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COMPONENTS OF MEMORY FUNCTIONING AND ATTENTIONAL BIASES IN INDIVIDUALS WITH OBSESSIVE – COMPULSIVE DISORDER CONTAMINATION FEARS AND COMPUSLIVE CHECKING SYMPTOMS

by

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Bachelor of Arts, University of North Dakota, 2008

A Thesis

Submitted to the Graduate Faculty of the

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in partial fulfillment of the requirements

for the degree of

Master of Arts

Grand Forks, North Dakota
May
2012

This thesis, submitted by Kristin L. Holland in partial fulfillment of the requirements for the Degree of Master of Arts from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

Thomas Petros, PhD, Chairperson

April Bradley, PhD

F. Richard Ferraro, PhD

This thesis meets the standards for appearance, conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

Wayne Swisher,
Dean of the Graduate School

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Department	Psychology
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Kristin L. Holland

May 12, 2012

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ABSTRACT

Recent neuropsychological research on anxiety disorders has paid special attention to the memory functioning and attentional abilities of individuals with varying presentations of Obsessive – Compulsive Disorder (OCD). Whether or not there are specific memory deficits and/or biases associated with differing OCD subgroups, or if these subgroups differ in how they attend to and process different types of threatening information are still issues that are being debated (Muller & Roberts, 2005).

The current study recruited 38 participants who had been identified by an earlier survey study as possessing a significant amount of obsessive – compulsive traits. From these 38 participants, 16 were identified as those whose primary OCD concerns were related to contamination fears, ten were identified as primarily compulsive checkers, and 12 were identified as possessing a significant amount of both contamination fear and checking related symptoms. In addition, another 38 participants who reported a very low amount of obsessive – compulsive traits were recruited for the control group.

Participants were administered a series of memory and attention tasks which contained neutral, threatening, and contamination related stimuli. A 4(Group) x 3(Word Type) mixed analyses of variance revealed that individuals who possess more specific OCD related concerns may display a heightened initial memory bias towards contamination related information, potentially affecting the way those individuals attend to and process other information. Limitations and future directions are discussed.

CHAPTER I

INTRODUCTION

Obsessive-Compulsive Disorder (OCD) is an anxiety disorder characterized by obsessions and/or compulsions that cause marked distress and anxiety. The Diagnostic and Statistical Manual of Psychiatric Disorders Fourth Edition, Text Revision (DSM-IV-TR), reports that the disorder is equally common in male and female adults, with a lifetime prevalence rate of 2.5% (p. 459 – 460). According to the DSM-IV-TR, the obsessions and/or compulsions in OCD must cause marked distress, consume more than one hour of the person's day, or significantly interfere with the individual's normal routine. This interference can include impairment in occupational, academic, or interpersonal functioning. Obsessions in OCD are defined as recurrent thoughts, impulses, or images that are considered intrusive, persistent, and inappropriate. Obsessions are not simply worries about real life problems, but are generally recognized by the individual as an excessive and unreasonable product of his or her mind. As a result, the person may try to suppress these thoughts, images, or impulses with compulsive behavior. Compulsions are defined by repetitive behaviors or mental acts that the person feels driven to perform in order to reduce anxiety experienced by obsessions. Compulsions are typically carried out according to a set of rigid rules created by the individual, and are not a realistic way of neutralizing anxiety.

In OCD, an individual's obsessive thought content and compulsive behavior can differ widely from one person to the next, although common patterns of these thoughts and behaviors have been established. The Padua Inventory – Washington State University Revision (PI - WSUR) (Burns, Keortge, Formea & Sternberger, 1996) is a 39 item self-report inventory of obsessive compulsive symptoms, designed to identify five different OCD subgroups based on common content dimensions seen in the disorder. The first subgroup identified by the PI – WSUR consists of individuals who possess obsessive *thoughts* about harm to oneself or others, while individuals in the second subgroup possess obsessive *impulses* to harm oneself or others. The third subgroup comprises individuals with contamination fears (CF subgroup), characterized by contamination obsessions and washing compulsions. The fourth subgroup consists of individuals who report checking compulsions, while individuals in the last subgroup report dressing and/or grooming compulsions. While researchers assert that there is some symptom overlap between these different subgroups; overall, these different content areas correspond to factorially distinct dimensions (Burns, 1996).

In OCD, the most common types of compulsions are checking compulsions and cleaning compulsions. Individuals with checking compulsions obsess about whether or not they have correctly completed an activity (e.g., turned the stove off) and repeatedly go back and check to see if it has been done, while those with cleaning compulsions repeatedly wash themselves or other things due to obsessions involving fears of contamination (Jenike, Baer, & Minichiello, 1990). These individual differences in dysfunctional beliefs and mental content are of particular interest to cognitive theorists. From a cognitive perspective, catastrophic misinterpretations of one's intrusive thoughts,

images, and impulses are core contributors to the etiology of obsessions in OCD (Rachman, 1998). According to this perspective, individuals with OCD attach undue significance to their intrusive thoughts, and thus, obsessions are formed. However, a large body of research within the last decade has been directed at the neuropsychological functioning of patients with OCD.

Neuropsychological research has proposed that the repetitive nature of the thoughts and behaviors central to OCD may be accounted for by certain information processing deficits and/or biases (e.g., Tallis, 1997). Such research suggests that OCD is associated with deficits in executive functioning, attention, memory, and visuospatial skills (Nakao, Nakagawa, Nakatani, Nabeyama, Sanematsu, Yoshiura, Togao, Tomita, Masuda, Yoshioka, Kuroki & Kanba, 2009). The results of these studies, however, have been inconsistent, particularly in regards to the memory functioning and attentional abilities of individuals with OCD. Whether or not there are specific memory deficits associated with OCD, or if the patient's obsessional thought processes impair the way the individual attends to and processes threatening information are still issues that are being debated and heavily researched within the literature (Muller & Roberts, 2005). Therefore, a deeper understanding of the specific components of memory and attention, along with a review of this research as it relates to OCD is warranted.

Patients with OCD, particularly "checkers", often report that they are unsure whether or not they have carried out an action or merely imagined carrying it out. As a result, repetitive rituals are formed, such as compulsive checking of locks, doors, etc. Based on these clients' apparent uncertainty of such events, researchers have become increasingly interested in the episodic memory functioning of individuals who suffer

from OCD (Jenike et al., 1990). Episodic memory refers to the memory of autobiographical events. There are many different types of episodic memories, including memory for verbal (e.g., words) and non-verbal (e.g., specific personal events, visual information) forms of information. As a result, not all studies have tested the same type of episodic memories. Muller and Roberts (2005), state that the nature of the episodic information may play a crucial role in our understanding of memory functioning in patients with OCD. In addition to the type of information being remembered, the means by which these memories are tested may also be important to consider. Recall and recognition tasks are both used to measure an individual's episodic memory. Recall tasks require the participant to produce an item form memory in the absence of any cues, while recognition tasks require the participant to identify the learned items when presented in a list with or alongside unlearned items or "distracter words".

The evidence is mixed when it comes to whether or not individuals with OCD possess an episodic memory deficit. These findings may be due, in part, to differences in the type of stimuli used in these studies. For example, it may be that individuals with OCD encode or retain memories differently for verbal stimuli than they do for non-verbal stimuli, personal experiences, actions, or imagined actions. Previous work has investigated participants' memories using each of these different types of stimuli.

