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Evaluating the Effects of Clutter on Information Processing Deficits in Hoarding Prone Individuals

Amanda Medley Raines
EVALUATING THE EFFECTS OF CLUTTER ON INFORMATION PROCESSING
DEFICITS IN HOARDING PRONE INDIVIDUALS

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AMANDA MEDLEY RAINES

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Amanda Medley Raines defended this thesis on January 7, 2013.
The members of the supervisory committee were:

Norman B. Schmidt  
Professor Directing Thesis

Jesse R. Cougle  
Committee Member

E. Ashby Plant  
Committee Member

The Graduate School has verified and approved the above-named committee members, and certifies that the thesis has been approved in accordance with university requirements.
This thesis is dedicated to my husband, parents, grandmother, and friends for their love and support during this academic endeavor.
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ABSTRACT

Compulsive hoarding has been defined as the accumulation of and failure to discard a large number of possessions that appear to have little or no value, to the extent that ones living spaces are precluded from everyday use. Current cognitive behavioral models of compulsive hoarding view hoarding as a multifaceted problem stemming from information processing deficits in the areas of memory, attention, decision making, and categorization. The vast majority of research to date has focused on establishing such deficits as vulnerability factors in the development of compulsive hoarding. However, there is also reason to suspect that the experience of compulsive hoarding may in turn be responsible for deficits in information processing. Thus, the current study seeks to expand upon the existing literature by examining the relationships between clutter and information processing deficits through an experimental test of a Scar model. Participants included 72 individuals from the community and undergraduate population. Participants were randomized into either a clutter or non-clutter condition and asked to complete various neuropsychological and behavioral tasks of memory, attention, decision making, and categorization. Results revealed that individuals with elevated levels of hoarding exhibited greater deficits in the areas of attention, decision making, and categorization. Inconsistent with prediction however, it appears that individuals in the clutter condition relative to the non-clutter condition did not experience greater deficits in information processing. The current findings provide useful information regarding potential vulnerability factors for compulsive hoarding and add considerably to a growing body of literature on hoarding behaviors. Moreover, the current study is the first to examine how the presence or absence of clutter might influence or contribute to deficits in information processing.
CHAPTER ONE
INTRODUCTION

Compulsive hoarding is defined as the accumulation of and failure to discard a large number of possessions that appear to have little or no value, to the extent that ones living spaces are precluded from everyday use (Frost & Hartl, 1996). Once thought to be a rare disorder, compulsive hoarding is estimated to affect between 4% and 5% of the population (Samuels et al., 2008). Severe hoarding can result in an inability to perform necessary household functions, health problems due to unsanitary conditions, social isolation, work disability, and even death (Frost, Steketee, & Williams, 2000; Frost, Steketee, Williams, & Warren, 2000; Kim, Steketee, & Frost, 2001).

Research suggests that compulsive hoarding is often comorbid with a wide range of psychiatric disorders including social phobia, schizophrenia, personality disorders, and depression (Chong, Tan, & Lee, 1996; Frost, Steketee, Williams, et al., 2000; Samuels et al., 2002). Although hoarding has traditionally been viewed as a symptom or subtype of obsessive compulsive disorder (OCD) and is currently listed as one of the eight criteria for obsessive compulsive personality disorder (OCPD), its diagnostic boundaries are unclear. Evidence suggests that hoarding is a complex phenomenon that might not be best captured within the OCD spectrum. Several studies have demonstrated that a large percentage of individuals who hoard display no other OCD symptoms (Pertusa et al., 2010; Samuels et al., 2008). Furthermore, relative to OCD patients without hoarding, those with hoarding have an earlier age of onset (Samuels et al., 2002), greater levels of global impairment (Lochner et al., 2005), and less insight into the nature of their symptoms (Steketee & Frost, 2003). Taken together, these findings
suggest that hoarding may be a distinct disorder and highlight the need for future research in this area.

According to Frost and Hartl’s (1996) cognitive behavioral model of hoarding, compulsive hoarding is viewed as a multifaceted problem resulting from (1) excessive emotional attachments to possessions, (2) behavioral avoidance, (3) mistaken beliefs about the nature of possessions, and (4) deficits in information processing. Studies have demonstrated that hoarders have extreme emotional attachments to their possessions (Frost & Gross, 1993). It appears that many hoarders view their possessions as extensions of themselves. When their items are moved or touched by others they feel violated (Frost, Hartl, Christian, & Williams, 1995). Behavioral avoidance, the act of saving possessions in order to postpone making decisions, is also thought to directly contribute to the saving behaviors of hoarders. This avoidance is suspected to reflect a fear of making a mistake while discarding (Frost & Gross, 1993). Further, hoarders often have mistaken beliefs about the nature of their possessions. For example, they may have mistaken beliefs regarding the future utility of their possessions, which leads them to save unused items “just in case” they are needed in the future (Frost et al., 1995). Finally, the last proposed component of Frost and Hartl’s cognitive behavioral model of hoarding, involves deficits in information processing. These include difficulties with memory, attention, decision making, and categorization (Steketee & Frost, 2003). In recent years, the effects of these information processing deficits on hoarding behaviors have been well-researched; all have been demonstrated to have profound effects on the clutter and saving behaviors of hoarders (Frost & Gross, 1993; Frost & Hartl, 1996; Grisham, Norberg, Williams, Certoma, & Kadib, 2010; Hartl, Duffany, Allen, Steketee, & Frost, 2005).

One information processing deficit proposed to affect hoarding behaviors involves memory deficits. Frost and Hartl (1996) suggest that two aspects of memory are particularly
important: (1) confidence in memory and (2) beliefs about the importance of remembering information. Hoarders often doubt their ability to remember information. Saving items becomes a way of retaining this information without having to actually remember it (Frost & Steketee, 1998). In addition, hoarders often overestimate the importance of remembering information. The thought of forgetting some detail about a possession is seen as a failure that brings about significant distress and anxiety (Frost & Steketee, 1998). Despite the suggested associations between memory performance and hoarding behaviors, only one study to date has been published examining memory problems among compulsive hoarders. Hartl and colleagues (2004) examined memory performance, memory confidence, and memory beliefs among a group of compulsive hoarders and non-clinical controls. Compared to non-clinical controls, hoarders recalled less information on two tests of learning and memory. Further, hoarders reported less confidence in their memory and more distressing concerns about the potential consequences of forgetting.

In addition to memory deficits, another cognitive processing problem related to hoarding involves attention difficulties. Individuals who hoard frequently shift attention from one object to another resulting in an inability to make decisions or follow through with decisions during tasks such as sorting (Grisham & Barlow, 2005). When comparing members of a clutter self-help group to a community control sample, Hartl and colleagues (2005) found that hoarders exhibited higher scores on measures of adult attention deficit hyperactivity disorder (ADHD) and on childhood symptoms of ADHD. Hoarders have also been found to exhibit difficulties with sustained attention and response inhibition on various neuropsychological tasks. For example, Grisham, Brown, Savage, Steketee, and Barlow (2007) found that compared to both clinical and non-clinical controls, hoarders had more difficulty initiating responses (slow, variable reaction time) and inhibiting prepotent responses (more commission errors) during the Conner’s
Continuous Performance Test. Further, hoarders performed more poorly on a test of visual memory span, suggesting deficits in spatial attention. These difficulties in sustained attention are consistent with clinical observations suggesting that hoarding patients have difficulty staying focused on tasks, even within a therapy setting (Steketee, Frost, Wincze, Greene, & Douglass, 2000).

