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Health Anxiety and Cognition: Chronic Awareness of Health Concerns or Situational Activation of Latent Dysfunctional Assumptions About Illness?

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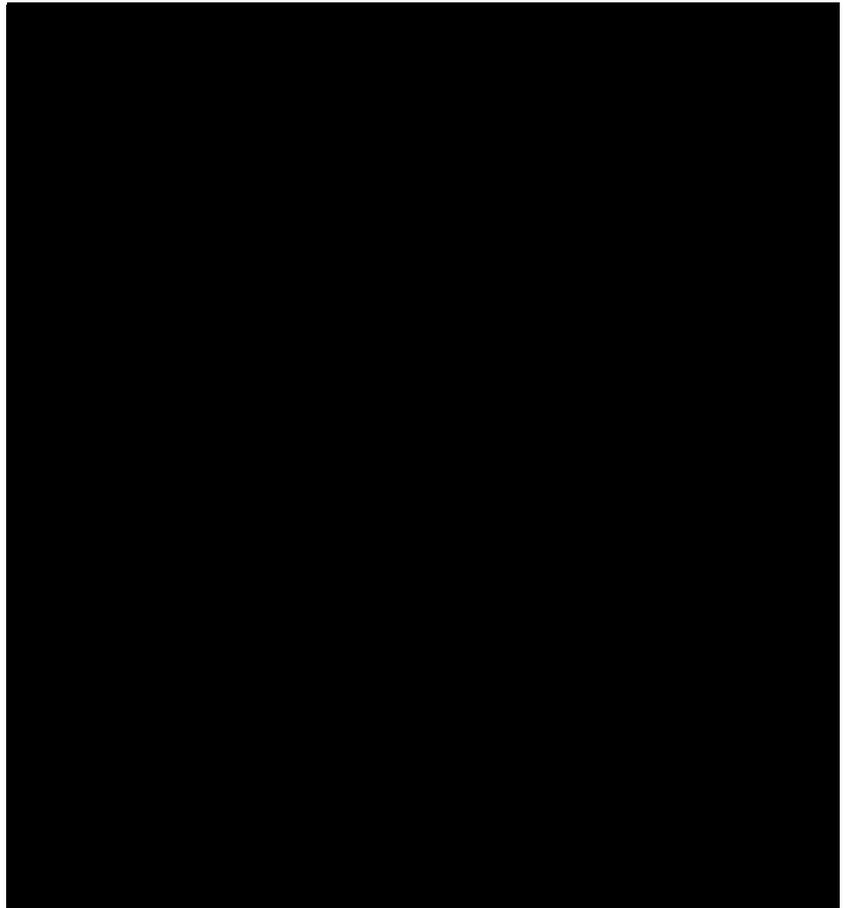
HEALTH ANXIETY AND COGNITION: CHRONIC AWARENESS OF HEALTH
CONCERNS OR SITUATIONAL ACTIVATION OF LATENT DYSFUNCTIONAL
ASSUMPTIONS ABOUT ILLNESS?

by

Desmon Craig Mitchell

A Dissertation
Submitted to the Graduate Studies Office
of The University of Southern Mississippi
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

Approved:



August 2008

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The University of Southern Mississippi

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ABSTRACT

HEALTH ANXIETY AND COGNITION: CHRONIC AWARENESS OF HEALTH CONCERNS OR SITUATIONAL ACTIVATION OF LATENT DYSFUNCTIONAL ASSUMPTIONS ABOUT ILLNESS?

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August 2008

Rationale: This study investigated if health anxious individuals have chronically aroused illness-related concerns or if these concerns remain latent, only to be activated when first primed by illness-related stimuli. To test these alternatives this study examined whether participants, with varying levels of health anxiety, differed as to their (a) performance on an emotional Stroop task that included health-related words, (b) memory tasks (free recall and recognition tasks), and (c) the participants' dream content, after either being exposed, or not exposed, to an illness-related trigger. *Hypotheses:* If illness concerns are chronically activated in health anxious individuals, then participants will perform worse on the Stroop task, remember more illness-related words on the memory tasks, and have more dreams about illness than the non-health anxious participants, regardless of priming. However, if these concerns are latent, then the health anxious participants will only perform worse on the Stroop, remember more illness-related words, and have more illness-related dreams, after the priming. *Method:* After listening to either an excerpt of an illness-related story (n=85), or an excerpt from a story not dealing with illness (n=85), participants completed the emotional Stroop task, followed by a free recall task, and then a recognition task. Participants also recorded their dreams two nights prior to listening to the assigned excerpt and on the night following listening to the excerpt to determine the

influence that priming might have on dreaming. *Results:* Performance on the Stroop task was not significantly related to either group designation or to the participants' level of health anxiety. Similarly, illness-related dream content and performance on the recall task were also not significantly related to these factors. Participants with higher levels of health anxiety, regardless of group designation, made more false positive responses to illness-word stimuli during the recognition task, but this was also true for all the other word categories as well. *Discussion:* Additional research is needed to help clarify differences between these results and the results from similar studies investigating attention, memory, and other cognitive factors in health anxiety.

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CHAPTER I

INTRODUCTION

According to the current Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR, American Psychiatric Association, 2000), individuals are identified as having hypochondriasis if they believe that they have a medical illness/disease when no physical pathology exists that could account for these beliefs. Although relatively few individuals meet the diagnostic criteria for hypochondriasis, Looper and Kirmayer (2001) have hypothesized that hypochondriacal/health anxiety concerns exist on a continuum ranging from mild concerns to clinically significant fears (hypochondriasis). Because even subclinical levels of health anxiety may cause significant impairment and distress (Owens, Asmundson, Hadjistavropoulos, & Owens, 2004), the present study examined these concerns in a college population.

Cognitive and perceptual factors appear to play a role in health anxiety because health anxious individuals tend to believe they are ill after misinterpreting physiological symptoms and signs as being indicative of illness (Hitchcock & Mathews, 1992). In fact, research has indicated that these factors play a part in both the development and maintenance of health anxious tendencies (e.g. Hadjistavropoulos, Hadjistavropoulos, & Quine, 2000; Haenen, de Jong, Schmidt, Stevens, & Visser, 2000; Hitchcock & Mathews, 1992).

Health anxious individuals are apprehensive about illness and these concerns can be largely attributed to the dysfunctional health and illness beliefs that these individuals hold (e.g. Hadjistavropoulos et al., 2000). For example, health anxious individuals tend to overestimate the frequency of serious illness (Marcus, 1999) and believe that they are

more likely to become ill than individuals with fewer health concerns (Hitchcock & Mathews, 1992). However, it is unclear if these concerns are chronic and cause health anxious individuals to have persistent self-focused concerns about their health, similar to the unremitting worry seen in generalized anxiety disorder. Alternatively, Salkovskis and Warwick (1986; Warwick, 1989; Warwick & Salkovskis, 1990) have proposed that these concerns may need to be triggered by external and/or internal stimuli before becoming active, similar to the triggering events thought to precede panic attacks in panic disorder (Barlow, 2002; Clark, 1986).

The present study was designed to investigate if health concerns in health anxious participants are more chronic in nature, or if these concerns need to be triggered by activating events before becoming active. Accordingly, participants completed an emotional Stroop task that included health-related words, two memory tasks (free recall and recognition tasks), and recorded the content of their dream(s) after either listening to an illness-related story (activating event) or a story not related to illness.

If illness concerns are chronically activated in health anxious individuals, then they should perform worse on the Stroop task, remember more illness-related words on the memory tasks, and have more dreams about illness than the non-health-anxious participants, regardless of priming. However, if these concerns remain latent until they are triggered, then the health anxious participants would only perform worse on the Stroop task, remember more illness-related words, and have more illness-related dreams, only after the activating event.

CHAPTER II

PREFERRED ATTENTION ALLOCATION

Chronic Awareness of Illness Concerns

Cioffi (1991) hypothesized that health anxious individuals may consciously attend to health-related information, or they may be more indirectly motivated to attend to this type of information, than less health anxious individuals. In other words, health anxious individuals may be more aware of health and illness-related issues in their lives (chronic awareness) because they intentionally seek out this information. Additionally, however, these same individuals may chronically attend to health-related information because their cognitive systems are sensitive to this type of information.

Findings from research investigating the cognitive processing of health anxious individuals appear to support the idea that health anxious individuals are chronically aware of health-related information without having to be primed to attend to this information. For example, on self-report measures, participants with higher levels of health anxiety report that they; (a) worry more about their overall health, (b) are more concerned about becoming ill or getting injured, (c) place more importance on their physical health and physical appearance (Barsky & Wyshak, 1989), (d) have more health-related goals (Karoly & Lecci, 1993; Lecci, Karoly, Ruehlman, & Lanyon, 1996), (e) have inflated/exaggerated beliefs regarding their risks and vulnerabilities to certain illnesses and diseases (Barsky et al., 2001), and (f) judge ambiguous physiological symptoms more negatively (Haenen, de Jong, Schmidt, Stevens, & Visser, 2000) than individuals with less health anxiety. Additionally, as will be reviewed later, support for

the idea that health concerns are chronically activated in health anxious individuals has also been found in research using the emotional Stroop task.