In one of the earliest studies to investigate memory functioning in OCD, Sher, Mann, and Frost (1984) tested 49 college students who were identified as compulsive checkers. Results indicated that the level of checking symptoms, as measured by the Maudsley Obsessive – Compulsive Inventory and the Everyday Checking Behavior Scale, correlated with overall scores on the Wechsler Memory Scale (WMS). In

particular, scores on the Logical Memory subtest, which requires the participant to recall details from short passages that are read to them, were significantly negatively correlated with the amount of checking symptoms the individual reported. These results has been replicated by two more recent studies (e.g., Deckersbach, Otto, Savage, Baer, & Jenike, 2000; Zitterl, Urban, Linzmayer, Aigner & Demal, 2001), and suggest that individuals with OCD symptoms suffer from verbal memory impairments. Deckersbach et al. (2000) tested 17 OCD participants' verbal memory, and found that their scores on the California Verbal Learning Test (CVLT) were impaired for both immediate and delayed free recall of items, relative to the normative data. However, when asked to identify target items using a recognition task, no impairment was identified, suggesting that a memory deficit in OCD may be confined to recall, but not recognition tasks.

On the other hand, a number of studies have failed to find evidence of a verbal memory deficit in patients with OCD (e.g., Boone, Anath, Philpott, Kaur, & Djenderjian, 1991; Christensen, Kim, Dyksen, & Hoover, 1992; Dirson, Bouvard, Cottraux, & Martin, 1995; Radomsky & Rachmen, 1999; Sher, Frost, Kushner, Crews, & Alexander, 1989; Zielinski, Taylor, & Juzwin, 1991). For example, MacDonald, Antony, MacLeod, and Richter (1997) compared OCD checkers, non-checkers, and controls, and found no statistically significant difference in a recall or recognition task for words that were previously presented on a computer screen. There are a number of possible explanations as to why the support for a memory deficit for verbal information has been mixed. First of all, the way in which the stimuli were presented varied from a visual presentation via a computer screen (e.g., MacDonald et al., 1997) to stimuli that were orally presented by the experimenter (e.g., Deckersbach et al., 2000). Secondly, not only are there

differences in methodologies across studies, but some of the content of the stimuli being presented is unknown. It remains unclear whether the target words used in previous research were all of similar content, frequency in the English language, and relative difficulty. The specific components of such content, in addition to the way in which the stimuli are presented, may be of particular importance in assessing the memory functioning of individuals with OCD. And lastly, the way in which participants were selected varied from patients who had been previously diagnosed with OCD by a mental health professional, to subjects whose OCD symptoms were identified by an objective measure such as the PI – WSUR or the Maudsley Obsessive – Compulsive Inventory.

While OCD sufferers may exhibit a memory deficit for general types of information, it has been proposed that individuals with OCD may actually demonstrate superior memory abilities for stimuli related to obsessional thought content. One hypothesis as to why individuals with OCD may exhibit such a memory bias is that they possess a selective information processing bias, which in turn makes it difficult to forget threatening information (Muller & Roberts, 2005). In a study by Wilhem, McNally, Baer, and Florin (1996), participants viewed a series of negative, positive, and neutral words, and were told to either remember or forget each item. Results suggest that patients with OCD had difficulty forgetting the negative items when compared to healthy controls, while no statistically significant differences were observed in patients' memories of positive or neutral words.

In light of the selective information processing theory, it has been hypothesized that OCD washers, or those with contamination fears, in particular, may exhibit a heightened sensitivity for stimuli involving the threat of contamination (Muller &

Roberts, 2005). Radomsky and Rachmen (1999) found that participants with OCD who had contamination fears demonstrated a better free recall for objects that were contaminated by the experimenter relative to both healthy and anxious controls. No statistically significant differences were found for general memory ability between the groups. In a more recent study, Radomsky, Rachman, and Hammond (2001) concluded that among OCD checkers, as the perceived responsibility for the outcome of a check increased, a memory bias for threat-related information also increased. This finding suggests that a memory bias may be present in patients with OCD only under specific circumstances (e.g., if the patient feels the outcome of a check is of particular importance, and that they possess a high degree of responsibility for that outcome). In an attempt to replicate the findings of Radomsky and Rachment (1999), Ceschi, der Linden, Dunker, Perroud, and Bredart (2003) found that compared to controls, OCD washers with contamination fears were able to better recall whether or not an object had been contaminated by the experimenter, as opposed to the specific stimuli itself. This finding suggests increased memory for the specific context involving threatening stimuli.

In summary, some of the recent literature suggests that individuals with OCD demonstrate a positive memory bias in regards to contamination related, or general threat related information or stimuli. However, most of the previously mentioned studies have focused on OCD washers with contamination fears, even though there has been some evidence to suggest that OCD checkers may also exhibit a memory bias under certain circumstances (e.g., depending on the level of importance and perceived responsibility regarding a check). Thus, more research is needed to establish whether or not certain

memory biases differ among the OCD subgroups or content dimensions, and if these results differ depending upon the type of stimuli used or the experimental circumstances.

In addition to a memory bias, a number of studies have demonstrated an attention bias towards threat – related stimuli among individuals suffering from anxiety disorders (Bar – Haim, Lamy Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007). These findings are consistent with cognitive theories of mental processing in anxious individuals (Cisler & Olatunji, 2010). In line with cognitive theorists, Eysenck (1992) proposed that a person's working memory becomes over – loaded in an attempt to process task – irrelevant worrisome thoughts, and thus the mental capacity devoted to task – relevant operations is compromised. It also appears that clinically anxious patients possess an increased ability to encode emotionally threatening information (Burgess, Jones, Robertson, Radcliffe, Emerson, & Lawler, 1981). In support of this view, some researchers propose that in individuals with OCD, intrusive, obsessional (task – irrelevant) thoughts may lead to decreased attentional capabilities towards other general stimuli. However, the literature regarding the specific components of an attentional bias in individuals with OCD is somewhat mixed.

In one of the earliest studies to investigate evidence of an attentional bias in OCD, Foa and McNally (1986) presented participants with two prose passages (one to each ear) in a dichotic listening task. Participants were required to detect and repeat aloud target words from the passage presented in a dominant ear. It has been demonstrated that subjects readily detect target words presented in their dominant ear, while target words presented in the unattended passage generally go unnoticed, unless they are unusually salient. Foa and McNally (1986) found that in 11 participants with OCD, fear-relevant

words (e.g., urine, cancer, rabies) were detected more readily than neutral words before, but not following, exposure and response prevention treatment. In exposure and response prevention treatment, patients are exposed to their feared stimuli, and they are encouraged to discontinue their escape response or compulsive behavior. Thus, the patient habituates to the feared stimulus, while practicing a fear – incompatible behavioral response (e.g., deep breathing). While this type of therapy has been shown to cause short - term anxiety while the patient actively participates in the treatment, it has been proven to facilitate long term reduction of obsessive-compulsive symptoms (Frandklin, Abramowitz, Kozak, & Foa, 2000). In addition to providing evidence for an enhanced ability to encode threatening information, the results from Foa and McNally (1986) suggest that increased attention to fear – relevant stimuli is due to fear of the target stimuli, because of the decrease in stimuli sensitivity following treatment. If familiarity were the source of the attentional bias, more exposure would have further increased the participants' sensitivity to the target stimuli.