The third information processing deficit related to compulsive hoarding involves decision making deficits. Hoarders often demonstrate difficulty when trying to distinguish “trash” from “treasure”. They feel that the majority of their possessions are valuable, thus making it difficult for them to distinguish between which items to keep and which to discard (Frost & Hartl, 1996). One core feature thought to be directly contributing to these deficits in decision making is indecisiveness (Frost & Gross, 1993; Frost & Shows, 1993). Frost and Gross (1993) suggest that the act of hoarding is an avoidance behavior directly linked to indecisiveness, in which the hoarder saves items in order to avoid the decision of discarding and to avoid any distress associated with the potential of making a mistake while discarding. Research examining the decision making deficits among hoarders has produced mixed results. For example, Lawrence et al. (2006) found that OCD patients with hoarding symptoms performed worse on the Iowa Gambling Test (IGT) than did OCD patients without hoarding symptoms. In contrast, Grisham et al. (2007) found no differences between compulsive hoarders, clinical controls, and non-clinical controls on the IGT. However, this difference may be related to sample selection. Whereas, Lawrence et al’s sample consisted of OCD patients with and without additional hoarding symptoms, Grisham et al’s sample consisted of patients with a primary diagnosis of hoarding.

The last proposed information processing deficit, which has received considerable attention in recent years, involves difficulties with categorization. Individuals who hoard appear to exhibit difficulties arranging and categorizing their possessions, which may in part explain
why clutter accumulates so readily in the homes of hoarders (Frost & Hartl, 1996). These
difficulties are thought to be the result of an under-inclusive categorization style (Frost & Hartl,
1996). Specifically, hoarders often view their items as having important and unique attributes
which makes it difficult for them to be placed into broad categories during sorting tasks. These
unique qualities also increase the overall perceived value of the item, making the decision to
discard even more difficult.

To date, only three studies have examined these categorization difficulties among clinical
and non-clinical hoarders. Luchian, McNally, and Hooley (2007) examined categorization
difficulties among a group of non-clinical hoarders who self-identified as “packrats”. The
authors found that compared to controls, non-clinical hoarders rated the categorization task as
more stressful and more difficult. Furthermore, the non-clinical hoarding group created more
piles and took twice as long to sort items relative to the control group. Wincze, Steketee, and
Frost (2007), compared hoarders, OCD non-hoarders, and non-psychiatric controls on three
categorization tasks. The participants were asked to sort and organize both personal items and
non-personal items. Both hoarders and non-hoarding OCD participants reported more distress
than control participants prior to the sorting tasks. No differences were found among the groups
when sorting non-personal items. However, when sorting personal items hoarding participants
took more time and created more piles than OCD non-hoarding participants and controls,
suggesting that specific deficits might be especially relevant to hoarders when classifying
personal objects. Similar results were reported in a more recent article by Grisham and
colleagues (2010). The authors compared three groups of participants: hoarders, non-hoarding
clinical participants, and non-clinical controls on a categorization task. Once again hoarding
participants were found to have more difficulty sorting personal items relative to non-personal
items. These difficulties included creating more piles, remaining more anxious, and taking a
longer time to sort personal items. In sum, the results of these studies suggest that categorization
difficulties are present in both clinical and non-clinical hoarding populations.

The vast majority of research assessing deficits in information processing have focused
on establishing such deficits as vulnerability factors in the development of compulsive hoarding
(Grisham & Barlow, 2005). In particular, research has attempted to demonstrate the possibility of
a Predisposition model in which the vulnerability factor (information processing) contributes to
the development of the disorder (Clark, Watson, & Mineka, 1994). However, as noted by Clark
and colleagues (1994), the Predisposition model is just one of several models that can be
considered when attempting to provide an explanation for the relationship among an alleged
vulnerability factor and a given disorder. For example, the Pathoplastic model would suggest that
the vulnerability factor influences the course or expression of the disorder. Further, the Spectrum
or Continuity model would suggest that the vulnerability factor and disorder reflect the same
underlying construct. Finally, the Scar or Complication model would suggest that the disorder
itself affects the vulnerability factor. These models are not intended to be mutually exclusive and
it is reasonable to assume that the relationship among an alleged vulnerability factor and a given
disorder could fit within a number of models.

In addition to the Predisposition model, the Scar or Complication model may be a useful
way of explaining the associations among deficits in information processing and the
development of compulsive hoarding. According to this model, the experience of compulsive
hoarding may in turn be responsible for deficits in information processing. In particular, one
aspect of hoarding that may be contributing to or exacerbating these deficits in information
processing is clutter. Over the past few years clutter has been identified as a key feature of
compulsive hoarding and in particular a main source of impairment. For example, in their
definition of hoarding Frost and Hartl (1996) posit that clinically significant hoarding cannot
occur in the absence of clutter. Further, they state that the most impairment associated with hoarding is a direct result of the influence that clutter has on an individual’s life. This impairment includes but is not limited to concern over others moving or touching possessions, controversy with spouses over clutter, illnesses due to unsanitary conditions, and an inability to perform daily activities such as cooking, paying bills, or working (Frost & Hartl, 1996). Despite the functional deficits associated with this symptom of compulsive hoarding, no empirical research has examined how the presence of clutter might influence or contribute to deficits in information processing. Thus, the current study sought to expand upon the existing literature by examining the relationships among clutter and information processing deficits through an experimental test of a Scar model. In particular, the current study expanded upon the existing information processing research by examining how clutter influences information processing deficits in the areas of memory, attention, decision making, and categorization.

It was hypothesized that individuals with elevated levels of hoarding would report more symptoms of indecisiveness and would have more difficulties with sustained attention. It was also expected that individuals with elevated levels of hoarding would perform more poorly than those without elevated levels of hoarding on a neuropsychological task assessing memory and would have more difficulty (i.e. create more piles, take more time, and experience more discomfort) sorting personal items relative to non-personal items during a behavioral sorting task. It was also hypothesized that participants completing the information processing tasks in the context of a cluttered environment, relative to a non-cluttered environment, would be significantly more impaired on information processing. Further, it was hypothesized that there would be an interaction between hoarding severity and environment such that individuals with elevated levels of hoarding who were also exposed to a cluttered environment would experience even greater deficits in information processing. To my knowledge, the proposed study was the
first to examine the relationships between information processing deficits and environmental states, in particular, the presence or absence of clutter.
CHAPTER TWO

METHOD

2.1 Participants

A total of 72 participants were recruited from both the general community and a pool of Introductory Psychology students maintained by the Psychology department at Florida State University (FSU). Participants were primarily female (76.4% female) with ages ranging from 18 to 77 ($M = 31.1, SD = 16.6$). All participants, depending on the means of recruitment, received either $20 cash or course credit for their participation and were selected based on their responses to a hoarding symptom screening instrument, the Hoarding Rating Scale-Self Report (HRS) (Tolin, Frost, & Steketee, 2010). Specifically, 56% of the sample was pre-selected for falling 1.5 standard deviations above the mean on the HRS, while the other 44% was unselected (i.e. not required to meet the HRS cut-off). This method was employed to ensure that we would have a continuous range of hoarding symptoms. The HRS is a brief 5-item questionnaire that assesses specific features of compulsive hoarding. Participants were asked to rate each item using a 9-point Likert scale with responses ranging from 0 (no problem) to 8 (extreme difficulty). The HRS demonstrated excellent internal consistency ($\alpha = .93$) within the current sample.