Priming Latent Dysfunctional Assumptions

An alternative to the assumption that health concerns in health anxious participants are chronically activated has been proposed by Salkovskis and Warwick (1986). Their model is similar to the cognitive models of panic disorder set forth by Clark (1986) and Barlow (2002). The central premise of this model is that individuals with health anxiety maintain several dysfunctional assumptions and beliefs in regard to their physical well-being and these dysfunctional assumptions and beliefs play a causal role in the development of health anxiety concerns. Namely, health anxious participants misinterpret bodily sensations as being signs of illness leading to an increase in anxiety in these individuals. In turn, this increase in anxiety confirms for the health anxious individuals their illness concerns (Marcus, 1999).

According to Salkovskis and Warwick (1986), these dysfunctional beliefs remain latent until they are “triggered” by activating event(s). These activating events can include any situation/event where the attention of the individual becomes focused on health concerns. For example, according to Marcus (1999) an activating event could include such things as: hearing/reading about illnesses or illness-related words, being exposed to media reports about illnesses, or increased awareness of bodily fluctuations and sensations, etc.

Once these latent dysfunctional assumptions and beliefs are triggered in health anxious individuals, they result in self-focused automatic thoughts about health and illness concerns. Salkovskis and Warwick (1986) believe that as a result of this

automatic cognitive processing, individuals with health anxiety become even more anxious about their health, and will also attend more to health-related stimuli. Research investigating this proposition has provided mixed results.

For example, Hadjistavropoulos, Craig, and Hadjistavropoulos (1998) activated the health concerns of their participants by telling them that they would experience pain during a simulated medical procedure. Hadjistavropoulos et al. found that high-health anxious participants experienced much more distress and difficulties during the simulated procedure when compared to participants with lower levels of health anxiety.

Similarly, Hadjistavropoulos, Hadjistavropoulos, and Quine (2000) told participants, before a 45 minute physiotherapy session, that they should either: 1) attend to all their physical sensations, 2) ignore or avoid monitoring their physical sensations, or 3) complete the session as they normally would. After being made more aware of bodily sensations, health anxious participants attended more to their physical sensations and became more concerned about their physical well-being (worries about suffering an injury), than participants with lower levels of health anxiety.

Conversely, Marcus (1999) was unable to find support for the assertion that health concerns need to be triggered in health anxious individuals before becoming active. Marcus asked participants to complete a scrambled-sentences task that used either illness terms or more ambiguous/neutral terms. The illness terms did not trigger higher levels of anxiety in individuals with more health anxiety concerns (as measured on the IAS). Research using the emotional Stroop task has also provided mixed results for the idea that health concerns can be situationally activated in health anxious participants.

CHAPTER III

EMOTIONAL STROOP TASK

Health anxious individuals may attend more (attentional bias) to health-related information than less health anxious participants (e.g. Barsky & Klerman, 1983; Karoly & Lecci, 1993; Kellner, 1986; Lecci, Karoly, Ruhlman, & Lanyon, 1996). The emotional Stroop task is an example of a cognitive task that was developed to study the preferred attention allocation of individuals (Williams, 2004). According to Lecci and Cohen (2007), the emotional Stroop task is one of the most common tools used to document attention bias.

This task entails presenting various words to participants in several different colors, and requires the participants to attend to the color in which words are presented and ignore the content of each word. In other words, according to Lecci and Cohen (2002), “participants differing on a given affective trait are asked to name the ink color of both affectively and nonaffectively valenced words, with the response latency functioning as the dependent variable” (p. 148). Increased color-naming latencies on this task are thought to represent interference caused by individuals attending to the meaning of the word (Lecci & Cohen, 2007; Owens et al., 2004).

Prior research has indicated that the color-naming latencies of anxious individuals are increased when they are presented with syndrome-specific target words. For example, relative to control participants, Hope, Rapee, Heimberg, and Dombeck (1990) found that individuals with social anxiety showed response latencies when presented with social threat stimuli for words like “embarrassed”, “rejected”, and “foolish”. These same color-naming latencies have also been noted among individuals with general anxiety

disorder for anxiety-provoking words (e.g. “worry”, “concern”, “anxious”) (Mogg, Mathews, & Weinman, 1989), individuals diagnosed with panic disorder (e.g. “panic”, “collapse”, “dizzy”) (McNally, Riemann, & Kim, 1990), and individuals with symptoms of posttraumatic stress disorder (e.g. “fear”, “threat”, “trauma”) (Kaspi, McNally, & Amir, 1995). More importantly for the present study, this same effect has been noted among health anxious individuals.

Chronic activation of health concerns

Owens, Asmundson, Hadjistavropoulos, and Owens (2004) found support for the assumption that health concerns in health anxious participants are chronically activated. These researchers hypothesized that participants with higher levels of health anxiety, as measured on the Illness Attitudes Scale (IAS; Kellner, Abbott, Winslow, & Pathak, 1987), would be more likely than those with lower levels of health anxiety to exhibit response latencies when presented with illness-related words during the emotional Stroop task. Participants were presented with 40 stimulus words: 10 illness-related words, 10 negative words, 10 positive words, and 10 neutral words during the Stroop task. Owens et al. found that participants with higher levels of health anxiety were significantly slower than less health anxious participants to name the color of illness-related stimuli. This appears to indicate that more health anxious participants paid greater attention to illness-related stimuli. In turn, this attentional bias interfered with the participants’ ability to promptly identify the color of the stimuli.

Related to this finding, Lim and Kim (2005) reported a similar attention bias among somatoform patients on the emotional Stroop task. Participants in this study consisted of healthy control participants or individuals diagnosed with either major

depressive disorder, panic disorder, or somatoform disorder. During the Stroop task the participants were exposed to 30 physical threat words, 30 positive words, 30 negative words, and 30 neutral words. Lim and Kim found that in comparison to the healthy controls, participants in the somatoform group showed significant response latency for color-naming the physical threat words. This finding appears to indicate that individuals with more bodily concerns and/or health anxiety have an attentional bias toward illness-related information, and that this can occur without participants being primed to attend to this type of information.

As part of their study, Williams, Wasserman, and Lotto (2003) asked participants to rate their physical health, before requiring approximately half of their participants to write a narrative about their most recent illness episode (priming task). Then using the Stroop task these researchers presented 28 illness words and 28 non-illness words to their participants. Participants who assessed their health more negatively had increased response latencies when presented with illness words in comparison to individuals who rated themselves as being healthier. This effect was found regardless of whether these individuals were exposed to the priming task. Instead of providing support for Salkoviskis and Warwick's model, these findings appear to indicate that individuals with health concerns and/or anxiety have more chronic health concerns. Although Williams et al. did not find support for Salkoviskis and Warwick's model other researchers have.

Priming of health concerns

In two different studies (2002, 2007), Lecci and Cohen found support for Salkoviskis and Warwick's model. In their first study (2002), Lecci and Cohen used a modified Stroop task consisting of 40 illness-related words and 40-neutral words. During

each trial, participants were presented with a stimulus word written a single ink color (white) that named several different colors: red, blue, purple, green, and yellow. After the stimulus word was presented to participants, a target word (illness-related or neutral words) was presented to them in a random order, and they were required to identify if the ink color of the target word was the same as the color identified by the stimulus word. In essence, to do well at this task, initially, the participants were required to attend to the meaning of the stimulus word, while ignoring the color of the ink in which it is presented. However, during the presentation of the target word, the participants were required to attend to the color of the ink and ignore the content of the word. During each trial, the reaction time for each response was recorded.

These researchers assigned undergraduate volunteers to either the experimental condition, where they received a brief medical exam (priming stimulus), or to the control condition where they did not receive the exam. As part of the medical exam, participants were asked questions about their health history, and their pulse and blood pressure was then recorded. After these physiological measures were recorded, the participants in the experimental condition were told that, although their pulse was normal, their blood pressure was “dangerously high” (p. 149). After the participants in the experimental condition received this feedback, the emotional Stroop task was administered.

Participants with higher levels of health anxiety, as measured on the Whiteley Index (WI; Pilowsky, 1967), performed worse on the Stroop task when compared to individuals with less health anxiety. However, this effect was found only for the health anxious participants in the experimental group, but not for health anxious participants in the control condition. These findings provide support for the concept that health anxious

individuals have dysfunctional assumptions about health and illness, but these assumptions remain latent until they are activated by a priming event.

Lecci and Cohen (2007) also conducted a study assessing Stroop interference for anthrax-related words. This study was conducted shortly after a threat of bioterrorism (anthrax) had occurred in the United States in 2001, which was believed by these researchers to be a naturally-occurring priming event. The participants ($N=328$) rated how likely they felt that they could become infected with anthrax. Then they rated the likelihood that someone similar to them could also become infected. Next, they read an anthrax fact sheet and answered items on a questionnaire regarding the fact sheet prior to being administered the Stroop task containing 40 anthrax-related words and 40 neutral words. Lecci and Cohen found that more health anxious participants, as assessed on the Somatosensory Amplification Index (SAMPI, Barsky, Wyshak, & Klerman, 1990), had greater response latencies to the anthrax-related words on the Stroop task than less health anxious participants. These findings appear to indicate that health concerns can be primed in health anxious participants. Additionally, they may indicate that health anxious individuals are more susceptible to being influenced by priming events than individuals with fewer health concerns.

As has been reviewed, researchers have found that, when using health-related words on the emotional Stroop task, health anxious participants had greater response latencies than less health anxious participants (Lecci & Cohen, 2002; 2007; Lim & Kim, 2005; Owens et al., 2004; Williams et al., 2003). Most researchers have found increased response latencies without exposing their participants to a triggering stimulus (Lim &

Kim, 2005; Owens et al., 2004; Williams et al., 2003), which supports the idea that health anxious individuals are chronically aware of health-related information.

