has value as a non-introspective assessement tool in the diagnosis of PTSD in that its relatively automatic and involuntary nature of responding (Williams et al., 1988) prevents subjective semantic processing that is possible with the usual self-

report intstruments. Second, the Stroop provides a means of detecting symptomatology in an individual who denies his/her symptoms, it can also be used as a means of detecting malingering. And third, it may be suitable for evaluating the effectiveness of therapeutic interventions designed to reduce attentional biasing.

Theoretical Implications

The results of this research are in accordance with notion proposed by trauma theorists that fragmented, disorganized cognitive trauma structures in PTSD individuals that result from the incomplete processing traumatic events are hypersensitive and selectively attentive to stimuli closely related to the trauma (Litz & Keane, 1989; Litz et al., 1996; Williams et al., 1996). RPTSD showed greater interference for words rape-related stimuli; other words did not produce interference.

The Cohen et al. (1990) connectionistic model of attentional biasing appears to be useful as an explanatory model for understanding the delayed color naming with the RPTSD group using the emotional Stroop stimuli. The model proposes that nonclinical individuals have the ability to override attentional bias toward threatening material (threatening words) so that the task (color naming) can be completed. This ability, as suggested by the Cohen model, was not evident in the RPTSD clinical population; latency in indicating the color suggests that the ability to override the tendency to attend to the threat-related stimuli was impaired. Williams et al. (1996) concurred with Mathews and MacLeod's (1994) suggestion that such a breakdown occurs when the

individual cannot expend the extra effort needed to override the attention towards the threat-related stimuli.

Research Implications

Given that PTSD individuals often experience intrusive cognitive activity without being able to identify triggering cues for their distress, further research related to the processing of traumatic information at both the subliminal and supraliminal level is needed to evaluate the role of attentional biasing in the psychyopathology of PTSD. Much of the research to date has focused on the circumstances under which attentional biasing takes place, an important issue for further research is to determine the actual underlying mechanisms involved in the processing of traumatic information (Williams et al., 1996) with respect to temporal and spatial determinants. Understanding of normal and pathological attentional processes with respect to the stage of information processing and the brain structures involved is needed. Determining such mechanisms requires the use of newer brain imaging techniques (e.g., event-related EEG, PET scanning, functional MRI).

Research into the use of emotional Stroop stimuli as an indicator of progress and outcome in the clinical setting is needed. Development and validation of the emotional Stroop stimuli designed specific to a particular disorder would be useful to the clinician in determining the effectiveness of interventions and in following the patient's progress.

Limitations of Study

The lack of representativeness of the groups may have compromised the external validity of this study. First, all participants were volunteers. According to Heppner, Kivlighan, Jr., and Wampold (1992), volunteers differ from nonvolunteers in that they generally are more intelligent, seek more stimulation, and have a higher need for social approval. The bias created by the sample limits the generalizability of the results to the population of rape-related PTSD individuals as a whole. Second, participants in the two clinical groups were recruited only from mental health treatment agencies and were currently in treatment; the restriction of recruitment to agencies where participants were in treatment, again, compromised the generalizability of results to all rape-related PTSD individuals. And third, the relatively small number of participants (N = 33) restricted the representativeness of the study as well. External validity, and hence, generalizability of results were compromised.

For the most part, each participant within the RPTSD and OPTSD groups, had experienced a number of traumatic events during her lifetime. Group placement (RPTSD or OPTSD) was based on the traumatic event which the participant indicated had been the most distressing for the past month. The psychological impact of the numerous traumatic events experienced by each participant may have confounded the results of the study in that there was no means of teasing apart the effects of one trauma over another.

Education level, although controlled for statistically, differed significantly between the groups and may have influenced the results of this study. In addition to educational level, future research may consider the impact of intelligence on attentional biasing with PTSD individuals. Level of intelligence may have influenced performance on the emotional Stroop task. The matching of groups for intelligence may have yielded more accurate results.

Choice of words within each category was determined by the number of letters in each word (limited to 5 letters for visual acuity in lateralized presentations) and after consultation with specialists in the area of psychological trauma. However, an idiographic word selection process (individuals indicating the level of distress elicited by a particular word) with members of each group may have offered a clearer distinction between the two threat groups and may have minimized the possibility of compromising the results.

To protect the confidentiality of participants, therapists at the various agencies were involved in the recruitment process by introducing the study to possible participants. The inclusion of additional people in the recruitment process is likely to have jeopardized the standardization of procedures. Although adequately instructed in the introduction of the study, there was a great possibility for the study to be misrepresented or introduced in a manner other than what the investigator had intended.