2.2 Procedure

Student participants were contacted via email and invited to participate in a study evaluating individual differences in response to environmental stress in exchange for two general psychology research credits. Interested students were instructed to sign up for the study through the departmental website. Community participants were recruited from the Anxiety and Behavioral Health Clinic (ABHC), an outpatient anxiety clinic located at FSU, and received $20 compensation for their time. All participants were instructed to bring in 20 personal items that
were representative of the types of items they would typically save. Upon arrival to the lab, informed consent was obtained. Next, participants were screened for any Axis I disorders using the Mini International Neuropsychiatric Interview (Sheehan et al., 1998). Then participants completed a battery of self-report questionnaires and were randomized into either a clutter or non-clutter condition. Individuals in the clutter condition were brought into a small laboratory room containing a desk, computer, and office chairs. In addition, this room contained items such as books, magazines, papers, pens, boxes, and empty water bottles. These items were arranged in a disorganized fashion throughout the room such that there was a limited amount of available space and so that objects were asymmetrical and distracting. Individuals in the non-clutter condition were brought into a similar laboratory room without the clutter component (see Figure 1). It should be noted that the clutter was standardized to ensure consistency across all individuals in the clutter condition.

Upon arrival to the experimental condition, participants were shown a box containing various items such as pens, post-its, coupon books, athletic schedules, and magazines. Participants were informed that they had 10 minutes to look through the items and rate how useful and valuable they considered each item to be. At the end of the item evaluation period, participants were given the five items they rated as most wanting to keep. For participants in the cluttered condition, these items were then added to the existing experimental clutter. This procedure was intended to add a personal component to the clutter condition. In the non-clutter condition, these items were placed in a bag and given to the participant upon completion of the experiment. To my knowledge, the current manipulation has not been used in prior research. However, similar item ratings have been gathered in a study assessing the relationship between compulsive hoarding and self-control (Timpano & Schmidt, 2010).
Additionally, while in one of these conditions, all participants completed the Vohs Depletion Measure. Further, participants completed an object sorting task and a neuropsychological task of memory and attention. Those in the clutter condition completed these tasks in a cluttered office/desk-space; those in the non-cluttered condition completed these tasks in a clean and tidy work area. After completing all tasks, participants were debriefed and thanked for their time. Total participation took 2 hours.

## 2.3 Measures

### 2.3.1 Clinician Administered

Mini International Neuropsychiatric Interview (MINI). The MINI is a brief structured diagnostic interview for the Diagnostic and Statistical Manual 4th edition (DSM-IV). It consists of standardized close-ended questions that were administered to all participants in order to identify the presence of any Axis I condition. Diagnoses were made according to the number of affirmative replies. Previous research has demonstrated that the MINI is both a reliable and valid diagnostic tool (Sheehan et al., 1997). The MINI was included in the current study to assess for potential AXIS I conditions.

Structured Interview for Hoarding Disorder (SIHD). The SIHD is a brief structured interview based on the provisional diagnostic criteria for Hoarding Disorder (Pertusa & Mataix-Cols, un-published). The interview consists of detailed questions and specifiers regarding each of the 6 proposed criteria. The SIHD was used in the current study to assess for potential Hoarding Disorder.

### 2.3.2 Self-Report

Demographics. A comprehensive demographics section was used to assess numerous variables including age, race, ethnicity, living situation, sexual orientation, GPA, and psychiatric diagnoses.
Attention Deficit Hyperactivity Disorder Symptom Checklist (ADHD-CL). The adult version of the ADHD-CL is an 18-item self-report symptom checklist in which respondents are asked to rate the intensity of ADHD symptoms on a 4-point Likert scale ranging from 0 (never or rarely) to 3 (very often). Previous research has demonstrated that this measure has good reliability and internal consistency (Barkley & Murphy, 1998). The ADHD-CL demonstrated excellent internal consistency ($\alpha = .91$) within the current investigation and was included as a supplementary measure of attention.

Depression Anxiety Stress Scales (DASS-21). The DASS is a 21-item self-report questionnaire that assesses three related but independent subscales of depression, anxiety, and stress. Participants were asked to rate on a 4-point Likert scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much), the degree to which each statement was representative of them over the past week. The DASS has been demonstrated to have good reliability and validity within non-clinical samples (Henry & Crawford, 2005) and was included in the current study to control for levels of depression and anxiety. Within the current investigation, the DASS demonstrated excellent internal consistency ($\alpha = .93$)

Item ratings. Participants were asked to provide “value” ratings for each item in the box of items provided by the experimenter (see procedure). They were asked to rate each item on a scale from ranging from 0 to 10, with 0 being “not at all” and 10 being “extremely”. Specifically, participants were asked to make their ratings regarding how useful they consider each item to be, how valuable they consider each item to be, how much they would like to keep each item, and how attached they feel to each item. These value ratings were gathered to determine the degree to which participants feel a personal attachment to the items. Similar item ratings have been used in prior hoarding research (Timpano & Schmidt, 2010).
Frost Indecisiveness Scale (FIS). The FIS is a 15-item self-report measure that asks participants to rate the extent to which they agree with various statements regarding indecisiveness. Items are rated on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). This FIS has been demonstrated to have good internal reliability and validity in an undergraduate sample (Frost & Shows, 1993). Moreover, the FIS demonstrated good internal consistency within the current sample ($\alpha = .87$) and was administered as a supplementary measure of decision making.

Obsessive Compulsive Inventory-Revised (OCI-R). The OCI-R is an 18-item self-report measure of obsessive compulsive symptoms. In addition to a total score, the measure yields six subscale scores including hoarding, checking, neutralizing, obsessing, ordering, and washing. This measure has been shown to have good internal consistency, test-retest reliability, and convergent validity within both non-clinical and clinical samples (Foa et al., 2002). The OCI-R was included in the current study to control for non-hoarding obsessive compulsive (OC) symptoms. Thus, a modified total score was created using all of the non-hoarding OCD items. In the current sample the OCI-R non-hoarding symptoms demonstrated great internal consistency ($\alpha = .92$).

Saving Cognitions Inventory-Revised (SCI-R). The SCI-R is a 24-item self-report questionnaire that assesses one’s reasons (i.e. emotional attachment, memory, control, or responsibility) for keeping various items. This measure has been shown to have good internal consistency and test-retest reliability, as well as concurrent and divergent validity in both hoarding and non-hoarding samples (Frost, Steketee, & Grisham, 2004). The SCI-R demonstrated excellent internal consistency within the current sample ($\alpha = .96$) and was included as a supplementary measure of hoarding symptoms.
Saving Inventory Revised (SIR). The SIR is a 23-item self-report measure that is used to assess hoarding behaviors. This measure consists of three subscales representing the three main aspects of hoarding: acquisitioning, clutter, and difficulty discarding. Participants were instructed to answer the questions using a 5-point Likert scale ranging from 0 (none) to 4 (almost all/complete). Higher scores on this measure reflect greater levels of hoarding behaviors. Previous research has shown good internal consistency and reliability in both clinical and non-clinical samples (Frost et al., 2004). In the current study, the SIR was shown to have great internal consistency ($\alpha = .97$). The SIR was included in the current study as a supplementary measure of hoarding symptoms.

Subjective Units of Distress Scale (SUDS). This idiographic anxiety barometer was used to determine how anxious a participant feels on a scale ranging from 0 (no anxiety) to 10 (most anxiety). Previous research has demonstrated that SUDS rating scales have good reliability and validity (Thyer, Papsdorf, Davis, & Vallecorsa, 1984). SUDS ratings were collected initially after randomization and before and after each sorting task as a measure of emotional reactivity.