A number of studies have used the Modified Stroop task to investigate evidence of an attentional bias to threatening information in OCD. In this type of task, participants view emotionally laden words (e.g., toilet) presented in different colors, and are instructed to name the color and ignore the word itself. This task is based on the assumption that the longer it takes the participant to name the color of the target word, the more difficult it is for him or her to avoid processing its semantic content. Many studies have demonstrated that clinically anxious participants exhibit a statistically significant amount of slowing to color naming emotionally threatening words, compared to neutral words (see Williams, Mathews, & MacLeod, 1996, for a review). This finding

suggests that anxious participants have a hard time ignoring emotionally laden words which results in the encoding of their content.

Foa, Ilai, McCarthy, Shoyer, and Murdock (1993) administered a Modified Stroop task, which included contamination words and general threat words, to 33 participants with OCD and 14 controls. The OCD participants were similar in overall symptom severity and on measures of anxious and depressive symptomology. Out of the 33 patients with OCD, 23 were identified as washers with contamination fears, and 10 were classified as non – washers. Results showed that compared to non-washers and controls, OCD washers evidenced longer latencies to respond to contamination words. Results also indicated that OCD non – washers evidenced interference to general threat words, relative to washers and controls. These results suggest that the selective processing of information in patients with OCD may be specific to the patient's individual concerns or OCD subtype.

Among the OCD subtypes, those with contamination fears have shown more evidence of an attentional bias towards threatening information (Cisler & Olatunji, 2010). However, additional research is needed to further establish whether this attentional bias is towards fear and disgust or contamination related stimuli, and/or just threatening information in general. In order to further explore this issue, Cisler and Olatunji (2010) used a spatial cueing task with neutral, disgust related, and general threat stimuli among individuals who were selected to have elevated contamination fear (CF) traits, along with a control group. In this type of task, participants viewed two empty boxes on each side of a computer screen. Pictures, which had been selected from the International Affective Pictures System (IAPS; Lang, Bradley, & Cuthbert, 1999) and established by previous

research to be neutral, disgust or contamination related, or threatening, were then individually displayed for a brief period of time in one of the two empty boxes. After each picture disappeared, participants were instructed to press the key corresponding to the side of the computer screen the picture had been presented on. This task was based on the assumption that faster reaction times on the CF trials indicated facilitated attention towards CF stimuli, while slower reactions times indicated difficulty disengaging one's attention from those particular stimuli. Results evidenced delayed disengagement from both general threat and CF related stimuli in the CF group, but not the control group. When general response slowing was controlled for, the CF group was still associated with delayed disengagement from threatening and contamination related stimuli. These findings suggest that individuals in the CF subgroup have difficulty disengaging attention from general sources of threat, in addition to disorder-specific stimuli.

Contrary to Cisler and Olatunji (2010), Lavy, can Oppen, and van den Hout (1994) found evidence of a more specific attention bias in patients with OCD using a word list recall task. Results demonstrated that 33 individuals with OCD selectively attended to threat words related to obsessions and compulsions, compared to 29 normal controls. Interestingly, patients did not exhibit this bias in relation to general threatening words, or even positive words related to their obsessions and compulsions. Furthermore, McNally, Amir, Louro, Lukach, Riemann and Calamari (1994) found that individuals with OCD did not exhibit a Stroop interference for panic-related or general threat words, suggesting further evidence that an attentional bias in OCD is highly specific to the individual's obsessions and/or compulsions.

In a more recent study utilizing the Stroop task for examining an attentional bias in OCD, Direnfeld, Pato, and Roberts (2001) tested 42 patients with OCD over the course of 12 weeks. While previous studies have attempted to group participants according to their specific subtype of OCD, patients in this study represented a broader range of obsessive-compulsive symptoms, as determined by the Yale Brown Obsessive-Compulsive Scale (YBOCS). Results indicated that individuals with OCD showed more interference to threat – related stimuli relative to normal controls, and that this attentional bias increased the more diverse the patient's OCD symptoms were. Taken together, the results of Lavy et al. (1994), McNally et al. (1994), and Direnfeld (2001) suggest that the more specific an individual's obsessional content concerns are, the more narrow their attention bias. In contrast, the more diverse a patient's OCD symptoms are, it appears the more likely they are to selectively attend to threatening information in general. In addition, Direnfeld et al. (2001) found that the attentional bias decreased significantly after a 12 week exposure and response prevention treatment, and that those participants who no longer demonstrated an attentional bias reported fewer obsessive symptoms at the end of the 12 weeks. However, it should be noted that these findings may also be the result of practice effects due to the frequency of testing throughout the duration of treatment. Nonetheless, these results provide important implications regarding the information processing functioning of patients partaking in OCD treatment.

In summary, while previous studies have demonstrated that individuals with OCD selectively attend to threatening information, whether or not they exhibit an even greater attentional bias towards information related to their particular concerns still remains unclear. As stated earlier, evidence of an attentional bias towards threatening stimuli has

been demonstrated in a number of anxiety disorders, including Post-Traumatic Stress Disorder (Buckley, Blanchard, & Neill, 2000; McNally, 1998), Social Phobia (Heinrichs & Hofmann, 2001), and Generalized Anxiety Disorder (McNally, 1998). Therefore, it is possible that comorbid symptoms of general anxiety or depression may influence the presence, or nature, of an attentional bias in individuals with OCD. Much of the previous literature failed to control for such confounding factors when recruiting their participants.

Another factor possibly contributing to conflicting results is the heterogeneity of OCD. To date, much of the previous literature has treated OCD as a uniform condition, and as previously mentioned, it is becoming increasingly clear that there are important subtypes within the disorder (e.g., Calmari, Wiegartz, & Janeck, 1999; Eichstedt, & Arnold, 2001; Leckman et al., 1997; Pigott, Myers, & Williams, 1996). These subtypes very well may vary in terms of information processing anomalies (Summerfeldt & Endler, 1998). Furthermore, how a participant is classified into these different subtypes may be influencing the results of some of the aforementioned studies. For example, Cisler & Olatunji (2010) used the PI – WSUR to classify participants into differing OCD subtypes, while McNally et al. (1994) and Direnfeld et al. (2001) used other measures, such as the YBOCS. How sensitive these measures are in regards to identifying differing OCD symptomology, as opposed to more generalized anxiety, may play a role in how sensitive the attentional bias towards specific types of stimuli. Due to the large differences in obsessional thought content in OCD, it is possible that individuals with OCD possess a bias towards certain verbal and non – verbal stimuli, depending upon the OCD subgroup to which their symptoms belong. This factor might explain why Cisler & Bunmi (2010) found delayed disengagement from both general threat and fear and

disgust stimuli using a spatial cueing task, while other studies found an attention bias highly specific to CF stimuli using a Modified Stroop or a word recall task. Similarly, certain memory deficits may only be present in certain circumstances, depending on the specific nature of the patient's obsessions and/or compulsions. For example, individuals who possess contamination fears may demonstrate superior memory performance for contamination related stimuli, while memory functioning for other stimuli suffers at the expense of the increased cognitive load they carry as a result of their heightened attention toward CF related material.