Conclusion

To date most studies have compared attentional biasing in PTSD to other emotion disorders and to normal controls (Cassidy et al., 1992; Foa et al., 1991; MCNally et al., 1993). Differences between the two PTSD groups noted in the current study suggest that additional research directed toward understanding differences in attentional biasing among PTSD populations with differing traumatic etiologies may be warranted. For example, in the current study, although individuals in each of the PTSD groups had been raped, the finding that only the rape-related PTSD group exhibited an interference effect for words that were rape-related has implications for future research into the role current concern plays in mediating attentional biasing of threatening information.

The finding that no processing biasing was exhibited at the subliminal level was inconsistent with previous research using different clinical populations. Further investigation to provide conclusive data around the unconscious processing of threatening information may provide greater understanding of the role of unconsciousness in the processing of emotional information in PTSD individuals.

As indicated previously, it is anticipated that, in the future, non-introspective tasks designed to evaluate attentional biasing and hemispheric asymmetries, such as the emotional Stroop design of the present study, will play an increasingly important role in the area of diagnostics and assessment of individuals with emotional disorders. It is also anticipated that the development of such tools will play a greater role in evaluating the effectiveness of clinical interventions in treatment.

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APPENDICES

APPENDIX A

Demographic/Screening Questionnaire

(rape victims)

Do **NOT** sign your name on this sheet. Please respond to each item by circling the appropriate letter or filling in the blank.

1. Age: _____ 2. Annual income: _____ 3. Ethnicity: _____

4. Highest degree earned/number of years of education _____
   (for example: high school = 12 years, bachelor = 16 years, graduate, if not graduated, give the number of years you attended school).

5. Marital status: _____ 6. Religious preference: _____

7. Do you consider yourself mostly right-handed, left-handed, or ambidextrous?

   Right Left Ambidextrous

8. Can you think of any situation in which you would use your non-preferred hand more than your preferred hand? (if Yes, please specify)

9. Which hand do you prefer to use to.....

Hand	Left Hand		Both	Right Hand	
	Always	Usually	Equally	Always	Usually
Draw?	____	____	____	____	____
Throw a ball?	____	____	____	____	____
Slice bread with a knife?	____	____	____	____	____
Strike a match?	____	____	____	____	____
Comb your hair?	____	____	____	____	____
Brush your teeth?	____	____	____	____	____
Cut with scissors?	____	____	____	____	____
Hold a spoon when eating?	____	____	____	____	____
Hammer something?	____	____	____	____	____

Hand	Left Hand		Both	Right Hand	
	Always	Usually	Equally	Always	Usually
Which hand did your father use for most of these activities?	_____	_____	_____	_____	_____
Your mother?	_____	_____	_____	_____	_____
Your brothers/sisters?	_____	_____	_____	_____	_____

10. Was anyone in your family ever forced to use their right hand?

Yes No

If yes, who?

11. Which foot do you prefer to kick with?

Left Always	Left Usually	Both Equally	Right Usually	Right Always

12. Which eye do you use when using only one?

Left Right

13. When you were very young, did you speak only English?

Yes No

If no, what other language(s) and what age were they learned?

14. Do you speak any other languages now?

Yes No

15. Do you or have you ever had any reading or learning difficulties?

Yes No

16. Do you have any problems with attention or concentration?

Yes No

If yes, please explain.

17. Were you born and educated in North America?

Yes No

18. Do you have any problems with your vision?

Yes No

If yes, are you wearing corrective lenses?

Yes No

19. Do you have any problems with your hearing?

Yes No

If yes, please explain.

20. Have you ever had any neurological or other disorders, such as encephalitis, epilepsy, birth defects, fractures to either of your hands, or polio, which affected your brain or the use of your hands?

Yes No

If yes, please explain.

21. Have you ever experienced seizures?

Yes No

22. Have you ever had a head injury or were unconscious?

Yes No

If yes, please explain. If unconscious, for how long?

23. Have you ever been raped?

Yes No

If yes, have you been raped more than one time?

Yes No

If yes, how long since the most recent assault? _____

24. As a participant in this study, can you think of any other information that may be helpful to us?

APPENDIX B

Demographic/Screening Questionnaire

(university students)

Do **NOT** sign your name on this sheet. Please respond to each item by circling the appropriate letter or filling in the blank.