Vohs Depletion Scale- State Version. The DS-SV is a 21-item self-report questionnaire used to assess the degree to which one feels depleted in the present moment. Items are rated on a 5-point Likert scale ranging from 1 “not at all like me” to 5 “very much like me”. The measure consists of 7 subscales including over arousal, physical symptoms, giving into temptations, losing emotional control, concentration problems, isolative behavior, and decision making. The decision making subscale was used in the current study as one of the dependent measures of decision making and was administered both before and after randomization. The DS-SV decision making subscale demonstrated good internal consistency ($\alpha = .88$) within the current sample.
2.3.3 Neuropsychological Tests

California Verbal Learning Test-2\textsuperscript{nd} edition (CVLT-II). The CVLT-II is a neuropsychological task that measures memory through auditory learning. Participants were given a list of words over successive trials and asked to recall them both immediately and after a 20 minute delay. The CVLT-II has been demonstrated to have good internal consistency (Delis, Kramer, Kaplan, & Ober, 2000) and will be included in the current study as the dependent measure of memory.

The PEBL Continuous Performance Test (PCPT). The PCPT is a computer-based task of sustained attention that measures one’s ability to suppress impulsive responses (Mueller, 2008). Specifically, participants were asked to press a button for all letters presented with the exception of the letter X. The test measures both errors of omission (failure to press button for a letter except for X) and errors of commission (press button when presented with X). Additionally, the task measures signal detectability, response style, and hit reaction time. This task was included in the current study as a dependent measure of attention.

2.3.4 Behavioral Measure

Sorting Task. Participants were asked to complete four sorting tasks and rate their subjective levels of distress both before and after sorting. These tasks include sorting 20 personal items (those items brought in by the participant), 20 non-personal items (items provided by the experimenter), 20 personal index cards (detailing the items the participant brought in), and 20 non-personal index cards (detailing the non-personal items provided by the experimenter). In accordance with Wincze et al. (2007), the 20 non-personal items were representative of the 5 types of items that are commonly found in the homes of hoarding participants (i.e. reading material, clothing, used containers, stationary, and bathroom items).
CHAPTER THREE

RESULTS

Before conducting any primary analyses, data screening was performed. This included running descriptive statistics to check for any data entry errors or missing data, assessing for univariate or multivariate outliers, and examining scatter plots for skewness and kurtosis. Preliminary investigations for all analyses indicated that there were no threats or violations of normality, multicollinearity, or homoscedasticity.

3.1 Sample Descriptives

The means, standard deviations, and zero-order correlations for all self-report measures used in the current analyses can be found in Table 1. The mean HRS total score was below that found in reports utilizing clinical populations (Tolin et al., 2010). However, it was well above that found in studies utilizing non-clinical populations and above the optimal cut score set forth by Tolin et al. (2010), suggesting that the current sample was above average with regard to hoarding symptoms. 44% of the sample met criteria for hoarding disorder based on self-reported symptoms during the structured clinical interview for hoarding disorder and 47% of the sample scored above the clinical cutoff on the HRS. The mean FIS total score was slightly below that found in reports utilizing clinical populations but slightly above that found in reports utilizing non-clinical populations (Grisham et al., 2010). The mean DASS total score was well above that found in reports utilizing both clinical and non-clinical samples, suggesting that the current sample was above average with regard to depression and anxiety symptoms (Grisham, Brown, Liverant, & Campbell-Sills, 2005; Timpano, Buckner, Richey, Murphy, & Schmidt, 2009; Tolin & Villavicencio, 2011). The mean ADHD inattention subscale was slightly lower than that found in reports utilizing clinical hoarding samples but well above that found in reports utilizing non-
clinical controls (Grisham et al., 2007; Hartl et al., 2005). The OCI-R non-hoarding total score was above that found in other reports utilizing hoarding populations (Tolin & Villavicencio, 2011), indicating that the current sample was slightly above average in OC symptoms. Finally, the SCI-R memory subscale score was lower than that found in other reports utilizing hoarding samples but much higher than that found in reports utilizing non-clinical controls (Steketee, Frost, & Kyrios, 2003). As expected given previous research, all correlations between the HRS, DASS, OCI-R non-hoarding, FIS, ADHD-inattention subscale, and SCI-R memory subscale were significant (Frost, Tolin, Steketee, Fitch, & Selbo-Bruns, 2009; Steketee et al., 2003; Timpano et al., 2009; Tolin & Villavicencio, 2011). Additionally, based on self-reported symptoms during the diagnostic interview 25% of the sample met criteria for a current mood disorder, 40% met for a current anxiety disorder, and 13% met for a current substance use disorder.

3.2 Primary Analyses

3.2.1 Decision Making

Two independent measures of decision making were utilized in the current study. The Vohs Depletion Scale- State Version (DS-SV) decision making subscale was administered both before and after randomization. However, this 3-item subscale is not a well-validated measure of decision making and has not been previously used in hoarding samples. Thus, the Frost Indecisiveness Scale (FIS) was administered prior to randomization as a supplementary measure of decision making. The FIS is a 15-item trait measure of indecisiveness. Previous research has demonstrated that the FIS is associated with compulsive hoarding in both clinical and non-clinical samples (Frost & Gross, 1993; Frost & Shows, 1993; Steketee et al., 2003).

The first hierarchical regression analysis (see Table 2) was performed to assess the relationship between hoarding severity (as measured by the HRS) and deficits in decision making.
making (as measured by the FIS) after controlling for gender, general levels of depression and anxiety (as measured by the DASS), and non-hoarding OC symptoms (as measured by the OCI-R non-hoarding items). In the first step of the model, all three covariates were entered. Gender, general levels of depression and anxiety, and non-hoarding OC symptoms accounted for 28% of the variance in decision making ($F (3,67) = 8.58, p < .001$). Among these three covariates, depression and anxiety symptoms were associated with decision making difficulties ($p < .01, r^2 = .13$), whereas gender ($p = .13, r^2 = .03$) and non-hoarding OC symptoms ($p = .99, r^2 = .00$) were not. In the second step of the model, HRS total scores were added accounting for an additional 16% of the variance in decision making ($F \text{ Change} = 18.68, p < .001$). As expected given previous research, results revealed that after controlling for the aforementioned covariates, hoarding severity significantly predicted decision making difficulties using the FIS ($p < .001, r^2 = .16$).

Next, I wished to examine the relationship between the Vohs DS-SV decision making subscale and the FIS using Pearson product-moment correlation coefficient. Results indicated that there was a strong positive correlation between the two measures ($r = .68, p < .001$). Thus, a hierarchical regression analysis (see Table 3) was performed to test the hypotheses that individuals with elevated levels of hoarding (as measured by the HRS), as well as individuals in the clutter condition relative to the non-clutter condition, would exhibit greater deficits in decision making (as measured by the Vohs DS-SV decision making subscale) after controlling for gender, depression and anxiety symptoms (as measured by the DASS), non-hoarding OC symptoms (as measured by the OCI-R non-hoarding items), and baseline levels of decision making (as measured by the baseline Vohs DS-SV decision making subscale). All four covariates were entered into the first step of the model. Gender, depression and anxiety symptoms, non-hoarding OC symptoms, and baseline levels of decision making accounted for
75% of the variance in time two decision making ($F(4,67) = 48.93, p < .001$). Out of the four covariates, only the baseline decision making subscale was significantly associated with time two decision making ($p < .001, r^2 = .42$). In the second step of the model, hoarding severity and experimental condition were added accounting for an additional .1% of the variance in time two decision making ($F_{\text{Change}} = 16, p = .85$). Inconsistent with initial predictions, hoarding severity ($p = .89, r^2 = .00$) and experimental condition ($p = .59, r^2 = .00$) were not significantly associated with time two decision making using the Vohs DS-SV decision making subscale. Finally, in the last step of the model the centered two-way interaction term was added. Hoarding severity by experimental condition accounted for an additional 1.4% of the variance in time two decision making ($F_{\text{Change}} = 3.80, p = .06$). Given the trending nature of these findings, the interaction term was probed using the guidelines of Aiken and West (1991). Specifically, the simple effects of the clutter condition on individuals +/- 1 standard deviation in hoarding severity were examined (see Figure 2). Inconsistent with initial predictions, at high levels of hoarding severity the effect of a clutter condition was not significantly associated greater self-reported decision making deficits ($p = .31, r^2 = .00$). However, the effect of a clutter condition at low levels of hoarding severity was trending such that those participants with low levels of hoarding who were also exposed to a clutter environment reported greater decision making deficits than those in the non-clutter condition ($p = .08, r^2 = .01$).