In addition, while individuals with compulsive checking symptoms may demonstrate facilitated attention toward threat – related material, they may place less confidence in their memories of such stimuli as a result of the heightened responsibility they feel to correctly control such threats. This notion could explain why these individuals feel the need to repeatedly check certain things in an effort to reduce the threat of what would happen if, on the off chance, they failed to remember something important (e.g., to turn the stove off). Provided the lack of consistency in the literature regarding evidence of memory and attentional biases in patients belonging to specific subgroups of OCD, the current study will focus solely on individuals who are classified into the most common content dimensions of the disorder: those who primarily possess contamination fears, those who primarily possess compulsive checking symptoms, and those who largely demonstrate both symptom clusters. To the researcher's knowledge, there have not been any studies to date which have examined aspects of memory and attention among the aforementioned OCD subgroups, utilizing contamination related, threat related, and neutral verbal stimuli.

CHAPTER II

METHODS

Participants

One thousand four hundred and seventy eight undergraduate students at the University of North Dakota were administered the Pauda Inventory – Washington State University Revision (PI - WSUR) (Burns et al., 1996), to identify individuals with obsessive – compulsive traits. Out of those surveyed, 61 students met criteria for the contamination subgroup. To ensure that participants in this subgroup had a sufficient elevation on the contamination subscale, only those students who scored at or above the contamination subscale clinical mean of 14 qualified. Participants who scored at or above the clinical mean on any of the other subscales were excluded from this subgroup, in order to ensure that these participants' primary symptoms were those of contamination fears. In addition, 28 of the 1,478 students surveyed qualified for the checking subgroup. In order to qualify for this particular subgroup, participants needed to score at or above the checking subscale clinical mean of 20. Those students who also scored at or above the clinical mean on another subscale were excluded from this subgroup, to ensure that the subgroup was comprised of those whose main symptoms were those of repeated checking. The third experimental subgroup consisted of 35 students who scored at or above the clinical mean on both the contamination and the checking subscales, thus representing those individuals whose primary OCD symptoms were those of both

contamination fears and repeated checking. Participants who scored at or above the clinical mean on any of the other subscales were excluded from this group. Lastly, 43 of the students surveyed obtained a total PI – WSR score of eight or lower, thus qualifying them for the control group.

E-mails were then sent out to each of the 124 students who qualified for one of the three experimental groups (contamination, checking, or "both" subgroup), inviting them to participate in the current study. The e-mail explained to students that they had qualified to participate in the present study based on their score from a previous survey study, and included instructions on how to sign up for participation if they wished to do so. From these recruiting efforts, a total of 38 students agreed to participate (16 from the contamination group, 10 from the checking group, and 12 whose scores met or exceeded the means on both groups). E-mails were also sent out to each of those students who qualified for the control group. Once 38 individuals from the control group signed up to participate, no further time slots were added, thus ending enrollment at 76 total participants.

Measures

The Padua Inventory (PI)

The Padua Inventory (PI) (Sanavio, 1988), which was used to classify participants into the differing subgroups, is a self-report measure of obsessive and compulsive symptoms which has been increasingly used in OCD research (Burns et al., 1995). However, since the PI's induction to clinical research, researchers have noted that instead of strictly measuring obesessional content relative to OCD, the PI also appears to measure general worry or anxiety (Freeston, Ladouceur, Rheaume, Letarte, Gagnon &

Thibodeau, 1994). Therefore, a revision of the PI was needed. The most recent revision of the PI, the PI – WSUR (Burns et al., 1996), which was used in the present study, measures five content dimensions, or different subgroups of OCD (i.e. obsessional thoughts of harm to self/others, obsessional impulses to harm self/others, contamination obsessions and washing compulsions, checking compulsions, and dressing/grooming compulsions).

The PI – WSUR has eliminated the items from the original PI that appeared to measure worries that were not specific to OCD and instead reflected a more general measure of anxiety. Thus, the PI – WSUR is a purer measure of obsessive and compulsive content. Support has been established for the PI – WSUR's content distinction between obsessions and worry, and results have ensured adequate reliability and validity of the revision (Burns et al., 1996). The PI – WSUR is comprised of 39 items, in which the subject ranks their responses on a scale that consists of 0) not at all, 1) a little, 2) quite a lot, 3) a lot, and 4) very much. The higher the score on each statement, and the higher the score on each of the OCD content areas, the more the endorsement of OCD symptoms.

Beck Depression Inventory – II (BDI – II)

The Beck Depression Inventory – II (BDI-II) is a 21-item, self-report measure used to assess the presence and intensity of an individual's depressive symptoms. The instrument was given to each participant in an effort to rule out the possible confounding effects of comorbid depression. Each item on this inventory is a list of four statements arranged in increasing severity regarding a particular symptom of depression. Respondents are required to choose the statement in each group that best describes how

they have felt within the previous two weeks. Items 1-13 measure psychological symptoms of depression, while items 14-21 measure somatic symptoms of depression. All items are in alignment with the DSM-IV diagnostic criteria for depression. The higher the individual's score is on each item, the more the endorsement of depressive symptoms.

State Trait Anxiety Inventory (STAI)

The State Trait Anxiety Inventory (STAI) is a self-report measure composed of two separate scales: one for measuring state anxiety, and the other for trait anxiety. State anxiety is defined as a transitory state or emotional condition with subjective, consciously perceived feelings of tension, apprehension, and heightened autonomic nervous system activity. Trait anxiety is defined as a more stable tendency to respond to situations as dangerous or threatening (Spielberger, Gorsuch, Lushen, Vagg & Jacobs, 1983). This inventory was given in an effort to rule out the possible confounding effects of comorbid symptoms of generalized anxiety. The state anxiety scale contains 20 questions (raw scores ranging from 20-80), in which the subject describes how he or she feels at that particular time. A response to each item is scored on a four point scale consisting of 1) not at all, 2) somewhat, 3) moderately so, and 4) very much so. The trait anxiety scale also consists of 20 statements (raw scores ranging from 20-80), in which the subject describes how they generally feel. Responses are scored using the same 4-point scale as the state anxiety scale.

Modified Stroop Task

The original Stroop task requires the participant to read through a list of color names (e.g., "red", "green", "blue") that are printed in a color not denoted by the name

(e.g., the word "red" is printed in green ink instead of red ink). Participants' time is then compared to the amount of time it takes him or her to read through a list of color names that are printed in the corresponding color (e.g., the word "red" is printed in red ink). The present study used a Modified Stroop task, similar to other Modified Stroop tasks that have been utilized in previous OCD research, to investigate evidence of an attentional bias to threatening or contamination related information. In this type of task, participants view words presented in different colors, and are instructed to name the color and ignore the word itself. The underlying assumption is that the longer it takes the participant to name the color of the target word, the more difficult it is for him or her to avoid processing its semantic content.