1. Age: _____ 2. Annual income: _____ 3. Ethnicity: _____

4. Highest degree earned/number of years of education _____
   (for example: high school = 12 years, bachelor = 16 years, graduate, if not graduated, give the number of years you attended school).

5. Marital status: _____ 6. Religious preference: _____

7. Do you consider yourself mostly right-handed, left-handed, or ambidextrous?

   Right Left Ambidextrous

8. Can you think of any situation in which you would use your non-preferred hand more than your preferred hand? (if Yes, please specify)

9. Which hand do you prefer to use to.....

Hand	Left Hand		Both	Right Hand	
	Always	Usually	Equally	Always	Usually
Draw?	____	____	____	____	____
Throw a ball?	____	____	____	____	____
Slice bread with a knife?	____	____	____	____	____
Strike a match?	____	____	____	____	____
Comb your hair?	____	____	____	____	____
Brush your teeth?	____	____	____	____	____
Cut with scissors?	____	____	____	____	____
Hold a spoon when eating?	____	____	____	____	____
Hammer something?	____	____	____	____	____

Hand	Left Hand		Both	Right Hand	
	Always	Usually	Equally	Always	Usually
Which hand did your father use for most of these activities?	_____	_____	_____	_____	_____
Your mother?	_____	_____	_____	_____	_____
Your brothers/sisters?	_____	_____	_____	_____	_____

10. Was anyone in your family ever forced to use their right hand?

Yes No

If yes, who?

11. Which foot do you prefer to kick with?

Left Always	Left Usually	Both Equally	Right Usually	Right Always

12. Which eye do you use when using only one?

Left Right

13. When you were very young, did you speak only English?

Yes No

If no, what other language(s) and what age were they learned?

14. Do you speak any other languages now?

Yes No

15. Do you or have you ever had any reading or learning difficulties?

Yes No

16. Do you have any problems with attention or concentration?

Yes No

If yes, please explain.

17. Were you born and educated in North America?

Yes No

18. Do you have any problems with your vision?

Yes No

If yes, are you wearing corrective lenses?

Yes No

19. Do you have any problems with your hearing?

Yes No

If yes, please explain.

20. Have you ever had any neurological or other disorders, such as encephalitis, epilepsy, birth defects, fractures to either of your hands, or polio, which affected your brain or the use of your hands?

Yes No

If yes, please explain.

21. Have you ever experienced seizures?

Yes No

22. Have you ever had a head injury or were unconscious?

Yes No

If yes, please explain. If unconscious, for how long?

23. Have you ever been raped?

Yes No

If yes, have you been raped more than one time?

Yes No

If yes, how long since the most recent assault? _____

24. As a participant in this study, can you think of any other information that may be helpful to us?

APPENDIX C

Ishihara Pseudo-isochromatic Color Plates

Information regarding this copyright instrument may be

obtained by writing to:

Richmond Products

1021 S. Rogers Circle

Boca Raton, FL 33487

APPENDIX D

Posttraumatic Stress Disorder Symptom Scale

Information regarding this copyright instrument may be

obtained by writing to:

NCS Assessments

5605 Green Circle Drive

Minnetonka, MN 55343

APPENDIX E

Guidelines for Recruitment of Subjects

(rape victims)

Guidelines for Recruitment of Subjects

Thank you for your willingness to assist in the recruitment of participants for this research project. In bold print below, you will find a suggested method of introducing potential participants to the research I will be conducting. You may use this as a guide or read it as it appears below. It is important that individuals clearly understand:

- purpose of the study
- that participation is completely voluntary
- procedures/ questionnaires involved in participation
- their rights to discontinue the research at any time and for any reason
- assurance of their anonymity and confidentiality

Some research is taking place today at the Woman's Center that I wanted to let you know about. It's a study designed to look at how women who have been raped respond to stressful words compared to non-stressful words. The researcher hopes to better understand how women process the different types of words in their brains.

If you choose to participate, you will be asked to fill out two questionnaire with questions about yourself, you will also be asked to respond to some words and figures that will be presented to you on a computer screen. Some of the words that you will see on the computer relate to rape and may cause some distress. The time that it takes is about 40 minutes.

This study is completely voluntary. If you start the experiment and don't want to finish, you can tell the researcher and she will stop the experiment. I will not know whether you decided to participate. If you don't want to volunteer, it is okay with me. Unless you choose to tell, I won't know if you volunteered.

The research is taking place today at the Woman's Center. This sheet of paper explains the research and how you can volunteer. If you volunteer, you will receive $5.00 from the researcher.

Thank you again for your cooperation and help in this research project.