In contrast, Lecci and Cohen (2002) found response latencies among their health anxious participants exposed to a triggering stimulus, but not among the health anxious participants not exposed to priming. Additionally, Lecci and Cohen (2007) also found increased response latencies among health anxious individuals after exposure to an activating event. These findings support the idea that individuals with health anxiety concerns have latent dysfunctional assumptions that can be primed and produce interference effects on the Stroop.

The present study was designed to help clarify these conflicting findings somewhat. Notably, health anxious participants were assigned to either primed or non-primed conditions and their Stroop performance assessed. It was thought that if illness concerns were chronically activated in participants with health anxiety concerns, then these individuals would perform worse on the Stroop task than participants with fewer concerns in this domain, regardless of priming. However, if these concerns remain latent until they are primed, then the participants with more health anxiety would only perform worse on the Stroop after priming occurred.

CHAPTER IV

MEMORY BIASES

In addition to possible attentional biases, memory biases for health-related information may be present in health anxious participants (e.g. Lecci & Cohen, 2002). The free recall task and the recognition task are cognitive tasks commonly used in research to assess participants' memory of events or information. Typically, participants are not told that they will be asked to remember events or information presented during the experimental task. Therefore, when participants are asked about what they remember about a particular task, answers provided on both tasks allow researchers the opportunity to assess for potential memory biases among participants (Brown et al., 1999).

The free recall task typically entails allowing participants to recall as many of the target variables as they can within a given time frame without receiving any sensory cues about the desired variables (Lim & Kim, 2005). For example, participants are routinely asked to name or write as many of the target variables as they can during a specified amount of time. Conversely, recognition tasks provide cues that may help the participant choose the correct response (Lim & Kim, 2005). For instance, participants may be provided with multiple response choices and asked to pick the correct response. A recognition task is generally considered to require less cognitive effort than a free recall task (Lim & Kim, 2005).

Prior research investigating memory biases among individuals with various anxiety disorders, after exposure to syndrome-specific threat words or events, has produced conflicting findings. Support has not been found for the idea that memory biases occur among individuals with social phobia (Coles & Heimberg, 2005) or

obsessive-compulsive disorder (Dirson, Bouvard, & Cottraux, 1995) either on recall tasks or recognition tasks. On the other hand, memory biases have been noted among individuals with panic disorder (Cloitre & Leibowitz, 1991), generalized anxiety disorder (Friedman, Thayer, & Borkovec, 2000), and post-traumatic stress disorder (Zeitlin & McNally, 1991) on at least one of these tasks. More importantly for the present study, similar memory biases have been found among individuals with health anxiety on these tasks (Brown et al., 1999; Ferguson, Moghaddam, & Bibby, 2007; Hitchcock & Mathews, 1992; Lim & Kim, 2005; Pauli & Alpers, 2002). Health anxious participants typically remember more health-related stimuli than participants with less health anxiety indicating a memory bias for health-related stimuli.

Participants in Hitchcock and Mathews' (1992) study read several random sentences containing illness and non-illness related words. After reading these sentences, the participants were presented with stimulus words and were asked to identify if the given stimulus word had appeared in the preceding sentences. The participants with more health anxiety, as assessed on the IAS, were able to correctly identify more of the illness-related words than less health anxious participants, but the performance of the two groups was similar for non-illness related words.

Ferguson, Moghaddam, and Bibby (2007) found that participants with greater health anxiety, as assessed on the WI and the SAMPI, had a better memory for health-related words than non-health anxious participants. Ferguson et al. presented participants with health-related words and non-health-related words on a computer screen and recorded how quickly each participant responded to the given words. The more health anxious participants responded quicker to the health-related words than less health

anxious participants. After completing this task, participants completed a free recall task followed by a recognition task. Health anxious participants remembered more health-related words than less health anxious participants on both tasks.

Pauli and Alpers (2002) found a similar memory bias toward remembering health-related information among health anxious participants. Their participants were presented with word-sets consisting of positive words, negative words, pain-oriented words, and neutral words. The health anxious participants, as measured on the WI and IAS, showed an enhanced immediate recall of pain words. In addition, during a recognition task conducted later, these participants made more false identifications of pain words (i.e. the participants incorrectly stated that they had seen a stimulus word that was not presented earlier).

Brown, Kosslyn, Delamater, Fama, and Barsky (1999) found that health anxious participants, as assessed on the IAS and the WI, showed a similar memory bias toward health-related information. Participants read aloud visually degraded words (health-related and non-health-related words) from a computer screen. This task was followed by an explicit memory task where participants saw the words again, in their non-degraded form, and rated how familiar (recognition) they were with each word. After the memory task, participants listed (recall) as many words as they could from the preceding tasks. Health anxious participants recognized more health-related words than non-health related words during the recognition task. In addition, in comparison to participants with fewer health concerns, health anxious participants correctly recalled more health-related words than less health anxious individuals.

After administering the emotional Stroop task to participants, Lim and Kim (2005) found that participants with somatoform disorder recalled significantly more physical threat words, on a free-recall task, than the other groups of participants. In addition, Williams et al. (2003) also assessed participants on a free recall task and found that health anxious participants showed a memory bias for illness-related words. For Williams et al. this occurred in both primed and non-primed experimental groups. Again, these findings provide support for the idea that health anxious individuals have a memory bias toward remembering health-related information.

Because all of the available research has shown some memory biases for health-related information among health anxious participants, this same effect was expected in the present study. In addition, because memory biases were found among participants even without being exposed to a priming task, memory biases were expected among health anxious participants regardless of the experimental condition they were assigned to. In other words, health anxious participants were expected to both recall and recognize more health-related words than less health anxious participants regardless of prior exposure to a priming task. Health anxious participants were also expected to make more false positive responses on the recognition task than participants with less health anxiety regardless of the experimental condition they were assigned to.

CHAPTER V

DREAM CONTENT

Health anxious individuals' dream content has never been studied experimentally. However, in the past, researchers have examined the dream content of individuals with several psychological disorders in order to better understand the psychological processes that may be contributing to their disorder(s). Much of this research was based on Beck's (1964) research using dreams. Beck believed that dreams are a form of automatic cognitive processing that can involve irrational automatic thoughts and cognitive distortions (schemas). Accordingly, Beck believed that these distortions could be identified by examining an individual's dream content. Beck believed that the dream content (schemas) of individuals with specific disorders, or with specific problems, would follow unique patterns thereby differentiating one group of individuals from others.

Beck's theory of dream content has received experimental support. For example, over the course of 20 nights, Beck and Hurvich (1959) investigated the manifest dream content of 6 depressed women, and 6 women who were not depressed, for "masochistic" (p. 50) dream content. Masochistic dream content was identified by these researchers as being any dream content where the dreamer had a) unpleasant affect (feeling bad, guilt, sad, hurt, etc.) during the dream, b) dream content where the dreamer was crying or sobbing during the dream; and/or c) dream content that contained an unpleasant experience for the dreamer (feeling deprived, disappointed, mistreated, excluded, rejected, etc.). In support of their hypothesis, Beck and Hurvich found that the depressed

women had a higher frequency of masochistic dream content in comparison to the non-depressed women.

In a follow-up study, Beck and Ward (1961) again found that the dreams of depressed individuals could be differentiated from non-depressed individuals based on the masochistic content of their dreams. Participants in this study were assigned to one of four depression-severity categories: none, mild, moderate, and severe based on a clinical evaluation before the study. As part of this study, Beck and Ward asked participants to give an oral report about a recent dream that they could recall. Again, similar to the findings of Beck and Hurvich, Beck and Ward found that depressed participants were more likely to recall dreams that contained content that was unpleasant for the dreamer.

In addition to these studies, Barrett and Loeffler (1992) determined that the dream content of depressed individuals could be differentiated from the dreams of non-depressed individuals based on the affect of the characters in the participants' dreams. Specifically, depressed individuals had far fewer characters in their dreams who expressed anger.

Research investigating other psychological disorders/problems has also concluded that individuals can be "grouped" based upon the content of their dreams. Schredl and Engelhardt (2001) found that the manifest dream content of psychiatric patients with different mental disorders could be differentiated from one another based upon the affect of the characters in the dreams (e.g. characters in the dreams of patients with anxiety disorders were more anxious, depressed patients were more depressed, etc.).

Firth, Blouin, Natarajan, and Blouin (1986) found that psychiatric patients who were suicidal, depressed, and violent could be differentiated from the other psychiatric

patients based on the themes of the dreams these patients reported. For example, suicidal patients reported more suicidal content, depressed patients reported more themes related to depression, and violent patients reported more acts of violence in their dreams. Finally, Free, Winget, and Whitman (1993) determined that individuals with panic disorder could be differentiated from individuals without this disorder based on the content of their dreams. These researchers found that individuals with panic disorder had more dream content related to separation anxiety than did individuals without panic disorder.

These findings support the idea that individuals with a certain psychological characteristic/disorder can be differentiated from individuals without these same characteristics based on the content of their dreams. Thus, it can be hypothesized that the dream content of health anxious individuals may be different than individuals with fewer health anxiety concerns. In particular, the dreams of health anxious individuals should contain more details/images related to health and illness issues than individuals with less health-related concerns. Supporting this idea is research that has indicated that health anxious individuals are more likely to remember health-related information than non-health anxious individuals (e.g. Hitchcock & Mathews, 1992; Pauli & Alpers, 2002).

