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## Hoarding and emotional reactivity: The link between negative emotional reactions and hoarding symptomatology

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### Abstract

Hoarding disorder (HD) is characterized by difficulty discarding, clutter, and frequently excessive acquiring. Theories have pointed to intense negative emotional reactions (e.g., sadness) as one factor that may play a critical role in HD's etiology. Preliminary work with an analogue sample indicated that more intense negative emotions following emotional films were linked with greater hoarding symptoms. Symptom provocation imaging studies with HD patients have also found evidence for excessive activation in brain regions implicated in processing emotions. The current study utilized a sample with self-reported serious hoarding difficulties to examine how hoarding symptoms related to both general and hoarding-related emotional reactivity, taking into account the specificity of these relationships. We also examined how two cognitive factors, fear of decision-making and confidence in memory, modified this relationship. 628 participants with self-identified hoarding difficulties completed questionnaires about general emotional reactivity, depression, anxiety, decision-making, and confidence in memory. To assess hoarding-related emotional reactivity, participants reported their emotional reactions when imagining discarding various items. Heightened general emotional reactivity and more intense emotional reactions to imagined discarding were associated with both difficulty discarding and acquisition, but not clutter, controlling for age, gender, and co-occurring mood and anxiety symptoms. Fear of decision-making and confidence in memory interacted with general emotional reactivity to predict hoarding symptoms. These findings provide support for cognitive-behavioral models of hoarding. Experimental research should be conducted to discover whether emotional reactivity increases vulnerability for HD. Future work should also examine whether emotional reactivity should be targeted in interventions for hoarding.

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## Keywords

Hoarding; Emotional Reactivity; Negative Emotions; Decision-Making; Memory

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## 1. Introduction

The role that emotional processes play in various psychiatric disorders has increasingly been recognized as an important research topic (Gross et al., 2011). Numerous theoretical models have converged to implicate two key constructs, emotional reactivity and emotion regulation, in the onset and maintenance of psychological symptoms (Davidson, 2003, Gross, 2002, Jazaieri et al., 2015, Johnson-Laird et al., 2006, Mennin, 2004, Mennin et al., 2005). Considered jointly, these two facets of emotional processing are thought to influence how any particular emotion is experienced, along with subsequent behavioral and cognitive responses. Emotional reactivity is defined as how sensitive an individual is to emotional stimuli, how intensely they feel emotions, and how long the emotions persist before returning to baseline levels (Nock et al., 2008). Emotion regulation is a broader construct that captures the strategies individuals employ to influence their emotions (Gross and Thompson, 2011). Although numerous investigations have considered the relationship between emotion regulation deficits and certain psychological disorders, including affective, eating, and personality disorders (e.g., Conklin et al., 2006, Davidson et al., 2002, Linehan, 1993, Mennin, Heimberg, 2005, Safer et al., 2001), less is known about the impact of emotional reactivity on psychiatric symptoms (Nock, Wedig, 2008). Since emotional reactivity is posited to predispose individuals to aberrant emotional responding, such as specific emotion regulation deficits (Nock, Wedig, 2008), studying how emotional reactivity relates to psychopathology may provide insight into how and why maladaptive behaviors and emotion regulation strategies are developed and sustained (Nock, Wedig, 2008).

One disorder for which we know relatively little about the role of emotional processes, despite strong theoretical support (Frost and Hartl, 1996), is hoarding disorder (HD). HD was recently identified as a disorder in DSM-5, and is characterized by extreme difficulty discarding, severe clutter, and often, excessive acquiring behaviors (American Psychiatric Association, 2013). HD represents a substantial public health burden and is estimated to affect 3–5% of the population (Timpano et al., 2011a). HD can lead to serious safety and health risks (e.g., fire hazards) for the individual and others (Frost et al., 2000). Given that HD is challenging to treat (Abramowitz et al., 2003, Christenson and Greist, 2001, Mataix-Cols et al., 2002), it is important to identify modifiable factors that increase the risk of developing and maintaining these symptoms, in order to determine how to improve interventions. Emotional reactivity, in particular, represents one theorized risk factor that could be targeted with cognitive and behavioral interventions.