Sincerely,

Bonnie Lambourn

APPENDIX F

Guidelines for Recruitment

(university students)

Guidelines for Recruitment of Subjects

Thank you for your willingness to assist in the recruitment of participants for this research project. In bold print below, you will find a suggested method of introducing potential participants to the research I will be conducting. You may use this as a guide or read it as it appears below. It is important that individuals clearly understand:

- purpose of the study
- that participation is completely voluntary
- procedures/ questionnaires involved in participation
- their rights to discontinue the research at any time and for any reason
- assurance of their anonymity and confidentiality

Some research is being conducted that, if you choose to participate, you can receive extra credit. The research is designed to examine how women who have been raped respond to rape-related stress words as compared to non-stress related words. Information obtained from this study will help understand how women cognitively process such emotional words. If you volunteer for this study, you can receive extra credit. This is not the only means of receiving extra credit for this class, I will tell you other ways if you are unaware of the other options available.

You would be volunteering to be a part of the CONTROL GROUP (those who have not been raped) so that the information you give will be compared with those who have been raped. Only women, those <u>without</u> a history of rape or sexual abuse, those with normal color vision, who are right-handed, and have English as a first language qualify to participate in the study. If you choose to participate, you will be asked to fill out a questionnaire about yourself, you will also be asked to respond to some words (stress or non-stress) and figures that will be presented to you on a computer screen. The time required for your participation is approximately 40 minutes.

Your participation in this study is completely voluntary. You must bring a signed form from the researcher that you participated so I can give you extra credit. Neither your grade nor your standing with me will be jeopardized if you refuse to participate.

This announcement tells you about the experiment and how you can volunteer. The researcher is available in room number ____ of (name of building) to arrange a time for you to do the experiment.

Thank you again for your cooperation and help in this research project.

Sincerely,

Bonnie Lambourn

APPENDIX G

Announcement

(rape survivors)

Hi, my name is Bonnie Lambourn and I am doing some research that will help understand how women who have been raped react to stressful words and nonstressful words. I am inviting you to volunteer to be a part of the study.

If you decide to volunteer, you will be asked to answer some questions about yourself on two different questionnaires. You will also be asked to respond to some words that will be presented on a computer screen. Some of the words that you will see on the computer relate to rape and may cause some distress. The time that it takes is about 40 minutes.

Your participation in this study is completely voluntary. If you start the experiment and decide to stop, you can do so. Your refusing to participate will not effect your relationship with the Woman's Center. Unless you tell, no one at the Woman's Center will know if you participated. Only the researcher will know that you volunteered for the study. The answers that you give will be kept confidential. The fact that you participated in this study and the answers you give on the questionnaire will be kept confidential.

I am in Training Room C, here at the Woman's Center. If you come to that room, we can do the experiment or, if necessary, set up another time for you to do the research.

YOU WILL BE PAID $5.00 FOR YOUR PARTICIPATION.

APPENDIX H

Announcement

(university students)

Hi, my name is Bonnie Lambourn and I am conducting some research designed to examine how women who have been raped cognitively process rape-related stress words as compared to non-stress related words. I am inviting you to volunteer to participate in this study. You would be volunteering to be a part of the CONTROL GROUP (those who have not been raped) so that the information you give will be compared with those who have been raped. Only women without a history of rape or sexual abuse, who have had no close friend or relative raped, those with normal color vision, who are right-handed, and who have English as a first language qualify to participate in the study.

If you choose to participate, you will be asked to fill out a questionnaire about yourself, you will also be asked to respond to some words (stress or non-stress) and figures that will be presented to you on a computer screen. Some of the words that you will see on the computer relate to rape and may cause some distress. The time required for your participation is approximately 40 minutes.

Your participation in this study is completely voluntary; you can stop at any time during the procedure. If you volunteer for this study, you can receive extra credit in the class where the announcement was made. This is not the only means of receiving extra credit in your class, your instructor will tell you other available options if you are unaware of them. Neither your grade nor your standing with you instructor will be jeopardized if you refuse to participate.

I will be in room number ___ of _____ after your class and from __a.m. to __a.m. on _____ to conduct the experiment or to arrange a time for you to do the experiment.

APPENDIX I

Consent Form

(rape survivors)

TEXAS WOMAN'S UNIVERSITY
SUBJECT CONSENT TO PARTICIPATE IN RESEARCH
Cognitive Processing of Trauma Related Information in Victims of Rape
Researcher: Bonnie Lambourn-Kavcic, M.A., (817) 382-9133
Advisor: Linda Rubin, Ph.D. (817)898-2303

I, _____, agree to participate in a study designed to understand how women respond to trauma-related words compared to non-trauma- related words. The information obtained from this study will add to the understanding of how women process the different types of words in their brains.