In addition to differentiating health anxious from less health anxious individuals, it was thought that examining the dream content of health anxious individuals would provide clues about the cognitive functioning of health anxious individuals. Specifically, it was thought that examining the dream content of health anxious individuals would help determine if these individuals were chronically aware of bodily concerns, or if these individuals had latent dysfunctional assumptions that needed to be primed before affecting their thoughts and behavior. For example, if illness concerns are chronically

activated in health anxious individuals, these participants would have more dreams about illness than the non-health anxious participants, regardless if they were exposed to a priming condition. However, if these concerns are latent, then the health anxious participants would have more illness-related dreams only after being exposed to a priming task.

CHAPTER VI

METHOD

Participants

The participants were 170 students at The University of Southern Mississippi (USM). Students were recruited for participation in the study using the Experimetrix website (www.experimetrix2.com/USM) and through e-mail and telephone solicitation. Most participants took part in the study for undergraduate course credit. Once students signed up for the experiment on the Experimetrix website, they were assigned a time to meet with a member of the research team. During this meeting, participants were told about the study in greater detail and provided written informed consent (see Appendix A). Participants then set an appointment to complete the emotional Stroop task.

The participants were assigned to one of two groups in an alternating fashion. Specifically, the first participant who met with a member of the research team was assigned to the priming condition (Group 1), the second to the control condition (Group 2), the third to the priming condition, etc. until the participant quota for each group was met. Group 1 consisted of 85 participants (female = 68, male = 17; age; $M = 20.71$, $SD = 2.98$). There were 44 Caucasian (51.76%), 37 African American (43.53%), 2 Asian American (2.53%), and 1 Hispanic American (2.53%) participants in Group 1. Group 2 consisted of 85 participants (female = 73, male = 12; age; $M = 20.48$, $SD = 2.44$) whose ethnic composition included 48 Caucasian (56.47%), 33 African American (38.82%), 3 Asian American (3.53%), and 1 Arabian American (1.18%) participants. Participants in Group 1 and Group 2 did not differ significantly as to age, ($t(84) = -1.017$, ns); gender, ($\chi^2(1, N = 170) = 1.039$, ns); and/or ethnic composition ($\chi^2(4, N = 170) = 3.602$, ns).

Procedure

After providing informed consent, participants were instructed that they would be required to record the content of their dreams for three consecutive nights. The participants were told that when they woke up each morning, they should write down as much as they could remember about their dreams regardless of how tangential or unimportant it may seem. The participants were also encouraged to be as specific and in-depth as possible when recording this information.

After the first night, a member of the research team contacted the participants to ensure that they were actually documenting what they could recall from their dreams, and to remind them to document the upcoming night's dreams as well. After the second night of documenting their dreams, participants met with a member of the research team and listened to a brief recorded story. Participants then completed the emotional Stroop task. After completing the Stroop task, the participants completed a free recall task where they wrote down as many of the stimulus words from the Stroop task as they could remember. After completing the free recall task, the participants completed a recognition task. As a manipulation check, participants then completed a 5-question quiz about the recorded story they listened to. After completing the quiz, each participant completed the Illness Attitude Scale (IAS). Participants completed the Stroop task and the short battery of forms in approximately 30 minutes. After the participants completed these tasks, the research team member reminded the participants to record their dreams from the upcoming night. An experimenter then instructed the participants to return their completed dream logs, the following day, to a drop box located in the Psychology Clinic at USM.

Materials

Manifest Dream Content. Participants recorded their dreams in a dream log (see Appendix B). The dream log required participants to record the date that the dream(s) occurred and describe the events of the dream, location(s) within the dream, main characters in the dream, main actions in the dream, and the emotion(s) that the participants felt. If participants failed to return the dream log on the day in which they had been asked to, they were contacted by members of the research team until they had returned their dream logs. To ensure experimental integrity, dream logs that were returned late were checked to ensure that the dates of the dreams, recorded in the dream log, were done on the correct nights (ie. the date of the third night of dreaming coincided with the date that the participant completed the Stroop task). All of the returned dream logs were completed on the correct nights. Two participants failed to turn in their dream logs, so their information was excluded from any analyses of the dream content data.

After the dream logs were gathered, the content of each dream was examined for the presence of scenes, content, or images related to preoccupation with bodily/illness concerns. Specifically, one member of the research team, blind to the participants' condition, documented the presence of health and/or illness-related dream content. If a given dream contained the target content it was identified with a "1". If the dream did not contain the target content it was coded with a "0". Three other members of the research team also independently rated 45 dreams for the target content. Overall, there was a high level of inter-rater reliability among the dream raters $\kappa = 0.94$.

Priming Task. Participants came to the laboratory individually and completed the remaining tasks. The priming task for this study consisted of the participants listening to

an approximately five-minute excerpt from either of two stories. Excerpts were taken from Leo Tolstoy's (1960) "The Death of Ivan Ilych," and from "Family Happiness". Participants in the priming condition listened to "The Death of Ivan Ilych" which tells the story of a man dying from the effects of a painful illness. As part of the story, the main character has become ill and has a "pain in his side" that "oppressed him and seemed to grow worse and more incessant" with time. As a result of this pain, Ivan Ilych exclaims, "again, again and it will never cease. A spark of hope flashes up, then a sea of despair rages, and always pain; always pain, always despair, and always the same." At the end of the story, Ivan Ilych dies as a result of the illness.

In contrast, participants in the control condition listened to Tolstoy's "Family Happiness," which highlights the dynamics of a marital relationship of one particular couple. The main character says about her relationship with her husband that, "the excitement of searching is over for us; our quest is done, and happiness enough has fallen to our lot. Now we must stand aside and make room for our children." Later, the main character says that her relationship with her husband and children have "laid the foundation of a new life and a quite different happiness; and that life and happiness have lasted to the present time."

A volunteer, with a background in dramatic reading, was recruited from the English Department at USM to read both transcripts. These readings were recorded on a standard audio cassette. When participants came to the experimental laboratory, they were placed in a quiet room by themselves and were given a handheld cassette player to listen to the assigned story. After listening to the story, the participants informed a

member of the experimental team that the selection was finished. After listening to the required selection, the participants then immediately completed the Stroop task.

Emotional Stroop Task. A desktop computer with a standard keyboard was used to administer the Emotional Stroop task. The *Inquisit* software program administered the stimulus words, timed the participants' responses to the stimuli, and tracked the participants' correct and incorrect responses. Before participating in the task, participants completed a short practice session (30 trials), where they were presented with 4 in. x 4 in. colored squares in one of four colors (red, yellow, green, blue) and were required to press a key on the keyboard corresponding to the colored box (F=red, G=yellow, J=blue, K=green). From this practice session, participants were able to learn the keys that were associated with each color. The participants then completed another short practice session (5 trials) where they were required to differentiate between the content of the word and the color in which the word was presented. For example, if participants were presented with the word "BLUE" in green ink they had to press the "K" key in order to make the correct response and move on to the next trial.

Next, the participants completed the actual task. Before the task began, the participants received brief written instructions to attend/respond to the color of the stimulus word, as quickly as possible without making errors. The same 40 stimulus words (10 illness-related word, 10 positive words, 10 negative words, and 10 neutral words; see Appendix C) used by Owens et al. (2004) were used in the present study.

Each stimulus word (3 in. high) was presented in the middle of a 17-inch color monitor in each of the colors. The *Inquisit* program randomly selected the color of every stimulus word so that each word was presented in each color one time only (e.g., the

word TUMOR was presented once in red, green, blue, and yellow). No word was presented more than once in succession, however. In addition to these 160 trials, neutral stimuli (“XXXX”) were also presented in the four different colors a total of nine times each for an additional 36 trials, for a total of 196 timed trials.

Each trial began with a single stimulus word being presented on the screen. This word remained on the screen until the participants pressed a response key. After responding, the software program recorded if the response was correct or incorrect as well as the participants' response latency. A new trial was immediately initiated at the end of each trial until the completion of all the trials. This task took approximately 12-15 minutes to complete.

Free Recall Task. Immediately after completing the Stroop task, the participants were given a sheet of paper and were verbally instructed to write down as many words as they could remember from the computer task they completed. The participants were told that the order of the words was not important. They were allowed to work on this task until they indicated that they could not remember any more words. The number of correct responses for each word category (illness-related, positive, negative, and neutral) was counted for each participant. These four categories of words were then summed to obtain the total number of words remembered correctly.

Three independent raters also categorized the participants' incorrect responses (intrusions). These intrusions were categorized similarly to the correct responses (e.g. illness-related, positive, negative, and neutral). In the rare event of disagreements among the three raters, responses were assigned to a given category based on the majority

decision (agreement of 2 of the 3 raters) of the raters (see Appendix D). The total number of intrusions was calculated by summing the four categories of intrusions.

Recognition Task. For the recognition task, 20 words used in the Emotional Stroop task were presented along with 20 equivalent words (Owens et al., 2004) on a sheet of paper (see Appendix E). Five words from the Stroop task, and five equivalent words, from each of the four word categories (illness-related, positive, negative, and neutral) were used. Participants were instructed to circle each word they recognized from the computer task. According to Owens et al. (2004), the equivalent words used in this task were similar to the words used in the Stroop task as to each word's frequency of usage in the English language, syllables, and number of letters. Performance on this task was assessed by the number of true positive, false negative, false positive, and true negative responses that participants made. Scores for each word category were calculated as was the total number of responses.

Quiz. After completing the recognition task, participants answered a written 5-question, true-or-false, quiz (see Appendix F) as a manipulation check to gauge their understanding and comprehension of the story they heard. Participants were required to answer at least four questions correctly to pass the manipulation check. Seven participants (Group 1, $n = 5$; Group 2, $n = 2$) did not answer at least four questions correctly, so their data were not included in the statistical analyses related to the laboratory tasks.