The cognitive-behavioral model of hoarding underscores the role of strong negative emotional reactions (e.g., sadness, anxiety) in spurring both saving and acquiring behaviors (Frost and Hartl, 1996, Steketee and Frost, 2003). A series of case studies has highlighted the role of emotional reactivity in hoarding by describing the intense experiences of anger, sadness, and anxiety felt by hoarding patients (Greenberg, 1987). Research on cognitive factors and executive function deficits linked with HD has also highlighted the fact that the

prospect of having to discard or *not* acquire an object is often associated with strong negative emotions (Frost and Hartl, 1996). For example, decision-making difficulties are associated with a variety of negative emotions (Frost and Gross, 1993, Frost and Hartl, 1996), and can lead HD patients to chronically save belongings to avoid the uncomfortable feelings associated with making decisions about possessions (Frost and Steketee, 1999). An additional example is that HD patients often report decreased confidence in their memory (Hartl et al., 2004, Steketee and Frost, 2003). Concerns about memory are one of the strongest predictors of hoarding behaviors, and can lead to a variety of negative emotions (e.g., sadness, grief, worry) when sorting and discarding items that are thought to serve as memory aids or reminders of loved ones (Frost and Hartl, 1996, Frost and Steketee, 1999, Frost and Steketee, 1998, Steketee and Frost, 2003). In sum, it appears that intensity of negative affect elicited either directly or indirectly in the context of discarding may be a key feature that exacerbates saving and acquiring tendencies (Frost and Hartl, 1996, Steketee and Frost, 2003).

Relatively little research has directly examined the association between hoarding and emotional processes. Preliminary research findings have supported the theorized link between aberrant emotional reactivity and hoarding. One analogue study found that heightened intensity and intolerance of negative emotions (i.e., anger, disgust, fear, sadness) during emotional films was associated with increased self-reported difficulty discarding and acquisition, but not clutter (Timpano et al., 2014a). Another non-clinical study found unique associations between severe “not just right experiences” (NJREs), a feeling often implicated in obsessive-compulsive disorder (OCD), and hoarding symptoms (Ghisi et al., 2010). Of note, symptom provocation imaging studies conducted with HD and OCD subjects with hoarding symptoms have found excessive activation in brain regions (e.g., insula, anterior cingulate cortex, right orbitofrontal cortex) commonly implicated in processing emotions (An et al., 2009, Mataix-Cols et al., 2004, Tolin et al., 2009, Tolin et al., 2012). The extant literature therefore suggests that difficulty discarding and acquisition, in particular, may be associated with heightened general levels of emotional reactivity and with feeling various negative emotions (i.e., anger, disgust, sadness, grief, anxiety, NJREs) more intensely.

Another indirect line of support for the link between increased negative emotional reactivity and hoarding comes from studies that have examined specific types of emotion regulation difficulties in hoarding. Although no group differences were identified between HD patients and healthy controls on an overarching measure of emotional intelligence (Grisham et al., 2008), several non-clinical studies have found that more severe hoarding symptoms are associated with greater negative urgency (i.e., tendency to act impulsively under negative affective states; Timpano et al., 2013) and lower distress tolerance (i.e., capacity to tolerate distress; Timpano et al., 2009, Timpano et al., 2011b, Timpano, Shaw, 2014a). Greater hoarding symptoms have also been connected with higher levels of experiential avoidance (i.e., tendency to avoid negative internal states; Ayers et al., 2014, Wheaton et al., 2011, Williams, 2012), though findings have been somewhat mixed (de la Cruz et al., 2013). In sum, the broader research literature on how hoarding symptoms relate to various types of emotion regulation difficulties supports the idea that hoarding symptoms would be associated with experiencing negative emotions more acutely.

The extant research on emotional reactivity in HD is small and marked by several limitations. Most past studies have used non-clinical student samples or clinical samples that have not adequately captured HD symptomatology (Mataix-Cols et al., 2010). Further, anger, disgust, sadness, anxiety, and NJREs have all been implicated in hoarding. Yet, no study has jointly examined how the intensity of each of these emotions during an imagined discarding task relates to hoarding. Another limitation is that no research has examined which factors may act synergistically with emotional reactivity to predict hoarding. For example, individuals who experience heightened emotional reactivity and are also elevated on cognitive factors implicated in hoarding (i.e., fear of decision-making and confidence in memory) may exhibit the greatest hoarding symptoms. As detailed above, both fear of decision-making and poor confidence in memory are linked with hoarding (Timpano et al., 2014b) and are also associated with emotional distress when individuals are unable to acquire or are faced with a need to discard items (Frost and Hartl, 1996, Frost and Steketee, 1999, Frost and Steketee, 1998, Steketee and Frost, 2003). Since both fear of decision-making and confidence in memory (Frost and Steketee, 1999) can be targeted in interventions, investigating how these factors interact with emotional reactivity may have implications for improving existing treatments.