### 3.2.2 Attention

A hierarchical regression equation (see Table 4) was performed to test the hypotheses that individuals with elevated levels of hoarding (as measured by the HRS) as well as individuals in the clutter condition relative to the non-clutter condition, would perform worse on a computerized task of sustained attention (as measured by the PCPT). In the first step of the model, the covariates of gender, depression and anxiety symptoms (as measured by the DASS),
and non-hoarding OC symptoms (as measured by the OCI-R non-hoarding items) were entered accounting for 18% of the variance in sustained attention \((F (3,68) = 4.81, p < .01)\). Of the three covariates, only female gender was significantly associated with attention difficulties \((p < .05, r^2 = .06)\). In the second step of the model, the two predictor variables were added. Hoarding severity and experimental condition accounted for an additional 26.1% of the variance in sustained attention \((F \text{ Change} = 15.31, p < .001)\). Consistent with initial predictions, hoarding severity significantly predicted attention difficulties \((p < .001, r^2 = .26)\), whereas experimental condition did not \((p = .68, r^2 = .00)\). In the final step of the model, the centered two-way interaction term was added. Hoarding severity by experimental condition accounted for an additional 3% of the variance in sustained attention \((F \text{ Change} = 3.64, p = .06)\). Due to the trending nature of these findings, the interaction term was probed using the recommendations of Aiken and West (1991) (see Figure 3). Consistent with initial predictions, results were trending such that at high levels of hoarding severity individuals who were exposed to a cluttered environment were experiencing even greater deficits in sustained attention \((p = .10, r^2 = .02)\). As expected, the effect of the clutter condition at low levels of hoarding severity was not significant \((p = .29, r^2 = .01)\).

### 3.2.3 Memory

A hierarchical regression analysis (see Table 5) was computed to test the hypotheses that individuals with elevated levels of hoarding (as measured by the HRS), as well as individuals in the clutter condition relative to the non-clutter condition, would perform worse on a neuropsychological task assessing memory (as measured by the CVLT-II) after controlling for gender, general levels of depression and anxiety (as measured by the DASS), and non-hoarding OC symptoms (as measured by the OCI-R non-hoarding items). In the first step of the model, all three covariates were entered accounting for 10% of the variance in memory performance \((F \)
(3,68) = 2.46, p = .07). Among the three covariates, lower levels of depression and anxiety were significantly associated with poor memory performance (p < .05, sr² = .08), whereas gender (p = .74, sr² = .00) and non-hoarding OC symptoms (p = .32, sr² = .01) were not. In the next step of the model, the two predictor variables of hoarding severity and experimental condition were added accounting for an additional 3.3% of the variance in memory performance (F Change = 1.26, p = .29). Inconsistent with initial predictions, hoarding severity (p = .18, sr² = .02) and experimental condition (p = .39, sr² = .01) were not significantly associated with poor memory performance. Finally, in the third step of the model the centered two-way interaction term of hoarding severity by experimental condition was added accounting for an additional .1% of the variance in memory performance (F Change = .05, p = .82). Inconsistent with initial hypotheses, results revealed that there was not a significant hoarding by clutter condition interaction for the dependent measure of memory performance (p = .82, sr² = .00).

Within a more exploratory framework, a second hierarchical regression analysis was performed to assess the relationship between hoarding severity (as measured by the HRS) and perceived memory performance (as measured by the SCI-R memory subscale) after controlling for gender, general levels of depression and anxiety (as measured by the DASS), and non-hoarding OC symptoms (as measured by the OCI-R non-hoarding items). Once again, all three covariates were entered into step one of the model. Gender, depression and anxiety symptoms, and non-hoarding OC symptoms accounted for 25% of the variance in perceived memory deficits (F (3,68) = 7.35, p < .001). Among these three covariates, general levels of depression and anxiety symptoms were significantly associated with perceived memory performance (p < .05, sr² = .08), whereas gender (p = .85, sr² = .00) and non-hoarding OC symptoms (p = .19, sr² = .02) were not. In the second step of the model, hoarding severity was added accounting for an additional 24% of the variance in perceived memory deficits (F Change = 30.92, p < .001). Thus,
results revealed that hoarding severity was significantly associated with perceived memory deficits ($p < .001$, $r^2 = .24$). These findings are consistent with more recent research suggesting that hoarders do not have actual memory deficits but rather perceived memory deficits (Tolin, Villavicencio, Umbach, & Kurtz, 2011).

3.2.4 Categorization

A series of hierarchical linear regression analyses were performed to test the hypotheses that individuals with elevated levels of hoarding, as well as individuals in the clutter condition, would have more difficulty (i.e. create more piles, take more time, and experience more discomfort) sorting personal items relative to non-personal items during a behavioral sorting task. The first regression analysis (see Table 6) was conducted to assess the relationships among hoarding severity, experimental condition, and the number of personal piles created during a behavioral sorting task. All three covariates were entered into step one of the model. Gender, depression and anxiety symptoms (as measured by the DASS), and non-hoarding OC symptoms (as measured by the OCI-R non-hoarding items) accounted for 10% of the variance in the number of personal piles created ($F(3,68) = 2.38, p = .08$). However, none of the covariates made a significant unique contribution. In the second step of the model, the two predictor variables of hoarding severity (as measured by the HRS) and experimental condition were added accounting for an additional 9.7% of the variance in the number of personal piles created ($F$ Change $= 3.95, p < .05$). As anticipated, results revealed that hoarding severity was significantly associated with the number of personal piles created during a behavioral sorting task ($p < .05$, $r^2 = .06$). Inconsistent with initial predictions however, experimental condition was not significantly associated with the number of personal piles created ($p = .06$, $r^2 = .04$). Whereas this finding was trending towards significance, results revealed it was trending in the opposite direction such that individuals in the non-clutter condition relative to the clutter condition were
creating more piles ($B = -2.07$). In the final step of the model, the centered two-way interaction term was added. Hoarding severity by experimental condition accounted for an additional 4% of the variance in the number of personal piles created ($F$ Change $= 3.43, p = .07$). Given the trending nature of these findings ($p = .07, \text{sr}^2 = .04$), the interaction term was probed according to the guidelines set forth by Aiken and West (1991). Inconsistent with initial hypotheses, results revealed that at high levels of hoarding severity individuals who were also exposed to a clutter environment, created fewer piles than individuals with elevated levels of hoarding in the non-clutter condition ($p = .01, \text{sr}^2 = .08$) (see Figure 4). As expected, the effect of experimental condition at low levels of hoarding severity was not significant ($p = .98, \text{sr}^2 = .00$).