Illness Attitude Scale (IAS; Kellner, 1986). After completing the quiz, participants completed the IAS. According to Ferguson and Daniel (1995), the IAS is typically used to measure the fears, attitudes, and beliefs associated with hypochondriacal concerns and

abnormal illness behaviors in individuals. The IAS is a 27-item self-rated measure of hypochondriacal concerns that consists of 9 subscales (worry about illness, concerns about pain, health habits, hypochondriacal beliefs, thanatophobia, disease phobia, bodily preoccupation, treatment experiences, effects of symptoms) with 3 items per subscale. The IAS has a 5-point Likert-type response format with response anchors ranging from 0 (no) to 4 (most of the time).

According to Speckens' (2001), review of the psychometric properties of the IAS, this measure has proven to be a valid (convergent and divergent) and reliable measure of health anxiety concerns across several studies. For example, Bouman and Visser (1998) found the Cronbach's alpha for the total score of the IAS ranged from 0.87 to 0.90, with a test-retest reliability of 0.96 after a four week period. Additionally, Kellner, Samet, and Pathak (1987) found that scores on all the IAS scales correlated highly with somatization, and Fava, Molnar, and Zielezny (1987) found that the hypochondriacal beliefs subscale differentiated those with high health anxiety from those with low health anxiety.

For the purposes of this study, total score for the IAS was computed by adding the five subscales (i.e. worry about illness, concerns about pain, hypochondriacal beliefs, disease phobia, and bodily preoccupation) that Kellner et al. (1987) suggested were most relevant to a diagnosis of hypochondriasis. Cronbach's alpha for this composite IAS score was .82.

No significant differences were found between male and female participants on the IAS $F(1, 161) = .93, ns$. Overall, African Americans had higher IAS scores than participants from other races $F(1, 161) = .94, p < .05$; however, when ethnicity was added to subsequent analyses it did not alter the findings in any significant way. Participants'

total score on the IAS for the control group ($M = 15.51$, $SD = 8.80$) and the experimental group ($M = 16.11$, $SD = 9.51$) did not differ significantly $F(1, 161) = .17$, ns.

CHAPTER VII

RESULTS

Emotional Stroop Task

Before computing Stroop interference scores, the raw Stroop scores for each group were analyzed. These analyses showed that there were no significant differences ($F(1, 161) = .00, ns$) between response latencies (ms) for the Family Happiness group ($M = 935.56, SD = 293.16$) and the Ivan Ilych group ($M = 935.83, SD = 305.76$). Similar to Owens et al. (2004), Stroop interference scores for each participant were computed by subtracting the mean reaction time for the neutral word stimuli from the mean reaction time for the illness word stimuli. Individual Stroop interference scores were compared to the overall mean for both groups ($M = -3.08, SD = 164.55$) to assess for outliers in the data. According to Owens et al.'s exclusion criteria (± 3 SD from the group mean), three participants (Family Happiness, $n = 1$; Ivan Ilych, $n = 2$) were found to be outliers and were removed from further analyses.

A mixed ANOVA/regression approach was used to analyze if health anxiety (IAS scores) and experimental condition (Family Happiness v. Ivan Ilych group) could be used to predict Stroop interference scores. Unlike a standard ANOVA in which scores are dichotomized, scores on the IAS were standardized (z-score) and treated as a continuous measure. Experimental condition was dummy coded (Family Happiness = 1, Ivan Ilych = -1) and multiplied by the standardized IAS scores to form an interaction term. Stroop interference means and standard deviations were computed for each group (Family Happiness = $M = 2.51, SD = 119.57$; Ivan Ilych = $M = -24.40, SD = 133.77$). The correlation between Stroop interference and IAS scores was $r = -.070, ns$. The regression

was not significant, $F(3, 156) = .55$, ns, with R^2 at .01 and adjusted $R^2 = -.01$. Stroop interference scores for the participants were not significantly related to participants' IAS scores ($t(160) = -.25$, ns), the experimental condition each participant was assigned to ($t(160) = -1.26$, ns), nor was there a significant interaction ($t(160) = -.02$, ns).

This same procedure was used to examine whether health anxiety scores and experimental condition could predict health-related errors (incorrect responses) on the Stroop. Group means and standard deviations were computed for this variable (Family Happiness = $M = 1.23$, $SD = 2.57$; Ivan Ilych = $M = 1.60$, $SD = 3.52$). The correlation between illness-related errors and IAS scores ($r = .03$) was not significant. The overall regression was not significant, $F(3, 156) = .28$, ns, with R^2 at .01 and adjusted $R^2 = -.02$. Illness-related errors were not significantly related to participants' IAS scores ($t(160) = .36$, ns), the experimental condition each participant was assigned to ($t(160) = .84$, ns), nor was there a significant interaction ($t(160) = -.09$, ns).

Free Recall Task

Health anxiety and experimental condition were used to predict the number of illness words recalled correctly. Group means and standard deviations were computed for this variable (Family Happiness = $M = 1.45$, $SD = 1.37$; Ivan Ilych = $M = 1.40$, $SD = 1.40$). IAS scores and correct recall of illness-related words were not significantly related ($r = -.04$). The overall regression was not significant, $F(3, 156) = .09$, ns, with R^2 at .00 and adjusted $R^2 = -.02$. Correct recall of illness words was not significantly related to participants' IAS scores ($t(160) = -.47$, ns), the experimental condition each participant was assigned to ($t(160) = .01$, ns), nor was there a significant interaction ($t(160) = .30$, ns).

Health anxiety and experimental condition were also used to predict the number of illness-related intrusions. Group means and standard deviations were computed for this variable (Family Happiness = $M = .07$, $SD = .26$; Ivan Ilych = $M = .09$, $SD = .28$). The correlation between IAS scores and number of illness-related intrusions was not significant ($r = -.03$). The overall regression was not significant, $F(3, 156) = .04$, ns, with R^2 at .00 and adjusted $R^2 = -.02$. Illness-related intrusions were not significantly related to participants' IAS scores ($t(160) = -.33$, ns), the experimental condition each participant was assigned to ($t(160) = -.04$, ns), nor was there a significant interaction ($t(160) = .03$, ns).

Recognition Task

Health anxiety and experimental condition were used to predict the total number of correctly identified illness words (illness TP). Group means and standard deviations were computed for this variable (Family Happiness = $M = 2.52$, $SD = 1.46$; Ivan Ilych = $M = 2.50$, $SD = 1.39$). The correlation between IAS scores and illness true positive responses ($r = .08$) was not significant. The overall regression was not significant, $F(3, 156) = .33$, ns, with R^2 at .01 and adjusted $R^2 = -.01$. Illness TP responses were not significantly related to participants' IAS scores ($t(160) = .98$, ns), the experimental condition each participant was assigned to ($t(160) = .03$, ns), nor was there a significant interaction ($t(160) = -.25$, ns).

Health anxiety and experimental condition were also used to predict the total number of illness word intrusions (illness FP). Group means and standard deviations were computed for this variable (Family Happiness = $M = .26$, $SD = .49$; Ivan Ilych = $M = .48$, $SD = .93$). The correlation between IAS scores and illness false positives ($r = .19$)

was significant at the .05 level. The overall regression was significant, $F(3, 156) = 3.64, p < .05$, with R^2 at .07 and adjusted R^2 value = .05. There was a main effect for health anxiety ($t(160) = 2.20, p < .05$). No main effect was found for experimental condition ($t(160) = 1.57, ns$). Additionally, no significant interaction effect ($t(160) = 1.61, ns$) was found.

These analyses indicate that, regardless of experimental condition, participants with higher levels of health anxiety made more false positive responses on the recognition task. However, this effect was not unique to illness-related words because health anxious participants also incorrectly identified more total words ($t(160) = 2.90, p < .01$), positive words ($t(160) = 1.77, p < .05$), negative words ($t(160) = 2.58, p < .05$) and neutral words ($t(160) = 1.73, p < .05$) than participants with less health anxiety. Therefore, although health anxious participants made more false positive identifications of illness words, this does not appear to be a specific memory bias for health-related information.

Dream Content

Because so few illness-specific dreams (Family Happiness = 12, Ivan Ilych = 15) were recorded by the participants during the first two nights of dreaming, illness-specific, physical threat, and death-related dreams were all added together and collapsed into a negative dream composite. The dream content for each experimental group was analyzed to assess for differences in negative dream content before the experimental manipulation. No significant differences were found between the two groups ($t(304) = .20, ns$). The correlation between IAS scores and negative dream content ($r = .01$) was not significant.

Dream content from the third night of the experiment (after the experimental manipulation) was also analyzed to determine if health anxiety and experimental condition could be used to predict negative dream content. Again, relatively few illness-specific dreams (Family Happiness = 6, Ivan Ilych = 4) were recorded by the participants on the third night of dreaming, so a negative dream composite was used for analysis. Group means and standard deviations were computed for this variable (Family Happiness = $M = .59$, $SD = .23$; Ivan Ilych = $M = .47$, $SD = .36$). For this night, the correlation between IAS scores and negative dream content ($r = -.05$) was not significant. The overall regression was not significant, $F(3, 130) = .19$, ns, with R^2 at .01 and adjusted $R^2 = -.01$. Negative dream content for the third night of dreaming were not significantly related to participants' IAS scores ($t(160) = .50$, ns), the experimental condition each participant was assigned to ($t(160) = -.52$, ns), nor was there a significant interaction ($t(160) = .19$, ns).