The current investigation examined the relationship between hoarding symptoms and both general and hoarding-related emotional reactions. We used a large sample of self-identified individuals with serious hoarding difficulties. Aim 1 examined the relationship between general levels of emotional reactivity on the Emotional Reactivity Scale (ERS; Nock, Wedig, 2008) and hoarding symptoms, taking into account the specificity of this relationship by controlling for age, gender, and depression and anxiety symptoms. We predicted that heightened general levels of emotional reactivity would be associated with difficulty discarding and acquisition, but not clutter, given past work highlighting the relationship between emotional processes and acquisition and difficulty discarding (Timpano, Shaw, 2014a) and theoretical work that has linked clutter more closely with executive function deficits (Steketee and Frost, 2003).

Aim 2 examined the associations between hoarding symptoms and hoarding-related emotional intensity elicited during an imagined discarding task, accounting for the specificity of these relationships by controlling for covariates. Similarly to Aim 1, we predicted that heightened intensity of a variety of negative emotions (i.e., anger, disgust, fear, sadness, NJREs) related to discarding would be associated with greater hoarding severity, particularly with respect to difficulty discarding and acquisition.

Aim 3 examined how general levels of emotional reactivity (on the ERS) interacted with fear of decision-making and confidence in memory to predict hoarding symptoms. These two risk factors were selected because they have been associated with negative emotions in the context of hoarding, are strong predictors of hoarding symptoms, and are amenable to intervention. With respect to the dependent variables, we considered overall hoarding symptoms, difficulty discarding, and acquisition, but not clutter, given that neither theories nor empirical research have linked emotional processes to clutter. We predicted that individuals with high general levels of emotional reactivity combined with high fear of

decision-making and/or low confidence in memory would exhibit the most severe hoarding symptoms, including difficulty discarding and acquisition.

## 2. Materials and Methods

### 2.1. Participants

Individuals provided email addresses after several national media appearances, and were subsequently invited to complete online questionnaires. Consistent with recommended internet research practices (Kraut et al., 2004), the data were checked for duplicate entries prior to data analyses. Given that identifying data was not available, potential duplicates were examined based on identical demographic data. This resulted in a removal of 9 duplicate cases (For further details, see: Tolin et al., 2008). Of the 852 unique individuals who started the survey and self-identified with hoarding, 628 participants met inclusion criteria for serious hoarding difficulties which required scores of 4 (moderate) or higher on clutter and difficulty discarding, as well as distress and/or impairment items of the Hoarding Rating Scale Self-Report (HRS-SR; Tolin et al., 2010). These criteria address DSM-5 criteria A, C, and D (American Psychiatric Association, 2013, Timpano, Exner, 2011a), although the HRS-SR is not able to ascertain whether the hoarding symptoms are due to another medical or psychiatric disorder (DSM-5 criteria E and F). These inclusion criteria have been used previously to indicate significant hoarding problems (Frost et al., 2013, Timpano, Exner, 2011a). The sample mean HRS-SR score of 29.03 ( $SD=4.90$ ; Range=17–41) was somewhat higher than the mean score of 24.22 ( $SD=5.67$ ) reported for other clinical samples (Tolin, Frost, 2010). Due to missing data, between 447 and 547 participants completed each of the major study variables. Missing data was addressed with casewise deletion.

Participants (94.3% female) ranged in age from 22 to 89 with a mean of 52.03 ( $SD=10.62$ ). Four percent of participants identified as Hispanic. The racial composition of the sample was approximately 94% White/Caucasian, 2% Black, 2% Asian American, and 2% Native American/Alaska Native.

### 2.2. Procedure

The current investigation was part of a larger study examining features of hoarding. Prior to beginning study procedures, participants read about study procedures and provided informed consent. Participants then completed questionnaires about their psychological symptoms, emotions, and thoughts. Study procedures were approved by the Institutional Review Boards at Smith College, Boston University, and Hartford Hospital. Research was conducted in compliance with the Code of Ethics of the World Medical Association (Declaration of Helinski).