Three large word lists were compiled for the present study (one neutral, one threatening, and one contamination related). Each of the words in these lists had all been previously rated as either neutral, threatening, or contamination related, and have been widely used and accepted by previous OCD researchers (Charash & McKay, 2002; Kapman, Keijsers, Verbraak, Naring, & Hoogduin, 2001; Tata, Leibowitz, Prunty, Cameron, & Pickering, 1996). All of these words were then assigned scores for their average frequency of occurrence in the English language (Kuchera & Frances, 1967), and six smaller word lists of approximate equal frequency in the English language (two neutral, two threatening, and two contamination related) were developed based off of these scores. Each of these word lists contained sixteen total words and are listed in Appendix A, along with their respective frequency scores.

Three of the final six word lists constructed for the present study were used for the Modified Stroop task (one neutral, one threatening, and one contamination related).

See Appendix B for each of these word lists. A list of colored X's was also constructed as a measure of the participant's general reaction time, to control for the possible confounding effect of individual naming latencies (see Appendix B).

Word Recall Lists

The remaining three word lists constructed for the present study (one neutral, one threatening, and one contamination related) were then used for an immediate and delayed recall task (see Appendix C). An audio recording which read aloud each of the three word lists was created by the experimenter. These recordings were made to ensure that each word list was read at the same volume and rate, along with the same tone and intonation. Each word list took approximately 30 seconds to play. After the audio recording for each list was played, the subject was asked to immediately free recall as many of the items as possible, in any order. The participant was also instructed to free recall as many of the words from each of the three lists, in any order, after a 20 minute delay.

Recognition Task

A recognition task was created consisting of eight randomly selected target words from each of the three word lists used in the word recall task (24 total target words), along with eight randomly selected distracter words from each of the three word lists used in the Modified Stroop task (24 total distracter words). Thus, the recognition task consisted of 48 words total (see Appendix D). During this task, the participant was instructed to answer "yes" after a word was read if it was included in one of the previously presented learning trials during the word recall task, and "no" if the word was not presented in any of the earlier learning trials.

Vocabulary Measure

The final measure utilized by the present study was the vocabulary subtest from the Wechsler Adult Intelligence Scale – Third Edition (WAIS-III). During this subtest, participants were asked to define a number of words, and scores were used as a general measure of the participants' vocabulary. A measure of vocabulary was included to control for the possible confounding effects that differences in overall vocabulary levels may have on participants' performance on tasks which require the memorization of words.

Procedure

First, the participant read over and signed an informed consent form, after some of the key points were high-lighted by the researcher. Next, the participant was given a standard demographic form to fill out. Participants were then administered the immediate recall task. The order that the three word lists for this task were presented was randomized to ensure that each word list would appear in each ordinal position equally often. Before each of the three word lists were presented, participants completed a practice test, where they free recalled a list of five neutral items. Participants' responses for each of the three experimental word lists were recorded, and recordings were reviewed twice in order to ensure accuracy of responses.

After the immediate recall task, each participant completed the BDI-II and the STAI, followed by the Modified Stroop task. The order that the three word lists (neutral, contamination, and threatening) for the Modified Stroop task were presented in was also randomized to ensure that each word list would appear in each ordinal position equally often. The series of X's was always completed first by all subjects, followed by a practice

test, which consisted of five neutral words. All participants were tested for accuracy of basic color naming to ensure knowledge of colors and to rule out possible color blindness. Responses for all lists were audio-recorded and reviewed twice to ensure accurate response times were recorded.

Participants generally took approximately 20 minutes to complete the BDI-II, the STAI, and the Modified Stroop task; therefore, the delayed recall task was administered next. Once again, verbal responses from this task were recorded and reviewed twice by the researchers to ensure accuracy of participants' scores. After the delayed recall task, the recognition trial was given, followed by the vocabulary subtest of the WAIS-III. All responses from the vocabulary subtest were recorded and scored twice to ensure accuracy.

CHAPTER III

RESULTS

A series of one-way analyses of variance (ANOVAs) were conducted to investigate whether or not participant groups differed on a variety of demographic variables. The means and standard deviations for these variables are presented in Table 1. Results revealed that age, education, vocabulary, and self-reported grade point average were not significantly different among the four participant groups.

Table 1. Demographics.

	Control	Contamination	Checking	Both
Number of Subjects	38	16	10	12
Age	19.76 (1.2)	21.31 (4.7)	19.8 (1.03)	19.58 (1.62)
Education	13 (0.96)	14 (0.96)	13.9 (0.74)	15 (1.5)
Vocabulary	43.34 (6.93)	42.88 (12.55)	41.5 (4.24)	38.75 (7.4)
GPA	3.23 (0.55)	3.59 (0.45)	3.4 (0.58)	3.17 (0.38)

A series of one-way analyses of variance (ANOVAs) were also conducted to determine if participant groups differed in regards to scores on the Beck Depression

Inventory-III (BDI-III) and the State - Trait Anxiety Inventory-III (STAI-III). The means and standard deviations for these scores are presented in Table 2.

Table 2. Psychological Variables.

	Control	Contamination	Checking	Both
Contamination Score	1.68 (1.23)	17.81 (3.15)	9.4 (2.84)	21.42 (7.22)
Checking Score	1.05 (1.25)	12.63 (4.1)	23.6 (2.17)	25.5 (3.73)
Overall PI Score	3.47 (2.39)	34.44 (7.51)	37.1 (4.61)	61.75 (23.87)
BDI	4.76 (5.84)	8.62 (8.61)	9.2 (7.11)	11.58 (6.2)
State Anxiety	29.71 (9.94)	36.13 (11.5)	31.9 (14.09)	34 (8.27)
Trait Anxiety	32.16 (10.38)	37.94 (11.82)	35 (11.88)	38.33 (11.44)

The results revealed that no group differences were observed for State and Trait Anxiety scores. However, the BDI-III scores were significantly different between groups $F(3,72) = 3.902$, $p<.05$. Subsequent Tukey tests revealed that BDI-III scores of those participants who scored above the clinical mean on both the contamination and checking subscales evidenced more depressive symptoms than the control group, although these symptoms were still within the normal range. All other pairwise comparisons were not significantly different. In subsequent analyses, group differences in BDI-III scores were not statistically corrected for given that higher levels of depressive symptoms would be expected among a clinical group when compared to a control group.

For the immediate word recall tasks, the number of words recalled for each participant was computed separately for each type of word list (neutral, general threat, or contamination). The means and standard deviations for these scores are presented in Table 3.

Table 3. Immediate Recall.

	Control	Contamination	Checking	Both
Neutral	6.18 (1.49)	5.69 (2.06)	5.8 (1.55)	6 (1.71)
General Threat	5.45 (1.55)	5.25 (1.29)	6.8 (3.16)	6.41 (2.15)
Contamination	6 (1.85)	7.31 (2.18)	7.1 (1.37)	7.17 (1.8)

These data were subjected to a 4(Group) x 3(Word Type) mixed analyses. Results revealed a significant main effect for Word type F (2, 144) =8.025, p<.05. Subsequent Tukey tests revealed that recall of the contamination words (mean = 6.895) was significantly higher than both recall of the neutral words (mean = 5.918) and general threat words (mean = 5.979). No other pairwise comparisons were significant. The Group x Word Type Interaction was also significant F (6, 144) = 2.770, p<.05. A subsequent analysis of this interaction examined the pattern of word recall for each group. For the Control Group and the Both Group, recall was not significantly different across word types. For the Checking Group, significantly more contamination words were recalled than neutral words with all other comparisons not significant. For the

Contamination Group, recall was significantly higher for the contamination words than either the threatening or neutral words.