CHAPTER VIII

DISCUSSION

The present study failed to provide evidence for the ideas that health anxious participants a) show greater Stroop interference effects for illness-related words, b) perform better on memory tasks involving illness-related words, or c) have more illness-related dreams than participants with less health anxiety. These findings held true regardless of whether the participants were primed to attend to health-related information. Unfortunately, these findings do not clarify if health concerns are chronically activated in health anxious individuals or if these concerns remain latent until they are activated.

Stroop Task

Prior studies found that health anxiety was associated with greater Stroop interference for illness-related words (Lim & Kim, 2005; Owens et al., 2004; Williams et al., 2003). Some studies only found this effect when the participants were primed to raise their level of health anxiety (Lecci & Cohen, 2002, 2007). The present study failed to find any evidence of a relationship between health anxiety and Stroop interference regardless of whether the participants were primed. Several explanations may account for these divergent findings.

Methodological Differences

One reason for the confirmatory evidence found in past studies may be due to the priming tasks implemented in the studies. In particular, the priming tasks used in the Lecci and Cohen studies (2002, 2007) may have been more salient than the priming task used in the current study. The 2002 study involved telling participants that their blood pressure was “dangerously high” (p. 149) and in the 2007 study participants were

previously exposed to media attention related to anthrax exposure and were then asked to read a fact sheet about the effects of anthrax exposure. The illness concerns of health anxious participants appeared to be strongly aroused by these tasks. In contrast, health anxious participants in the present study may not have had their health concerns aroused by the priming task. This may have happened because the health anxious participants did not feel directly threatened and/or in danger from hearing the excerpt from “The Death of Ivan Ilych.”

It is also possible that other methodological differences between the studies can account for the divergent findings. Participants in other Stroop studies (Owens et al., 2004; Williams et al., 2003; Lim & Kim, 2005) named the stimulus words rather than responding by keyboard. This difference in mode of response required from participants may be responsible for the confirmatory findings in these studies compared to the null findings in the present study. Unfortunately, no current research has been conducted on what, if any, differences may exist between the different modes of responding. However, Lim and Kim (2005) have hypothesized that different levels of cognitive processing exist in participants exposed to threatening stimuli and that higher levels of cognitive processing may correspond with increased response latencies on the Stroop task. Accordingly, verbal responses may require a different (higher) level of cognitive processing than responding to stimuli by pressing a key on a keyboard. This difference in cognitive processing may account for the conflicting findings between the studies.

Another methodological difference between the studies was the number of word categories presented to the participants during the Stroop task. In the present study, participants responded to four word categories (neutral, illness, positive, negative). In

contrast, in the Williams et al. and the Lecci and Cohen (2002, 2007) studies, participants only responded to illness-related or non-illness-related words. Lecci and Cohen (2007) have posited that Stroop interference effects may be related to the salience of the illness words presented during the Stroop task. It may be that fewer word categories made the illness-related words more salient for the health anxious participants. In turn, this possibly caused longer response latencies for these words.

Analyses Differences

One reason why researchers may have found Stroop interference effects among their health anxious participants was that they included state and trait anxiety as covariates when analyzing the data from their study (Lecci & Cohen, 2007; Owens et al., 2004). According to Meehl (1971) a covariate is a potentially biasing factor that needs to be statistically controlled for during statistical analyses. Controlling for these biasing factors increases statistical power by reducing error variance (Meehl, 1971). However, researchers have cautioned against needlessly controlling for the variance of certain covariates because of the increased likelihood of finding spurious relationships (e.g. Meehl, 1971; Spector, Zapf, Chen, & Frese, 2000).

According to Spector et al. (2000), to be considered a bias, a variable must distort the assessment of a particular construct. These researchers further state that “only when a variable has been demonstrated conclusively to be a bias, and only a bias” (p. 90) should its variance be partialled out, otherwise this can lead to removing the effects of the very variable(s) under investigation. In addition to these cautions, it is not clear if state and trait anxiety have a biasing effect on health anxiety or if they have a more substantive role. If state and trait anxiety play a substantive role in health anxiety, controlling for

their variance does not actually eliminate bias but only serves to distort the effects of each variable (Meehl, 1971). As Meehl points out, corrected figures produced after needlessly partialling out covariates are “pseudofactual” (p. 146) and compromise any conclusions that can be drawn from this data. It is likely that by including state and trait anxiety as covariates in their analyses, Lecci and Cohen (2007) and Owens et al. (2004) obtained distorted results that actually did not address the effects that health anxiety has on attentional processes.

The differences in methodology and statistical analyses may account for the lack of confirmatory evidence found in the present study and studies that have found evidence for Stroop interference among health anxious participants. Additionally, another issue that should be mentioned is the “file-drawer effect” (Rosenthal, 1979). According to Rosenthal, studies are routinely published only if the results from the study are statistically significant. On the other hand, results from studies that do not obtain statistical significance are typically not published. Rosenthal states that this leads to deficits in the collective knowledge of any given construct. Regarding the current study, there is no way to know the number of unpublished studies that have failed to find Stroop interference effects for illness-related words. The present results may not be such an anomaly if other unpublished studies obtained similar findings.

Memory Tasks

Prior studies have found that health anxiety was associated with both greater recognition and recall of illness-related words (e.g., Brown et al., 1999; Ferguson et al., 2007; Pauli & Alpers, 2002). These findings were documented among participants even without being exposed to a priming task (e.g., Brown et al., 1999). The present study

failed to find any evidence of a relationship between health anxiety and either enhanced recognition or recall of illness words. This finding held true regardless of whether the participants were primed. These null results were unexpected given the previous research. It is not known why the difference in results occurred. There were no apparent significant differences in experimental methodology, participant variables, and/or statistical analyses between the current study and these prior studies.

The present study did replicate Pauli and Alpers' (2002) finding that, even without being exposed to a priming event, health anxious participants made more illness word intrusions (illness FP) on the recognition task than participants with less health anxiety. This effect was not found in other recognition task studies (Brown et al., 1999; Ferguson et al., 2007), however. Although replicating Pauli and Alpers' finding, health anxious participants in the present study also had more intrusions when the total number of words, positive words, negative words, and neutral word intrusions were analyzed. These results indicate that higher health anxiety participants in the present study did not have a specific memory bias for health-related information, but apparently had difficulty inhibiting intrusive responses in general. Past research does not help explain why these results may have occurred.

Manifest Dream Content

This is the first study to examine the effects of health anxiety on dreaming. Past research has indicated that participants with certain affective trait(s) dream differently than individuals without similar trait(s). For example, depressed individuals (Barrett & Loeffler, 1992; Beck & Hurvich, 1959; Beck & Ward, 1961), anxious individuals (Schredl & Engelhardt, 2001), suicidal individuals (Firth, Blouin, Natarajan, & Blouin,

1986), violent individuals (Firth et al., 1986), and individuals with panic disorder (Free, Winget, & Whitman, 1993) have all been found to have more disorder-specific dream content than individuals without these same concerns.

The present study investigated whether health anxious participants had more dreams about health concerns than participants with less health anxiety. This study also examined whether these concerns had to be primed before influencing the dreams of health anxious participants. Participants in the present study had a similar amount of illness-related dream content regardless of level of health anxiety or group designation.

Past dream studies have used a variety of methodologies and research participants. The scoring and analyses of dream content also varied among the studies. Therefore, assessing differences between the present study and past dream studies is difficult. One difference between the present study and earlier dream studies was that participants in the present study did not meet diagnostic criteria for a specific disorder. In contrast, all of the studies previously noted compared individuals diagnosed with particular disorders (depression, panic disorder) or histories of behavior (anxious, suicidal, violent) to individuals that did not exhibit signs or symptoms of these disorders or problems. In essence, these studies were similar to an extreme groups research design. Conversely, the present study assessed the dream content of participants along a continuum of health anxiety. This difference in design study may account for the different findings between the present study and past dream research studies.

Another issue that appeared to influence the present results was the infrequency of illness-related dreams among the participants. Because illness-related dreams were so rare, and dreams were collected on only three nights, finding a true relationship between

health anxiety and dream content would have been difficult. Due to the apparent infrequency of this type of dream, it is likely that gathering dreams across a longer period of time would help shed light on whether a relationship between health anxiety and illness-related dreams exists.

Obviously, more research needs to be conducted to determine if the findings from the present study were an aberration, or if health anxious participants simply do not dream differently than participants with less health anxiety. In the future, an extreme groups research design should be used to more accurately reflect past dream content studies. This group design may help clarify the present findings by helping to determine if the dream content of participants diagnosed with hypochondriasis differ from participants that do not meet criteria for this disorder. Additionally, participants in future studies should be required to record their dreams for a longer period of time (preferably for two weeks or more), because of the apparent infrequency of illness-related dreams. This may help clarify whether the present results occurred because a relationship between health anxiety and illness-related dream content does not exist or if the small sample size of illness-related dreams did not allow for group differences.

Study Limitations and Future Directions

The present study did not help clarify the conflicting findings from past Stroop studies. Presently, researchers do not know if Stroop interference effects exist in health anxious participants without being exposed to a priming event (Owens et al., 2004; Lim & Kim, 2005; Williams et al., 2003), only in health anxious participants after exposure to a priming event (Lecci & Cohen, 2002, 2007), or if these effects occur at all among certain participants (present study).