### 2.3. Measures

**Hoarding Rating Scale Self-Report (HRS-SR)**—The HRS-SR (Tolin, Frost, 2010) is a 5-item questionnaire about the core features of hoarding. Respondents rate their hoarding behaviors on a 9-point scale, from 0 (none) to 8 (extreme). Both the interview and self-report versions of the HRS have demonstrated excellent internal consistency and

discriminant validity in previous studies (Timpano, Exner, 2011a, Tolin, Frost, 2010). It exhibited good internal consistency in the current sample ( $\alpha=.80$ ).

**Saving Inventory-Revised (SI-R)**—The SI-R (Hartl, Frost, 2004) is a 23-item self-report assessment of hoarding symptoms. Participants rate items on a 5-point scale, with higher scores indicating greater hoarding symptom severity. The mean score on the SI-R (Table 1) is somewhat higher than past clinical samples of hoarding participants ( $M=53.7$ ,  $SD=14.9$ ; Frost et al., 2004). The questionnaire includes three subscales: difficulty discarding, acquisition, and clutter. The SI-R has previously demonstrated excellent internal consistency, good test-retest reliability, and acceptable convergent validity (Coles et al., 2003, Hartl, Frost, 2004) and exhibited good to excellent internal consistency in the current sample (total  $\alpha=.91$ ; difficulty discarding  $\alpha=.84$ ; acquisition  $\alpha=.84$ ; clutter  $\alpha=.90$ ).

**Emotion Reactivity Scale (ERS)**—The ERS (Nock, Wedig, 2008) is a 21-item measure of general emotional reactivity. The mean ERS score (Table 1) for this sample was comparable to mean scores of patients with mood ( $M=49.7$ ,  $SD=12.6$ ) and anxiety ( $M=45.5$ ,  $SD=14.8$ ) disorders (Nock, Wedig, 2008), although the range of scores was broader in the current sample. Participants rate items on a 5-point scale from 0 (not at all like me) to 4 (completely like me). The ERS has demonstrated excellent internal consistency, convergent and discriminant validity previously (Nock, Wedig, 2008) and exhibited excellent internal consistency in the current study ( $\alpha=.96$ ).

**Modified Differential Emotions Scale (MDES)**—The MDES is a modified version of the Differential Emotions Scale (Gross and Levenson, 1995, Sawchuk et al., 1999). It measures the intensity of various emotions that participants would imagine experiencing when considering discarding items from seven different categories (clothing, food, housework, sentimental, craft, office, paper). Participants rate the intensity of five negative emotions (anger, disgust, fear, sadness, NJREs), three positive emotions (amusement, contentment, surprise), and neutral emotion for each type of item on a Likert scale from 0 (never) to 5 (always). The mean intensity of each emotion reported across the seven different item categories was calculated for each negative emotion. For the current study, we only examined the negative emotions subscales, as we did not have specific hypotheses about the role of positive or neutral emotions in discarding. Although the psychometric properties of this version of the MDES have not yet been investigated, in the present study the subscales demonstrated good to excellent internal consistency ( $\alpha=.86-.90$ ).

**Depression, Anxiety, Stress Scales (DASS-21)**—The DASS-21 (Henry and Crawford, 2005) is a 21-item questionnaire of depressive, anxious, and stress symptomatology. For our sample, scores on the DASS-21 (Table 1) were lower than mean scores on the DASS depression ( $M=15.6$ ,  $SD=11.8$ ) and anxiety ( $M=12.1$ ,  $SD=9.9$ ) subscales previously reported by hoarding participants (Grisham et al., 2010). Participants rate how much each item has applied to them over the past week using a scale from 0 (did not apply to me at all) to 3 (applied to me very much). The current investigation only used the depression and anxiety subscales. The DASS-21 has demonstrated excellent internal consistency and concurrent validity previously (Antony et al., 1998, Henry and Crawford,

2005). In the present study, the subscales exhibited good to excellent internal consistency ( $\alpha=.83-.92$ ).

**Frost Indecisiveness Scale (FIS)**—The FIS (Frost and Shows, 1993) is a 15-item questionnaire that measures indecisiveness. Participants rate items on a 5-point scale, from 1 (strongly disagree) to 5 (strongly agree). The FIS includes two subscales: fear of decision-making and positive feelings about decision-making. The current study only used the fear of decision-making subscale. The FIS has previously demonstrated good internal consistency and validity (Frost and Shows, 1993). In this sample, the fear of decision-making subscale exhibited good internal consistency ( $\alpha=.86$ ).