For the delayed word recall tasks, the number of words recalled for each participant was computed separately for each type of word list. The means and standard deviations for these scores are presented in Table 4.

Table 4. Delayed Recall.

	Control	Contamination	Checking	Both
Neutral	3.05 (1.45)	2.5 (2.37)	3.5 (2.01)	2.67 (1.23)
General Threat	2.03 (1.38)	2.13 (1.54)	3.2 (3.26)	3.75 (2.41)
Contamination	3.18 (1.52)	4 (2.45)	4.2 (1.93)	3.5 (2.11)

These data were subjected to a 4(Group) x 3(Word Type) mixed analyses. Results revealed a significant main effect for word type $F(2, 144) = 4.867$, $p<.05$. Subsequent Tukey tests revealed that delayed recall of the contamination words (mean = 3.721) was significantly higher than both recall of the general threat words (mean = 2.775) and neutral words (mean = 2.930); however, the Group x Word Type Interaction was not significant.

For the word recognition task, the number of words correctly recognized for each participant was computed separately for each type of word list. The means and standard deviations for these scores are presented in Table 5.

Table 5. Recognition Trial.

	Control	Contamination	Checking	Both
Neutral	5.68 (1.63)	5.8 (1.56)	4.9 (2.38)	5 (1.71)
General Threat	5.47 (1.35)	5.63 (1.41)	5.4 (1.71)	6.42 (1.31)
Contamination	6.5 (1.22)	6.5 (1.37)	6.3 (1.34)	7 (0.95)

These data were subjected to a 4(Group) x 3(Word Type) mixed analyses. Results revealed a significant main effect for word type F (2, 144) = 15.383, p<.05. Subsequent Tukey tests revealed that recognition of the contamination related words (mean = 6.575) was significantly higher than both the recognition of the general threat words (mean = 5.729) and neutral words (mean = 5.349). However, the Group x Word Type Interaction was not significant.

For the Modified Stroop Task, each participant's total time was recorded separately for each type of word list (Neutral, General Threat, and Contamination), along with the control condition where participants were given a sheet with a series of X's on it and were instructed to name the color of the ink each group of X's was printed in. The means and standard deviations for these different word lists' response times (in seconds) are presented in Table 6.

Table 6. Modified Stroop.

	Control	Contamination	Checking	Both
Neutral	8.89 (1.47	8.63 (2.19)	8.2 (1.55)	9.17 (1.11)
General Threat	8.74 (1.75)	8.56 (2.16)	9 (2.11)	10.25 (1.82)
Contamination	9.53 (1.75)	9.19 (2.54)	9.7 (1.57)	11.17 (1.9)

A one-way ANOVA computed on the latencies for the Control condition was not significant F (3, 72) < 1.0. This finding suggests that any group differences in the pattern of responding for the different word lists were not likely due to group differences in vocalization latencies. A 4(Group) x 3(Word Type) mixed analyses of variance was then conducted. Results revealed a significant main effect for Word Type F(2, 144) = 21.370 , p<.05. Subsequent Tukey tests revealed that the time taken to complete the Contamination word list (mean = 9.895) was significantly longer than the time taken to complete the General Threat list (mean = 9.038), which in turn was significantly longer than the time needed to complete the Neutral word lists (mean = 8.633). Furthermore, the Group x Word Type Interaction was also significant F (6, 144) = 2.400, p<.05. A subsequent analysis revealed that for the Control and Contamination Groups, no significant differences in latencies were observed across Word Types. For the Checking Group, Contamination words led to significantly longer latencies than the Neutral words, and all other pairwise comparisons were not significantly different. Lastly, the participants who scored within the clinical range on both the Contamination and

Checking subscales ("Both" group) took significantly longer to complete the Modified Stroop task when the words were Contamination related (mean = 11.167) compared to Threat related (mean = 10.25), while the time needed to complete the Modified Stroop when the words were Threat related was significantly higher than when the words were Neutral (mean = 9.167).

In order to further explore group differences in performance on the Modified Stroop task, two difference scores were calculated for each participant. The means and standard deviations for this condition are presented in Table 7. One score was the difference between latencies for the Neutral and the Threat words, and another was the difference between the Neutral and the Contamination words.

Table 7. Differences in Modified Stroop Performance.

	Control	Contamination	Checking	Both
Neutral/Threat	.16 (1.46)	.063 (1.39)	-.8 (1.93)	-1.08 (1.11)
Neutral/Contamination	-.63 (1.44)	-.56 (1.15)	-1.5 (1.65)	-2.0 (1.35)

A one way ANOVA of group differences for the Neutral-Threat condition was significant, F (3, 72) = 3.824, p = .013. A subsequent Tukey analysis revealed that the difference scores were larger for the Both group compared to the Contamination group and the Control group. All other pairwise comparisons were not significant.

A second difference score was the difference between the neutral and the Contamination words. A one way ANOVA of group differences for the Neutral-Threat condition was significant, F (3, 72) = 2.793, p = .046. A subsequent Tukey analysis

revealed that the difference scores were larger for the Both group compared to the Contamination group and the Control group. All other pairwise comparisons were not significant.

CHAPTER IV

DISCUSSION

While some of the data obtained from the present study support previous research, other results offer new insight or conflicting evidence in regards to the information processing abilities of individuals with obsessive – compulsive traits. While overall, immediate recall of the contamination words was significantly higher than immediate recall of the neutral and general threat words, recall was not significantly different across words types for the control group or the group with combined contamination fears and compulsive checking symptoms. However, for individuals with predominantly contamination fears or predominantly checking symptoms, immediate recall was significantly higher for the contamination related words than for the neutral words, suggesting that individuals who possess more specific OCD related concerns may display a heightened memory bias towards contamination – related information. For those in the contamination fear subgroup, significantly more contamination words were also recalled in comparison to the general threat words. This finding is consistent with previous research, which supports the notion that participants with contamination fears demonstrate better free recall for contamination related stimuli relative to controls (Radomsky & Rachmen, 1999). However, to the researcher's knowledge, the finding that participants with checking symptoms also demonstrate better free recall of contamination

related stimuli compared to neutral words has not been reported, given that previous work has not examined a contamination related memory bias in those individuals who are identified primarily as checkers. To date, previous research has suggested that in OCD checkers, a memory bias exists for threat – related information (Radomskey et al., 2001); however, a memory bias for contamination related stimuli has not yet been examined in these participants.

The finding that checkers demonstrated better free recall of contamination related stimuli and that more individuals in our sample met the clinical cutoff criteria for both the contamination fear and checking subgroups than did those who met the cutoff criteria for the checking subgroup alone, suggests that there may be more symptom overlap between the different OCD subgroups than previously thought. For example, it may be that many individuals' repeated checking behaviors are driven by contamination fears (e.g., a check is performed to make sure the soap was put in the dishwasher correctly). Given that the present study only tested a total of ten individuals with predominately checking symptoms, researchers were not able to further divide the group into those with general checking symptoms and those with checking symptoms revolving around contamination fears, although doing so would have allowed researchers to test this hypothesis. Nonetheless, it remains unclear why results from the current study indicate that for participants with significant elevations on both the checking and the contamination subscales, no significant differences across word types were found. If participants with significant levels of either checking symptoms or contamination fears demonstrate a memory bias for contamination related stimuli when members of distinct subgroups, it would make good theoretical sense that participants with elevations on both of these

scales would perhaps demonstrate an even greater memory bias. However, it may be that the group with co-morbid checking and contamination symptoms constitute a qualitatively different presentation than either the checking only or contamination only subgroups. It is also possible that the more diffuse one's OCD symptoms become, the weaker the memory bias towards specific types of information. Participants among the three clinical groups did not significantly differ in measures of vocabulary, overall number of words recalled, or depressive or anxious symptoms, therefore ruling out variables that could have potentially explained the aforementioned results.