The next regression equation was performed (see Table 7) to assess the relationships among hoarding severity (as measured by the HRS), experimental condition, and the number of non-personal piles created. Once again, all three covariates were entered into step one of the model. Gender, depression and anxiety symptoms (as measured by the DASS), and non-hoarding OC symptoms (as measured by the OCI-R non-hoarding items) accounted for 9% of the variance in the number of non-personal piles created ($F (3,68) = 2.25, p = .09$). Once again, none of the covariates made a significant unique contribution. In the second step of the model, hoarding severity and experimental condition were added accounting for an additional 14.4% of the variance in the number of non-personal piles created ($F$ Change $= 6.19, p < .01$). Inconsistent with initial predictions, hoarding severity was significantly associated with the number of non-personal piles created ($p < .05, \text{sr}^2 = .08$). In addition, experimental condition was a significant predictor of the number of non-personal piles created ($p < .05, \text{sr}^2 = .07$). However, inconsistent with initial predictions those in the non-clutter condition created more piles ($B = -1.84$).

A second set of regression analyses were performed to assess the relationships among hoarding severity (as measured by the HRS), experimental condition, and time taken to sort both...
personal and non-personal items. In the first regression equation (see Table 8), the covariates of gender, depression and anxiety symptoms (as measured by the DASS), and non-hoarding OC symptoms (as measured by the OCI-R non-hoarding items) were entered into step one of the model. These three covariates accounted for 1.4% of the variance in time taken to sort personal items ($F(3,68) = .32, p = .81$). Among the three covariates, there were no individual significant predictors. In the next step of the model, the predictor variables of hoarding severity and experimental condition were added accounting for an additional 16.2% of the variance in time taken to sort personal items ($F_{\text{Change}} = 6.47, p < .01$). As predicted, hoarding severity was significantly associated with time taken to sort personal items ($p < .01, r^2 = .16$). However, contrary to initial predictions experimental condition was not a significant predictor of time taken sort personal items ($p = .59, r^2 = .00$). Finally, in the last step of the model the centered two-way interaction term was added. Hoarding severity by experimental condition accounted for an additional .9% of the variance in time taken to sort personal items ($F_{\text{Change}} = .68, p = .41$). Contrary to initial predictions, results indicated that there was not a significant hoarding severity by clutter condition interaction ($p = .41, r^2 = .01$).

The next regression equation (see Table 9) was computed to assess the relationships among hoarding severity (as measured by the HRS), experimental condition, and time taken to sort non-personal items. All three covariates were once again entered into step one of the model. Gender, depression and anxiety symptoms (as measured by the DASS), and non-hoarding OC symptoms (as measured by the OCI-R non-hoarding items) accounted for 6.1% of the variance in time taken to sort non-personal items ($F(3,68) = 1.48, p = .23$). Once again, there were no individual significant predictors in step one of the model. In the second step, the predictor variables of hoarding severity and experimental condition were added, accounting for an additional 6.6% of the variance in time taken to sort non-personal items ($F_{\text{Change}} = 2.49, p = .
.09). Consistent with initial predictions, experimental condition was not significantly associated with time taken to sort non-personal items (p = .87, sr² = .00). However contrary to initial predictions, hoarding severity was significantly associated with time taken to sort non-personal items (p < .05, sr² = .07).

A final set of regression analyses were performed to assess the relationships among hoarding severity (as measured by the HRS), experimental condition, and distress (as measured by SUDS) while sorting both personal and non-personal items. In the first regression equation (see Table 10), the covariates of gender, depression and anxiety symptoms (as measured by the DASS), and non-hoarding OC symptoms (as measured by the OCI-R non-hoarding items) were entered into step one of the model accounting for 26.2% of the variance in distress while sorting personal items (F (3,68) = 8.07, p < .001). Among these three covariates, only depression and anxiety symptoms were significantly associated with distress while sorting personal items (p < .05, sr² = .07). Next, the two predictor variables of hoarding severity and experimental condition were added accounting for an additional 5.5% of the variance in distress while sorting personal items (F Change = 2.68, p = .08). Consistent with initial hypotheses, hoarding severity was significantly associated with levels of distress while sorting personal items (p < .05, sr² = .06). However, inconsistent with initial predictions experimental condition was not significantly associated with distress while sorting personal items (p = .92, sr² = .00). In the final step of the model, the centered two-way interaction term was added. Hoarding severity by experimental condition accounted for an additional 1.2% of the variance in distress while sorting personal items (F Change = 1.16, p = .29). Thus, results revealed that there was not a significant interaction between hoarding severity, clutter condition, and distress while sorting personal items (p = .29, sr² = .01).
The final regression equation (see Table 11) was performed to assess the relationships among hoarding severity (as measured by the HRS), experimental condition, and distress (as measured by SUDS) while sorting non-personal items. In the first step of the model, all three covariates were entered. Gender, depression and anxiety symptoms (as measured by the DASS), and non-hoarding OC symptoms (as measured by the OCI-R non-hoarding items) accounted for 29% of the variance in levels of distress while sorting non-personal items ($F (3,68) = 9.04, p < .001$). Among these three covariates, non-hoarding OC symptoms were significantly associated with distress while sorting non-personal items ($p < .05, \text{sr}^2 = .07$), whereas gender ($p = .39, \text{sr}^2 = .01$) and general levels of depression and anxiety ($p = .08, \text{sr}^2 = .03$) were not. In the second step of the model, the two predictor variables were added. Hoarding severity and experimental condition accounted for an additional 2.2% of the variance in levels of distress while sorting non-personal items ($F \text{ Change} = 1.06, p = .35$). As anticipated, results revealed that hoarding severity was not significantly associated with levels of distress while sorting non-personal items ($p = .37, \text{sr}^2 = .01$). In addition, experimental condition was not significantly associated with levels of distress while sorting non-personal items ($p = .25, \text{sr}^2 = .01$).
CHAPTER FOUR

DISCUSSION

Consistent with initial predictions, results indicated that hoarding severity was significantly and robustly associated with decision making difficulties, as measured by the FIS. These findings remained significant even after controlling for gender, general levels of depression and anxiety, and non-hoarding OC symptoms, which have been shown to be highly comorbid with hoarding behaviors (Frost, Steketee, & Tolin, 2011). These findings support previous research establishing indecisiveness as a hallmark symptom of compulsive hoarding (Frost & Gross, 1993; Frost & Shows, 1993; Steketee et al., 2003). Specifically, hoarders demonstrate an inability to readily distinguish “trash” from “treasure”. They believe that a disproportionate number of their items are valuable, thus making it difficult for them to distinguish between which items to keep and which to discard (Frost & Hartl, 1996). One core feature thought to be contributing to these deficits in decision making is indecisiveness. This conceptualization is consistent with self-reported symptoms (Frost, Tolin, Steketee, & Oh, 2011), as well as neuroimaging research demonstrating that compulsive hoarders display excessive hemodynamic activity in various regions of the brain known to effect decision making processes (Tolin, Kiehl, Worhunsky, Book, & Maltby, 2009).

Inconsistent with initial hypotheses, hoarding severity was not significantly associated with decision making difficulties as measured by the Vohs DS-SV decision making subscale. One potential explanation for these findings is that the Vohs DS-SV decision making subscale is not a validated measure of decision making and has not been previously used in hoarding samples. In addition, Pearson product-moment correlation coefficient results indicated that while there is a strong positive correlation between the FIS and Vohs DS-SV decision making subscale
\( r = .68, p < .001 \), they are not perfectly correlated. Indeed, calculating the coefficient of determination indicated that these two measures share only 46\% of their variance. This suggests that while there is some overlap between the two measures they are likely tapping into different aspects of the construct.

Contrary to initial predictions, results also indicated that experimental condition was not a significant predictor of decision making difficulties. Specifically, it was hypothesized that individuals in the clutter condition relative to the non-clutter condition would report more symptoms of indecisiveness. Over the past few years, clutter has been identified as a core component of compulsive hoarding and in particular a main source of impairment (Frost & Hartl, 1996). Despite the functional deficits associated with this symptom (Frost, Steketee, & Williams, 2000; Frost, Steketee, Williams, et al., 2000), it appears that the presence or absence of clutter does not affect decision making difficulties. One potential explanation for these findings is that individuals who hoard may have become accustomed to a cluttered atmosphere. That is, due to repeated exposure they may have habituated to the potential interfering effects that a cluttered environment has on decision making abilities.