Undertaking future studies using less subtle triggering stimuli may help clarify these divergent findings in the Stroop literature. It is possible that the priming stimulus used in the present study did not effectively arouse the illness concerns of health anxious participants. Future research should include priming tasks that are an analogue to real-life situations or that are directly targeted toward the participants. For example, participants could be told that they are at an increased risk of getting a communicable disease or that they will become ill if they do not take certain precautions against illness. This type of priming task may prove more salient to participants by making the task more relevant to their personal concerns.

Future Stroop studies should also specifically investigate whether verbally responding to Stroop stimuli differs from making keyboard responses. Participants in the present study responded by keyboard, whereas, participants in other Stroop studies responded verbally to stimuli. Currently, no research exists investigating this phenomenon. A possible study that could examine this idea would match participants relative to their level of health anxiety. Half of the participants could then complete the Stroop by responding verbally to stimuli and the other participants could use the keyboard to make responses. This proposed research could help determine if the different response methods influence results from the Stroop task.

Additional research should also investigate whether differences in Stroop performance exist when participants respond to two word categories or multiple word categories. In the present study, illness words may have been less salient to health anxious participants because of the inclusion of other word categories (neutral, positive, negative). A possible research study could match experimental groups on their level of

health anxiety and then ask them to complete the Stroop task. Half of the participants could complete the task with two word categories (illness v. non-illness), and participants in the other group would complete the task with three or more word categories (illness, positive, negative, etc.). This proposed study could help determine if more word categories decrease the likelihood of finding Stroop interference effects for illness words.

Replication of the present study with participants having a diagnosis of hypochondriasis is also important. The priming stimulus used in the present study may have primed hypochondriacal participants to attend to health-related information more readily, but it was not salient enough to arouse the concerns of participants not diagnosed with hypochondriasis. As was previously discussed, hypochondriacal participants may also have more illness-specific dreams than individuals without this disorder. Investigating this possibility would be a worthwhile endeavor.

Finally, the present study failed to replicate findings from past memory task(s) studies and there do not appear to be identifiable reason(s) for these findings. Replicating the present study with a different participant sample could help clarify these issues. Additionally, developing possible research proposals that take into account the limitations of the present study (lack of a salient prime, etc.) may shed light on the present results.

The null findings from the present study may suggest that health anxious participants do not always have attentional and memory biases for illness-related words as previous research has indicated. In other words, findings from past research may be less robust than has been shown. It may be the case that only under certain conditions are attention and memory biases present in health anxious individuals. For example,

confirmatory evidence for Stroop interference may only be garnered when using a voice-activated response method, using only two word categories, and/or when including state and trait anxiety as covariates in analyses. Memory biases may also only hold under certain conditions as well, although these conditions are not known at this time.

The present study also showed that health anxiety was not related to the number of illness-related dreams. As was discussed, future research could include participants diagnosed with hypochondriasis and collect dreams across a greater length of time. This may help to understand the present situation more clearly. This additional research may show that health anxiety is related to the number of illness-related dreams. Conversely, it may allow researchers to more strongly conclude that health anxious individuals do not have more illness-related dreams than individuals with less health anxiety.

APPENDIX A

INFORMED CONSENT FORM
DREAMS AND COGNITIVE PROCESSES

This study is concerned with what people dream and how they process information. Over the course of three consecutive nights, upon waking, you will be asked to record everything you can recall from the previous night's dreams. After the second night of recording your dreams (the third day enrolled in the study) you will go to an experiment where you will listen to a short story and will then be asked to complete a computer task followed by two short paper-and-pencil tasks. These tasks should not last longer than one hour. On the third night you will then record your dream(s). You will then be asked to turn in your dream logs to a room on campus. You are free to withdraw from this experiment at any time. Overall, participation in this study will be between 2-3 hours.

Your responses will be identified by a random ID number and your anonymity is guaranteed both in responding and in later analysis of your responses. If you agree to participate, this form, with your signature, will be stored independently of your responses in a locked file cabinet at USM.

You are not required to participate in this study. If you elect to participate, you are free to withdraw from the study at any time during the experiment. If you are receiving class credit, make sure you have created and activated an Experimentrix account. You will receive the credit even if you withdraw before the study concludes. After you have completed the study, a complete description of this research will be presented to you.

In the unlikely event that as a result of experimental procedures you feel anxious or troubled, please let the experimenters know or contact the University Counseling Center, where counseling and psychological services are available to all USM students at no charge (601-266-4829).

Any questions concerning the procedure of this study can be discussed with the experimenter, Desmon C. Mitchell, M.A. (desmon.mitchell@usm.edu; 601-266-4588).

This project has been reviewed by the Human Subjects Protection Review Committee, which ensures that research projects involving human subjects follow federal regulations. Any questions or concerns about rights as a research subject should be directed to the chair of the Institutional Review Board, The University of Southern Mississippi, 118 College Drive #5147, Hattiesburg, MS, 39406-0001, (601) 266-6820.

The results of this study are expected to be of considerable value and importance to psychologists. Your cooperation is greatly appreciated.

Desmon C. Mitchell, M.A. - The University of Southern Mississippi
desmon.mitchell@usm.edu

APPENDIX C

STROOP WORD LIST

Illness Threat words- cardiac, cancer, death, paralyzed, collapse, disabled, corpse, tumor, stroke, palpitations

Negative Emotion words- contemptible, lonely, violence, peril, hateful, snubbed, hazard, dangerous, inferior, ignored

Positive Emotion words- angelic, cheerful, courageous, excited, spirited, passionate, tender, overjoyed, happy, romantic

Neutral words- bananas, notebook, subscribing, doormen, nutmeg, elephant, gloves, instructor, furniture, tree

APPENDIX D

FREE RECALL TASK-INTRUSION RATINGS

intrusions	rater 1	rater 2	rater 3
alone	negative	negative	negative
anger	negative	negative	negative
angry	negative	negative	negative
anticipation	neutral	neutral	neutral
anxious	negative	negative	negative
bahamas	positive	positive	positive
blood	neutral	neutral	neutral
body	neutral	neutral	neutral
box	neutral	neutral	neutral
buried	neutral	neutral	neutral
caution	negative	negative	negative
cautious	neutral	neutral	neutral
comfortable	positive	positive	positive
common	neutral	neutral	neutral
compassionate	positive	positive	positive
compatible	positive	positive	positive
compensatable	neutral	neutral	neutral
compliance	positive	neutral	neutral
computer	neutral	neutral	neutral
consider	neutral	neutral	neutral
contagious	illness	illness	illness
contemplative	neutral	neutral	neutral
convertible	neutral	neutral	neutral
courteous	positive	positive	positive
deception	negative	negative	negative
discomfort	negative	negative	negative
disoriented	negative	negative	negative
dispatcher	neutral	neutral	neutral
dispute	negative	negative	negative
encourage	positive	positive	positive
enormous	neutral	neutral	neutral
envious	negative	negative	negative
evil	negative	negative	negative
experiment	neutral	neutral	neutral
fearful	negative	negative	negative
forgetful	negative	negative	negative
friendship	positive	positive	positive
glad	positive	positive	positive
gross	negative	negative	negative
hate	negative	negative	negative
heart	neutral	neutral	neutral

hostile	negative	negative	negative
hungry	negative	illness	negative
hurt	negative	negative	negative
incompatible	negative	negative	negative
influence	neutral	neutral	neutral
isolated	negative	negative	negative
jealous	negative	negative	negative
joy	positive	positive	positive
joyful	positive	positive	positive
laughter	positive	positive	positive
lazy	neutral	negative	negative
love	positive	positive	positive
lovely	positive	positive	positive
mad	negative	negative	negative
money	neutral	neutral	neutral
nonviolence	positive	positive	positive
outraged	negative	negative	negative
outrageous	neutral	neutral	neutral
philanthropist	positive	positive	positive
plantations	neutral	neutral	neutral
platapus	neutral	neutral	neutral
read	neutral	neutral	neutral
sad	negative	negative	negative
scorpion	neutral	neutral	neutral
scrubbing	neutral	neutral	neutral
sophisticated	positive	positive	positive
spirit	neutral	neutral	neutral
spiritual	positive	positive	positive
storm	negative	negative	negative
strong	positive	positive	positive
student	neutral	neutral	positive
task	neutral	neutral	neutral
teacher	neutral	neutral	neutral
toxic	illness	illness	negative
urgent	negative	neutral	neutral

APPENDIX E

RECOGNITION TASK FORM

Directions: Please circle all of the words that you can remember seeing during the computer task that you completed earlier. Please circle only the words that you can remember seeing.

courageous	lonely	sincerity	cancer
painfulness	scissors	cheerful	shoes
basket	corpse	violence	sadness
hateful	doormen	elephant	paralyzed
punishment	bananas	diabetes	overjoyed
passionate	angelic	tumor	despair
honor	furniture	teacher	choke
inferior	stroke	dish	confusion
peace	ignored	convulsion	subscribing
triumph	seizure	respect	hostility

APPENDIX F

MANIPULATION CHECK QUIZZES

Directions: Below are five questions from the story you heard earlier. For each question please circle the correct response.

- 1) T F The main character's name was Ivan Ilych.
- 2) T F The main character was injured in an automobile accident.
- 3) T F The main character's only ailment is a broken leg.
- 4) T F The main character is in a lot of pain.
- 5) T F The main character dies at the end of the story.

Directions: Below are five questions from the story you heard earlier. For each question please circle the correct response.

- 1) T F The main characters are married in the story.
- 2) T F The main characters live separately for a while.
- 3) T F The main characters get divorced at the end of the story.
- 4) T F The main characters have children together.
- 5) T F The main characters die at the end of the story.