I understand that I will complete a task at the computer that consists of identifying the color in which trauma-related and non-trauma-related words appear on the computer screen. I will also be asked to complete a questionnaire that asks for information about me and will be asked to respond to some questions asked by the researcher. Total participation time should be approximately 40-50 minutes.

I have been told that any information obtained in this study will be recorded with a code number so that my name is not associated with the information collected. All information that I give will be completely confidential. The fact that I volunteered for the study or didn't volunteer for the study will also be kept confidential. I understand that I will not be given my individual results and that only group data will be used in the study. The informed consent form and all other information collected will remain in a locked cabinet in the possession of the researcher for 5 years and, after that time, destroyed by shredding. Under these conditions, I agree that information collected in this research project may be used for possible publication and/or educational purposes.

I know that my participation in this study is completely voluntary. I realize that by volunteering I may lose some time that I would ordinarily use otherwise, I also realize that I may experience some degree of boredom, and I realize that exposure to the trauma words may cause some degree of emotional stress. I have also been told that I may stop participation in the study at any time and for any reason and that my stopping would not affect the services provided to me by The Woman's Center. The investigator will try to prevent any problem that could happen because of this research. I should let the researcher know at once if there is a problem and she will help me. I understand, however, that the Woman's Center does not assume responsibility for my participation or the consequences thereof. Neither the Woman's Center nor TWU will provide medical services or financial assistance for injuries that might happen because I am taking part in this research. If I decide to seek counseling, I can obtain the name of an agency from the researcher and I will be responsible for payment of the services.

If I have any questions about the research or about my rights as a subject, I should ask the researchers: their phone numbers are at the top of this form. If I have questions
later, or wish to report a problem, I may call the researchers or the Office of Research & Grants Administration at (817) 898-3377.

Participant	Date
Researcher	Date

APPENDIX J

Consent Form

(university students)

TEXAS WOMAN'S UNIVERSITY
SUBJECT CONSENT TO PARTICIPATE IN RESEARCH

Cognitive Processing of Trauma Related Information in Victims of Rape

Researcher: Bonnie Lambourn-Kavcic, M.A., (817) 382-9133
Advisor: Linda Rubin, Ph.D. (817)898-2303

I, _____, agree to participate in a study designed to understand how women respond to trauma-related words compared to non-trauma- related words. The information obtained from this study will add to the understanding of how women process the different types of words in their brains.

I understand that I will complete a task at the computer that consists of identifying the color in which trauma-related and non-trauma-related words appear on the computer screen. I will also be asked to complete a questionnaire that asks for information about me and will be asked to respond to some questions asked by the researcher. Total participation time should be approximately 40-50 minutes.

I have been told that any information obtained in this study will be recorded with a code number so that my name is not associated with the information collected. All information that I give will be completely confidential. The fact that I volunteered for the study or didn't volunteer for the study will also be kept confidential. I understand that I will not be given my individual results and that only group data will be used in the study. The informed consent form and all other information collected will remain in a locked cabinet in the possession of the researcher for 5 years and, after that time, destroyed by shredding. Under these conditions, I agree that information collected in this research project may be used for possible publication and/or educational purposes.

I know that my participation in this study is completely voluntary. I realize that by volunteering I may lose some time that I would ordinarily use otherwise, I also realize that I may experience some degree of boredom, and I realize that exposure to the trauma words may cause some degree of emotional stress. I have also been told that I may stop participation in the study at any time and for any reason and that my stopping would not affect the services provided to me by The Woman's Center. The investigator will try to prevent any problem that could happen because of this research. I should let the researcher know at once if there is a problem and she will help me. I understand, however, that the Woman's Center does not assume responsibility for my participation or the consequences thereof. Neither the Woman's Center nor TWU wi ll provide medical services or financial assistance for injuries that might happen because I am

taking part in this research. If I decide to seek counseling, I can obtain the name of an agency from the researcher and I will be responsible for payment of the services.

If I have any questions about the research or about my rights as a subject, I should ask the researchers: their phone numbers are at the top of this form. If I have questions later, or wish to report a problem, I may call the researchers or the Office of Research & Grants Administration at (817) 898-3377.

_____	_____
Participant	Date
_____	_____
Researcher	Date