Delayed recall and recognition of the contamination words was significantly higher than recall of the general threat and neutral words; however, the Group x Word Type interaction was not significant, suggesting that any kind of memory bias among the different OCD subtypes is confined to immediate recall tasks. One possibility is that this finding is due to the effects of hypermnesia among each of the experimental groups. Hypermnesia is a phenomenon of improved memory performance that is associated with repeated testing and is facilitated by relational processing, especially with a well-categorized stimulus list, such as the lists used in the present study (Otani & Hodge, 1991). So, while differences may be observed across groups for immediate recall abilities, the effects of hypermnesia may prevent these differences from occurring on any subsequent trials. In contrast, there is some previous work to suggest that individuals with OCD symptoms are impaired on both immediate and delayed free recall of items, as measured by the California Verbal Learning Test (CVLT) (Deckersbach et al., 2000). However, Deckersbach et al. (2000) tested outpatients with OCD, who all met DSM – IV criteria for the disorder and indicated moderate to severe OCD symptoms on the Yale –

Brown Obsessive – Compuslive Scale, which may account for a greater degree of impairment. In addition, Deckersbach et al. (2000) did not utilize a Modified CVLT, and therefore was measuring general immediate memory abilities.

Evidence from the present study suggests that depending on the specific OCD subgroup to which the participant belongs and the specific content of the stimuli being presented, participants with OCD may actually demonstrate superior immediate recall abilities. This finding is more in line with the findings of Radomsky et al. (1999), which demonstrated that patients with contamination fears were able to better recall whether or not an object had been contaminated by the experimenter. Further research might investigate whether or not individuals who score highly on measures such as the Yale Brown Obsessive-Compulsive Scale (YBOCS) or the Padua Inventory-Washington State Univeristy Revision (PI – WSUR) differ in their memory abilities compared to individuals who meet DSM – IV – TR criteria for the disorder. When considering results from the current study, taken together with previous research, one might hypothesize that individuals with OCD symptoms demonstrate a positive memory bias for contamination related stimuli; however, memory impairments for other types of stimuli do not appear unless the individual has a clinical diagnosis of OCD and more severe symptomology.

For the Modified Stroop task, the results indicate that the time taken to complete the contamination word list was significantly longer than the time taken to complete the general threat list, which in turn was significantly longer than the time needed to complete the neutral word list. This same pattern of responding was evidenced in participants who met cut-off criteria for both the checking and contamination fear subscales. This is an interesting finding being previous work has only found an attention

bias for contamination related words with OCD washers, for both outpatients with OCD and/or for individuals who scored highly on self – report measures, while non-washers (i.e., checkers), typically only evidence interference to general threat words, as opposed to those that are contamination related (Foa et. al., 1993; Lavy et. al., 1994). Furthermore, for participants in just the checking subgroup, contamination words led to significantly longer latencies than the neutral words, with all other pairwise comparisons not significantly different. And lastly, participants in the control and contamination groups did not evidence significant differences in latencies across the different word types. Taken together, these findings provide further evidence to suggest that there may be more symptom overlap between the contamination and checking groups than previously thought. However, the finding that individuals in the checking subgroup evidenced significantly longer latencies for contamination words compared to neutral words, while there were no significant differences in latencies across word types for the contamination subgroup, seems like an odd finding. One possibility is that the more OCD symptoms one possess the heightened their attention bias will be, given that the clinical mean and minimum subscale score needed for inclusion in the checking subgroup is 20, whereas the clinical mean and minimum subscale score needed for inclusion in the contamination subgroup was only 14.

There are, however, certain limitations of the present study that should be noted. One of the main limitations is the generalizabiltiy of the current findings to an actual clinical sample comprised of individuals who have been given an official OCD diagnosis. While previous research has indicated that individuals who have not sought out treatment but who have scored highly on self-report measures of OCD symptoms often meet

diagnostic criteria for the disorder (Burns et al., 1996), the present study found that approximately eight percent of the 1,478 individuals given the Padua Inventory – Washington State University Revision (PI – WSUR) met or exceeded the clinical mean on one or both of the checking and contamination subscales – a percentage that is much higher than actual OCD prevalence rates. This finding brings into question the notion that those who score highly on self-report measures often meet diagnostic criteria for the disorder. Furthermore, the DSM – IV – TR indicates that while community studies have estimated a lifetime prevalence rate of 2.5% in OCD, and a 1 – year prevalence of 0.5% to 2.1% in adults, methodological problems with assessment tools raise the possibility that true prevalence rates are even lower. The current study found that four of the 38 participants who participated in the study had received a previous diagnosis of OCD. How many of the remaining clinical participants would have met diagnostic criteria for the disorder is a question that remains unanswered.

Perhaps if the present study had made the qualifying criteria more stringent for the three clinical groups by requiring higher PI – WSUR subscale scores, the number of qualifying participants would have more closely resembled actual OCD prevalence rates and been more representative of a true clinical sample. For example, Cisler & Bunmi (2010), who also classified participants into differing OCD subgroups based on their scores form the PI – WSUR, required that participants' scores fall at or above *one standard deviation* above the clinical mean on the specified subscale, while the present study included participants whose scores simply fell at or above the clinical mean on the given subscale. While requiring that participants endorse a high degree of symptoms in order to qualify for a study may increase the chances that the obtained results will better

generalize to a clinical sample, there are also disadvantages to implementing more stringent inclusion criteria. Provided the previously mentioned low prevalence rates of OCD, finding enough individuals who endorse such a high degree of OCD symptoms can be a monumental task, which may become even more difficult when working within a college student sample. Given that OCD rituals must either be time consuming and/or interfere with normal functioning, one could argue that prevalence rates of the disorder may be even lower in a college student sample, when considering the everyday demands of pursuing a post – secondary education. This issue subsequently raises the question of whether or not studies such as Cisler & Bunmi (2010) may have included subjects in their clinical groups who had a tendency to over – report their symptoms, as opposed to individuals who truly possessed those traits. Future research may attempt to screen participants more thoroughly, perhaps by conducting clinical interviews with each individual, in order to more accurately assess who meets diagnostic criteria for OCD and who does not.

In addition, sixty eight percent of participants from the present study were female, whereas the DSM – IV – TR indicates that in adults, OCD is equally as common in males as in females. It is unclear whether or not more females happened to be present in the classes that were administered the pre – screening measure, whether more females were actually suffering from OCD symptoms, or whether females just had a greater tendency to over – report their symptoms. More research is needed to further delineate these questions, and to examine whether or not results from the present study generalize as well to males as they do females who possess similar OCD symptomology.