It was also hypothesized that there would a significant hoarding severity by clutter condition interaction such that individuals with elevated levels of hoarding who were also exposed to a cluttered environment would experience even greater deficits in decision making. However, inconsistent with initial predictions, results revealed that individuals with elevated levels of hoarding who were also exposed to a cluttered environment reported fewer symptoms of indecisiveness than those with elevated levels of hoarding in the non-clutter condition. Anecdotal reports have indicated that hoarders often feel a sense of security when surrounded by their items (Frost & Hartl, 1996). It is possible that this type of chaotic environment provides
more comfort than discomfort allowing individuals to not be cognitively burdened by decision making task.

Consistent with previous research, results also revealed that individuals with elevated levels of hoarding performed more poorly on a computerized task of sustained attention after controlling for gender, general levels of depression and anxiety, and non-hoarding OC symptoms. These findings are consistent with clinical observations (Steketee et al., 2000) and empirical research demonstrating that hoarding is associated with neuropsychological weaknesses in sustained attention (Grisham et al., 2007; Tolin et al., 2011). Moreover, these findings may help explain the gross disorganization and clutter observed in the homes of hoarders.

Contrary to initial predictions, there was not a significant main effect of experimental condition on attention difficulties. However, the hypothesis that there would be a significant hoarding severity by clutter condition interaction was trending such that individuals with elevated levels of hoarding who were also exposed to a cluttered environment experienced even greater deficits in sustained attention. This finding is consistent with clinical observations detailing that hoarding patients are easily distractible and have difficulty staying focused when completing tasks (Steketee et al., 2000). It has been suggested that hoarders may have a lessened capacity to stay focused, particularly when faced with distractions and competing stimuli such as clutter (Grisham & Barlow, 2005).

It was also hypothesized that individuals with elevated levels of hoarding as well as individuals in the clutter condition would perform more poorly on a neuropsychological task assessing memory. However, results indicated that there was not a significant main effect for hoarding severity or experimental condition. Moreover, the hypothesis that there would be a significant hoarding severity by clutter condition interaction, such that individuals with elevated
levels of hoarding who were also exposed to a cluttered environment would experience even greater deficits in memory performance was not supported. Whereas these findings are inconsistent with previous research by Hartl and colleagues (2004), they are consistent with more recent research demonstrating that hoarders do not exhibit impaired verbal or nonverbal memory deficits on the CVLT (Fitch & Cougle, 2012; Tolin et al., 2011). One potential explanation for these mixed findings is that more recent studies utilized a newer version of the CVLT. The current study also utilized this newer version which contains all new items, as well as new norms for individuals ages 16-89. Another possibility is that hoarders may not have actual memory deficits but rather perceived memory deficits. Anecdotal reports have indicated that hoarders often report a lack of confidence in their memory (Frost & Hartl, 1996). Saving items becomes a way of retaining information without having to actually remember it (Frost & Steketee, 1998). Additionally, it has been suggested that hoarders overestimate the importance of remembering certain information. The thought of forgetting some detail about a possession is seen as a failure that brings about significant distress and anxiety (Frost & Steketee, 1998). Consistent with this conceptualization and prior research (Fitch & Cougle, 2012; Hartl et al., 2004; Tolin et al., 2011), results indicated that hoarding severity was significantly associated with perceived memory deficits even after controlling for gender, general levels of depression and anxiety, and non-hoarding OC symptoms. Thus, it appears that beliefs about memory deficits rather than actual memory deficits may be an important determinant of saving behaviors.

Consistent with initial predictions, results revealed that hoarding severity was significantly associated with the number of personal piles created during a behavioral sorting task, time taken to sort personal items, and levels of distress while sorting personal items. These findings support previous research demonstrating that hoarders experience difficulty arranging and categorizing possessions (Grisham et al., 2010; Wincze et al., 2007). Specifically, it has been
suggested that hoarders have an under-inclusive categorization style (Frost & Hartl, 1996). That is, each possession is seen as extremely unique making it difficult to place them into broad categories during sorting task. Interestingly, results also revealed that individuals with elevated levels of hoarding created more piles and took more time sorting non-personal items. However, hoarding severity was not significantly associated with levels of distress of while sorting non-personal items. These findings support previous research by Luchian and colleagues (2007) suggesting that the classification of possessions is not only problematic for personal objects but also for non-personal objects. Moreover, these findings suggest that while individuals with elevated levels of hoarding experience difficulty categorizing both personal and non-personal objects, they only become distressed about sorting items of personal relevance.

Inconsistent with initial predictions experimental condition was not significantly associated with the number of personal piles created, time taken to sort personal items, or levels of distress while sorting personal items. Moreover, the hypotheses that there would be a significant hoarding severity by clutter condition interaction for the dependent variables of number of personal piles created, time taken to sort personal items, and levels distress while sorting personal items were also not significant. It should be noted, that the effects of experimental condition on number of personal piles created and the two-way interaction of hoarding severity by experimental condition for number of personal piles created, were trending towards significance. However, results were trending in the opposite direction such that individuals in the non-clutter condition relative to the clutter condition were creating more piles. One potential explanation for these findings is that the non-clutter condition inherently had more available space potentially allowing individuals the opportunity to create more piles.

Finally, as predicted there was not a significant main effect of condition on time taken to sort non-personal items or on levels of distress while sorting personal items. However, contrary
to initial hypotheses there was a significant main effect of condition on the number of non-
personal piles created such that individuals in the non-clutter condition compared to the clutter
condition were creating more piles. As previously mentioned, this finding could be a result of the
additional space available in the non-clutter condition for individuals to potentially create more
piles.

Taken together, the current findings fit within the broader framework of Frost and Hartl’s
(1996) cognitive behavioral model of hoarding. Within this model, compulsive hoarding is
viewed as a multifaceted problem stemming from faulty beliefs about the nature of possessions,
extreme emotional attachments to possessions, behavioral avoidance, and deficits in information
processing. These findings are consistent with extant research demonstrating that information
processing deficits in the areas of attention, categorization, and decision making are central to
hoarding behaviors (Frost, Tolin, et al., 2011; Grisham et al., 2010; Tolin et al., 2011).
Furthermore, with the exception of attention difficulties, these findings also suggest that the
experience of compulsive hoarding (i.e. clutter) does not appear to influence deficits in
information processing.

Limitations of the current study should be considered in light of future directions. For
example, due to the cross sectional nature of the current study clear conclusions regarding
causality cannot be made. Prospective studies are needed to more clearly determine the temporal
relationships between information processing deficits and compulsive hoarding. A second
limitation was that the current study did not assess for medications that participants had recently
taken that may have enhanced or diminished their performance on the various information
processing tasks. Future studies could also benefit from a more comprehensive battery of tests.
Specifically, the relationships among attention and decision making difficulties should be
examined using more naturalistic tasks. Additionally, only 44% of the current sample met
diagnostic criteria for hoarding disorder. It will be important for future research to attempt to replicate the current findings in pure hoarding samples. Finally, items in the cutter condition did not belong to the participant. It is possible that this lack of personalization with regard to the clutter contributed to the non-significant findings between experimental condition and deficits in information processing.