APPENDIX G

INSTITUTIONAL REVIEW BOARD APPLICATION

Health Anxiety and Cognition

Human Subjects Review

1. Project Goals

Presently, two rival ideas for understanding the cognitive functioning of individuals with health anxiety have been proposed. One theory suggests that individuals with high levels of health anxiety chronically attend to health-related information. The other theory proposes that health anxious individuals need to be situationally primed for them to attend to health-related information. The proposed study will help to determine which theory is more accurate.

2. Protocol*Procedures*

The proposed study will examine the dream content (self-report), memory (free recall task and recognition task), and attention allocation (Emotional Stroop Task) of participants to determine if differences exist between health anxious and non-health anxious participants in these areas. Students enrolled in Introductory Psychology courses will complete the Illness Attitudes Scale (IAS) as part of a screening for research credit. Individuals scoring in the top (health anxious) and bottom (non-health anxious) quartile on this measure will be recruited, through telephone solicitation, to participate in this study. Students willing to participate will be asked to record the manifest content of their dreams over the course of three days. After the second night of recording, half of the health anxious and non-health anxious groups will be exposed to an illness-related trigger (an audio taped excerpt from Tolstoy's "The Death of Ivan Ilych"; copies of script attached) before being administered the Stroop task, followed by the free recall task, and then the recognition task. The other groups will be administered these same tasks after listening to an audio-taped excerpt from a story that does not deal with illness (an audio taped excerpt from Tolstoy's "Family Happiness"; copies of script attached). After completion of the computer-based tasks the participants will be given a 5-question quiz regarding the taped excerpt they were exposed to as a means to test each participant's attention to and comprehension of the excerpt. Participants must answer four of the questions correctly for their data to be analyzed and included in the study. Students who complete the study will receive full credit for participating regardless of their performance on the quiz. Copies of the quizzes are attached. All of the participants in each group will then record their dream content on the third night.

Measures

IAS- The IAS is a 27-item self-rated measure of hypochondriacal concerns. Copies of the IAS are attached.

Dream content- All of the participants will record what they can recall regarding the content of their dreams for three consecutive nights. The participants will be instructed that each morning, on their awakening, they should write down as much as they can about their dreams. The participants will be encouraged to be as specific and in-depth as possible when recording this information. These dream logs will be coded for the presence of content indicative of health or bodily concerns.

Emotional Stroop Task- The Emotional Stroop Task is a cognitive task that was developed to study the preferred attention allocation of individuals. Our Stroop task will consist of forty stimulus words (10 illness-related word, 10 positive words, 10 negative words, and 10 neutral words). These stimulus words will be presented to the participants four times each in a random sequence, for a total of 160 trials. No word will be presented more than once in succession, however. Each stimulus word (10 mm high) will be presented in the middle of a 17-inch color monitor in one of four colors (red, green, blue, and yellow). The computer will randomly select the color of each stimulus word so that each word will be presented in each color one time only (e.g., the word TUMOR will be presented once in red, green, blue, and yellow). Each trial will begin with a single stimulus word being presented on the screen. This word will then remain on the screen until the participant presses the correct color-coded key (red, green, blue, or yellow). At that time the participant's response latency will be recorded by the computer. At the end of each trial a new trial will then be initiated until the completion of all 160 trials. Completion of this task should take approximately 10 minutes. Copies of the stimulus words are attached.

Free Recall task- After completing the Stroop task, participants will be asked to write down, in any order, as many of the stimulus words from the Stroop task that they can recall. Participants will be given a maximum of five minutes to complete this task. The number of correct responses for each participant will then be calculated.

Recognition task- After completing the free recall task, the participants will be presented with a sheet of paper that will include 40 words. Twenty of the words will be from the stimulus words they were exposed to during the Stroop task (5 illness-related words, 5 positive words, 5 negative words, and 5 neutral words) and twenty words they were not exposed to during the Stroop task (5 illness-related words, 5 positive words, 5 negative words, and 5 neutral words). The participants will then be asked to circle the words they recognize from the Stroop task. The number of correct and incorrect responses will be calculated, as well as the number of false-positive (indicating that a word was part of the stimulus word set when it was not) and false-negative (failing to indicate that a target word was part of the stimulus word set) responses for each word type. Copies of the recognition task are attached.

Participants

Approximately 140 female college students enrolled in undergraduate psychology classes at USM will be provided the opportunity to participate in this study to fulfill experiment requirements or in exchange for extra credit points. Male participants will be excluded from this study based on the lower incidence rates of health anxiety among this demographic and the relatively high rates of health anxiety concerns among females. Participants will be recruited by experimenters through telephone calls. The experimenters will ensure that the participant is at least 18 years old before enrolling them in the study. Participants will also be recruited by listing the study on the Experimentrix website. Participants must be at least 18 years old to register on Experimentrix. We anticipate that the sample demographics will match the demographics of these classes for race. Participation will be voluntary. Participants will be notified of the option to withdraw from the study at any time. The participants will complete the testing protocol in a reserved experimental classroom on campus and they will record their dreams at their homes upon waking. Participation will last approximately 2-3 hours.

3. Benefits

Although the study will not provide direct benefits, the results should lead to a more thorough understanding of cognitive factors that contribute to health anxiety. This, in turn, may lead to more effective treatments for health anxiety. Other opportunities to receive credit are available for all introductory-level psychology students.

4. Risks

Participants will not be exposed to more than minimal risk. The passage from *The Death of Ivan Ilych* may increase some participants' anxiety level, but this effect should be short-lived. In the extremely unlikely event that participants exposed to the health-related priming task become excessively uncomfortable appropriate referrals to the University Counseling Center for treatment will be made. The participants will be notified in the consent form that they are free to withdraw at any time if they so desire. Personal information of the participants will not be linked with the data and all results will remain private in a locked file cabinet under Dr. David Marcus's supervision. Following the study, all participants will be debriefed by a typed statement. After seven years, the data will be shredded.

HUMAN SUBJECTS REVIEW FORM
UNIVERSITY OF SOUTHERN MISSISSIPPI
(SUBMIT THIS FORM IN DUPLICATE)

Protocol # 27020801
(office use only)

Name Desmon C. Mitchell Phone (601) 266-4588

E-Mail Address desmon.mitchell@usm.edu

Mailing Address 109 Virginia Dr., Hattiesburg, MS; 39401
(address to receive information regarding this application)

College/Division Education and Psychology Dept Psychology

Department Box # 5025 Phone (601) 266-4591

Proposed Project Dates: From 02/01/2007 To 12/31/2007
(specific month, day and year of the beginning and ending dates of full project, not just data collection)

Title Health Anxiety and Cognition: Chronic Awareness of Health Concerns or Situational Activation of Latent Dysfunctional Assumptions About Illness?

Funding Agencies or Research Sponsors N/A

Grant Number (when applicable) N/A

5025 New Project

Dissertation or Thesis

Renewal or Continuation: Protocol # _____

Change in Previously Approved Project: Protocol # _____

[Signature] Principal Investigator Date 01/29/07

[Signature] Advisor Date 1/29/07

[Signature] Department Chair Date 1/29/07

RECOMMENDATION OF HSPRC MEMBER

Category I, Exempt under Subpart A, Section 46.101 () (), 45CFR46.

Category II, Expedited Review, Subpart A, Section 46.110 and Subparagraph (B).

Category III, Full Committee Review.

[Signature] HSPRC College/Division Member DATE 2/6/07

Lawrence A. Hooper HSPRC Chair DATE 2-14-07

APPENDIX H

INSTITUTIONAL REVIEW BOARD APPROVAL



The University of
Southern Mississippi

Institutional Review Board

118 College Drive #5147
Hattiesburg, MS 39406-0001
Tel: 601.266.6820
Fax: 601.266.5509
www.usm.edu/irb

TO: Desmon C. Mitchell
109 Virginia Drive
Hattiesburg, MS 39401

FROM: Lawrence A. Hosman, Ph.D.
HSPRC Chair

PROTOCOL NUMBER: 27020801
PROJECT TITLE: Health Anxiety and Cognition: Chronic Awareness of Health
Concerns or Situational Activation of Latent Dysfunctional Assumptions About
Illness?

Enclosed is The University of Southern Mississippi Human Subjects Protection
Review Committee Notice of Committee Action taken on the above referenced
project proposal. If I can be of further assistance, contact me at (601) 266-4279,
FAX at (601) 266-4275, or you can e-mail me at Lawrence.Hosman@usm.edu.
Good luck with your research.



The University of
Southern Mississippi

Institutional Review Board

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HUMAN SUBJECTS PROTECTION REVIEW COMMITTEE NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Human Subjects Protection Review Committee in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 27020801

PROJECT TITLE: **Health Anxiety and Cognition: Chronic Awareness of Health Concerns or Situational Activation of Latent Dysfunctional Assumptions About Illness?**

PROPOSED PROJECT DATES: 02/01/07 to 12/31/07

PROJECT TYPE: **Dissertation or Thesis**

PRINCIPAL INVESTIGATORS: **Desmon C. Mitchell**

COLLEGE/DIVISION: **College of Education & Psychology**

DEPARTMENT: **Psychology**

FUNDING AGENCY: **N/A**

HSPRC COMMITTEE ACTION: **Expedited Review Approval**

PERIOD OF APPROVAL: **02/08/07 to 02/06/08**

Lawrence A. Hosman

Lawrence A. Hosman, Ph.D.
HSPRC Chair

2-14-07

Date

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