Despite the aforementioned limitations, the present study has some important implications for clinical practice. If future research is able to better delineate aspects of memory and attentional biases in individuals with OCD, perhaps assessment measures such as a Modified Stroop task or a modified word recall task could be used to help further assess an individual's OCD symptomology. Such measures may also be useful in assessing the efficacy of exposure and response prevention treatment at an informational processing level. As previously mentioned, Foa and McNally (1986) found that in participants with OCD, fear-relevant words (e.g., urine, cancer, rabies) were detected more readily than neutral words before, but not following, exposure and response prevention treatment, lending support to this idea. In addition, these types of assessment measures may be useful in identifying which individuals may be at risk for developing OCD. If certain informational processing abnormalities are contributing factors to the etiology of OCD and precede OCD thoughts and behaviors, perhaps the presence of certain contamination related memory and/or attentional biases may help identify certain at risk individuals and subsequently prevent them from developing clinical levels of the disorder. In order to determine if the aforementioned assessment measures may be used as preventative screening tools, future research should further investigate whether or not such informational processing abnormalities precede OCD thoughts and behavior, or if such memory and attentional biases are the result of OCD symptomology.

APPENDICES

Appendix A

Six Constructed Word Lists With Corresponding Frequency Scores

Contamination Word List 1:

Toilet-13	Polluted-1	Mucus-2	Diarrhea-7	Corpses-5	Rotten-2
Spatter-1	Tarnished-3	Odor-14	Stench-1	Ooze-2	Dung-2
Decompose-1	Disgusted-6	Rubbish-4	Feces-0		

16 total words, Average frequency = 4.0

Threatening Word List 1:

Scream-14	Intruder-1	Inept-2	Hateful-3	Complaint-1	Attacker-6
Infectious-5	Ashamed-16	Masacare-1	Intimidate-2	Unlovely-1	Coffin-7
Lethal-5	Jealous-4	Rattlesnake-3	Castration-0		

16 total words, Average frequency = 4.1

Neutral Word List 1:

Shoe-14	Layered-1	Pumpkin-2	Handbag-3	Greyhound-1	Kitchens-5
Lukewarm-5	Glimpse-16	Navigate-1	Shampoo-2	Bracelet-1	Apron-7
Roadway-5	Violinist-4	Seafood-3	Trillion-1		

16 total words, Average frequency = 4.1

Contamination Word List 2:

Decay-14	Excretion-1	Fungus-2	Stinking-2	Urine-1	Filthy-7
Manure-6	Perspired-14	Festering-1	Maggots-2	Pimple-1	Garbage-7
Spitting-5	Salivia-4	Vomitting-3	Puss-0		

16 total words, Average frequency = 4.4

Threatening Word List 2:

Fainted-1	Assults-6	Incompetent-2	Kidnapper-1	Hazard-7
Torture-3	Offended-3	Heartbreaking-2	Inferior-7	Painful-25
Persecuted-3	Intimidate-2	Comas-1	Insulting-2	Negligent-2
Paralysis-6				

16 words total, Average frequency = 4.5

Neutral Word List 2:

Sideboard-1	Landscaped-3	Tortoise-3	Sterling-7	Cheekbones-5
Cinema-3	Presentable-2	Audio-2	Moonlit-2	Iced-1
Windy-2	Diluted-6	Robin-2	Harmonies-7	Verbal-21
Elasticity-5				

16 total words, average frequency = 4.4

Appendix B

Modified Stroop Lists

Reaction Time:	*Contamination:*	*Threat:*	*Neutral:*
XXXX	Decay	Fainted	Sideboard
XXXX	Manure	Torture	Presentable
XXXX	Spitting	Persecuted	Robin
XXXX	Excretion	Paralysis	Landscaped
XXXX	Perspired	Assaults	Audio
XXXX	Saliva	Offended	Harmonies
XXXX	Festering	Intimidate	Tortoise
XXXX	Vomiting	Heartbreaking	Moonlit
XXXX	Urine	Incompetent	Verbal
XXXX	Filthy	Comas	Sterling
XXXX	Pimple	Kidnapper	Iced
XXXX	Fungus	Inferior	Elasticity
XXXX	Stinking	Insulting	Cheekbones
XXXX	Maggots	Negligent	Windy
XXXX	Puss	Hazard	Cinema
XXXX	Garbage	Painful	Diluted

Appendix C

Word Recall Lists

NEUTRAL:		**THREATENING:**		**CONTAMINATION:**	
Shoe	____	Scream	____	Toilet	____
Lukewarm	____	Infectious	____	Spatter	____
Roadway	____	Lethal	____	Decompose	____
Layered	____	Intruder	____	Polluted	____
Kitchens	____	Ashamed	____	Dung	____
Glimpse	____	Jealous	____	Ooze	____
Violinist	____	Inept	____	Tarnished	____
Pumpkin	____	Massacre	____	Disgusted	____
Navigate	____	Rattlesnake	____	Mucus	____
Seafood	____	Hateful	____	Feces	____
Handbag	____	Intimidate	____	Rubbish	____
Trillion	____	Castration	____	Odor	____
Shampoo	____	Unlovely	____	Diarrhea	____
Greyhound	____	Complaint	____	Rotten	____
Apron	____	Attacker	____	Corpses	____
Bracelet	____	Coffin	____	Stench	____

Appendix D

Recognition Word List

Infectious (t)	**YES**	NO	Shoe (n)	**YES**	NO
Decompose (c)	**YES**	NO	Stench (c)	**YES**	NO
Cinema (n)	YES	**NO**	Trillion (n)	**YES**	NO
Diarrhea (c)	**YES**	NO	Handbag (n)	**YES**	NO
Mucus (c)	**YES**	NO	Massacre (t)	**YES**	NO
Lukewarm (n)	**YES**	NO	Apron (n)	**YES**	NO
Complaint (t)	**YES**	NO	Intimidate (t)	**YES**	NO
Corpses (c)	**YES**	NO	Intruder (t)	**YES**	NO
Urine (c)	YES	**NO**	Kidnapper (t)	YES	**NO**
Torture (t)	YES	**NO**	Fainted (t)	YES	**NO**
Windy (n)	YES	**NO**	Sterling (n)	YES	**NO**
Painful (t)	YES	**NO**	Decay (c)	YES	**NO**
Stinking (c)	YES	**NO**	Glimpse (n)	**YES**	NO
Filthy (c)	YES	**NO**	Perspired (c)	YES	**NO**
Lethal (t)	**YES**	NO	Garbage (c)	YES	**NO**
Manure (c)	YES	**NO**	Pumpkin (n)	**YES**	NO
Saliva (c)	YES	**NO**	Robin (n)	YES	**NO**
Comas (t)	YES	**NO**	Audio (n)	YES	**NO**
Seafood (n)	**YES**	NO	Tortoise (n)	YES	**NO**
Rubbish (c)	**YES**	NO	Disgusted (c)	**YES**	NO
Persecuted (t)	YES	**NO**	Ashamed (t)	**YES**	NO
Castration (t)	**YES**	NO	Dung (c)	**YES**	NO
Assaults (t)	YES	**NO**	Elasticity (n)	YES	**NO**
Harmonies (n)	YES	**NO**	Hazard (t)	YES	**NO**

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