Despite these limitations, the current investigation provides valuable information regarding the relationships between information processing and compulsive hoarding. Consistent with prior research it appears that elevated levels of hoarding are associated with deficits in categorization, decision making, and attention. To my knowledge, this was the first study to examine how the presence or absence of a cluttered environment might influence or contribute to deficits in information processing. With the exception of attention difficulties, it appears that deficits in information processing are not exacerbated by the presence of a cluttered environment. In summary, the current findings add to a growing body of literature on the nature of hoarding behaviors. Research of this type is integral to understanding the etiology and maintenance of compulsive hoarding.
Table 1
Zero-order correlations, means, and standard deviations for all self-report measures

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Note. ***p < .001, **p < .01, *p < .05. HRS = Hoarding Rating Scale; DASS = Depression Anxiety Stress Scale; OCIR-NH = Obsessive-Compulsive Inventory – Revised: 15 non-hoarding items total score; DSSV-DM = Depletion Scale State Version: Decision making subscale; FIS = Frost Indecisiveness Scale; ADHD-Att = Attention Deficit Hyperactivity Disorder Inattention subscale; SCIR-Mem = Saving Cognitions Inventory Revised Memory subscale.

Table 2
Hierarchical Regression Analysis Summary for HRS Predicting Decision Making Using the FIS

<table>
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Note. ***p < .001, **p < .01
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Note. *** p < .001

Table 4
Hierarchical Regression Analysis Summary for HRS and Experimental Condition Predicting Attention Difficulties

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Note. *** p < .001, ** p < .01, * p < .05
Table 5
Hierarchical Regression Analysis Summary for HRS and Experimental Condition Predicting Memory Performance

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Note. *p < .05

Table 6
Hierarchical Regression Analysis Summary for HRS and Experimental Condition Predicting Number of Personal Piles Created during a Behavioral Sorting Task

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Note. *p < .05
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Note. **p < .01, *p < .05

Table 8
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Note. **p < .01
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Note. *p < .05

Table 10
Hierarchical Regression Analysis Summary for HRS and Experimental Condition Predicting Distress While Sorting Personal Items during a Behavioral Sorting Task

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Note. ***p < .001, *p < .05
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*Note:* ***p < .001, *p < .05*
Figure 1. Personal Pictures of the Cluttered and Non-cluttered Conditions
Figure 2. Hoarding Severity by Condition Interaction for Decision Making

Figure 3. Hoarding Severity by Condition Interaction for Attention Difficulties

Figure 4. Hoarding Severity by Condition Interaction for Number of Personal Piles Created during a Behavioral Sorting Task
APPENDIX A

HUMAN SUBJECTS RESEARCH APPROVAL LETTER AND CONSENT FORM

Office of the Vice President For Research
Human Subjects Committee
P. O. Box 3062742
Tallahassee, Florida 32306-2742
(850) 644-8673 · FAX (850) 644-4392

RE-APPROVAL MEMORANDUM
Date: 12/17/2012
To: Amanda Medley <medley@psy.fsu.edu>
Address: 1107 West Call St
Dept.: PSYCHOLOGY DEPARTMENT
From: Thomas L. Jacobson, Chair
Re: Re-approval of Use of Human subjects in Research:
   Relationship between Clutter and Information Processing

Your request to continue the research project listed above involving human subjects has been approved by the Human Subjects Committee. If your project has not been completed by 12/11/2013, you must request renewed approval by the Committee.

If you submitted a proposed consent form with your renewal request, the approved stamped consent form is attached to this re-approval notice. Only the stamped version of the consent form may be used in recruiting of research subjects. You are reminded that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report in writing, any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chairman of your department and/or your major professor are reminded of their responsibility for being informed concerning research projects involving human subjects in their department. They are advised to review the protocols as often as necessary to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

Cc: HSC No. 2012.9411
I, _________________________________, being 18 years of age or older, freely and voluntarily and without undue inducement or any element of force, fraud, deceit, duress, or other form of constraint or coercion, consent to be a participant in the above named research project, to be conducted at the Florida State University by Amanda Medley, a graduate student in psychology, and Dr. Brad Schmidt, Ph.D., Professor of Psychology. Listed below are the procedures to be followed in this research and their purposes, any risks, discomfort, and benefits associated with participation in this study, and the measures which will be taken to ensure confidentiality of the information obtained.

Procedures for the research: I understand that if I participate in the project, I will be asked to fill out questionnaires and speak with a clinician about my current mood, thoughts, and beliefs. If I should reveal that I am a threat either to myself or others, I understand that the experimenter will approach me to ensure my safety and may provide me with referral information. I understand that if I participate, the experiment will involve completing self-report questionnaires and several behavioral tasks. I understand that I will be asked to participate in this experiment for one session, which will require one trip to the laboratory. Finally, I understand that I will be randomized into one of two groups. One group will be an experimental condition and the other will be a control condition. If I meet the eligibility criteria for the study, the total time commitment will be approximately two and a half hours. I will be compensated by receiving $20 or 2 research credits for my time, depending on the means of recruitment.

Potential risks or discomforts: Although I may feel uncomfortable discussing my mood, thoughts, and beliefs, I understand that this study involves no known risks to my health or well-being. I understand I may experience some anxiety and frustration in anticipation of and during the experimental procedures. However, such situations should not be any more anxiety-provoking than situations commonly experienced in day-to-day life. The research assistant and clinician will be available to talk with me about any discomfort I may experience while participating. I have the right to refuse or discontinue participation at any time. If I decide to stop participation, I will still be entitled to one (1) research credit for my time.

Potential benefits to you or others: I have not been given any guarantee that I will benefit from my participation in this study. However, I may derive benefit from the self-assessment process as it may increase my awareness of my thoughts, feelings, and behaviors. In addition, I will be provided appropriate referrals to clinical services (e.g., FSU Psychology Clinic, Anxiety and Behavioral Health Clinic, FSU Counseling Center) if I would like to seek treatment. Finally, I may also develop a better understanding of research methodology and will be providing researchers with valuable insight. The information gained from this experiment will also benefit society by gaining new knowledge. This knowledge will be beneficial to the development of etiological models for specific Anxiety related disorders and may help researchers to understand which specific features should be targeted to reduce associated symptoms.

Confidentiality: I understand my participation is totally voluntary and I may stop participation at any time. All my answers to the questions will be kept confidential, and my confidentiality will be protected to the full extent allowed by law. My name will not appear on any of the results.
and only group findings will be reported. I may inquire about referral sources if I wish, and the experimenter will be able to provide me with that information. All data will be destroyed on or before January 21st, 2021.

I understand that this consent may be withdrawn at any time without prejudice, penalty or loss of benefits to which I am otherwise entitled. I have been given the right to ask any inquiry concerning the study. Questions, if any, have been answered to my satisfaction. I understand that I may contact Amanda Medley, Florida State University, Department of Psychology, or her supervisor, Norman B. Schmidt, Ph.D., for answers to questions about this research or my rights. Group results will be sent to me upon my request. I understand that if I have any questions about my rights as a participant in this research, or if I feel I have been placed at risk, I can contact the Chair of the Human Subjects Committee, Institutional Review Board, through the Vice President for the Office of Research at (850) 644-8633.

I have read and understand this consent form. By choosing freely and voluntarily to participate in the study as described here I indicate my informed consent:

__________________________________________________________________________

(Participant Signature) (Date)
REFERENCES


BIOGRAPHICAL SKETCH

Amanda Medley Raines graduated from Florida State University in 2007 with a Bachelor of Science degree in Psychology. Following graduation, she worked as a full-time research assistant for the Anxiety and Behavioral Health Clinic at Florida State University. In 2008, Amanda was accepted to the doctoral program in clinical psychology at FSU. Her primary research interests include the etiology, comorbidity, and maintenance of compulsive hoarding.