**Confidence in Memory Scale (CIMS)**—The CIMS is a subscale of the Memory and Cognitive Confidence Scale (Nedeljkovic and Kyrios, 2007) that includes 15-items measuring confidence in memory. Participants rate items on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating *lower* confidence in memory. The CIMS has previously demonstrated excellent internal consistency and good test-retest reliability (Nedeljkovic and Kyrios, 2007), and also exhibited excellent internal consistency in the current study ( $\alpha=.96$ ).

## 2.4. Statistical Analysis

All statistical analyses were conducted in SPSS 22.0. Zero-order correlations and partial correlations controlling for age, gender, and depression and anxiety scores were used to examine the relationship and specificity between emotional variables and SI-R scores. To test the moderations hypothesized in Aim 3, we used procedures recommended by Holmbeck (2002). Scores were first centered to reduce multicollinearity, after which the interaction term between ERS scores and each of the two cognitive factors was calculated. Next, we constructed separate linear regression equations with the ERS and cognitive variables entered simultaneously as independent variables and SI-R scores as the dependent variable.

## 3. Results

### 3.1. Aim 1: The relationship between general emotional reactivity (ERS) and hoarding

Zero-order and partial correlations between general emotional reactivity and SI-R scores are presented in Table 2. Greater general emotional reactivity was associated with greater total hoarding severity, and with each SI-R subscale. Controlling for age, gender, and depression and anxiety symptoms, greater general emotional reactivity remained significantly associated with greater SI-R total, difficulty discarding, and acquisition, but not with clutter.

### 3.2. Aim 2: The relationship between emotional intensity to imagined discarding and hoarding

Zero-order and partial correlations between hoarding-related emotional intensity and SIR scores are presented in Table 2. More intense angry and disgusted feelings to imagined discarding were associated with greater total scores, as well as difficulty discarding and acquisition. More intense fearful, sad, and NJRE feelings to imagined discarding were

associated with greater total scores and each SI-R subscale. Controlling for the covariates, more intense angry, disgusted, fearful, sad, and NJRE feelings to imagined discarding remained significantly associated with greater SI-R total, difficulty discarding, and acquisition. In contrast, hoarding-related emotional intensity, regardless of the specific emotion, no longer predicted SIR clutter, controlling for the covariates.

### 3.3. Aim 3: Interaction between general emotional reactivity (ERS) and cognitive factors

We also investigated whether general emotional reactivity (ERS scores) interacted with two common cognitive factors implicated in hoarding—fear of decision-making and confidence in memory—in predicting hoarding. Results for all interactions are summarized in Table 3. General emotional reactivity interacted with fear of decision-making to significantly predict SI-R total and to marginally predict difficulty discarding, though not acquisition. Examination of the simple effects revealed that individuals with high levels of general emotional reactivity showed greater SI-R total and difficulty discarding scores when fear of decision-making was also high. In contrast, general emotional reactivity did not significantly predict SI-R total and difficulty discarding when fear of decision-making was low. The interactions predicting SI-R total and difficulty discarding scores are depicted in Figures 1 and 2, respectively.

A similar set of analyses (see Table 3) evaluated the interaction between general emotional reactivity (ERS scores) and confidence in memory in predicting hoarding. General emotional reactivity significantly interacted with confidence in memory to predict SI-R total and acquisition, though not difficulty discarding. Investigating the simple effects demonstrated that individuals with high levels of general emotional reactivity experienced more SI-R total and acquisition when CIMS scores were high (indicating *low* confidence in memory). ERS scores did not significantly predict SI-R total or acquisition when CIMS scores were low (indicating *high* confidence in memory). The interactions predicting SI-R total and acquisition scores are depicted in Figure 3 and 4, respectively.

## 4. Discussion

This study examined how hoarding symptoms are linked with general and hoarding-related emotional reactivity. Across measures and types of negative emotions, more intense emotional reactions were associated with both greater difficulty discarding and acquisition, but not clutter. These findings were robust, as the relationships remained significant controlling for demographic variables and co-occurring symptoms. This investigation is the first to consider how emotional reactivity interacted with cognitive factors implicated in hoarding to predict specific symptoms. We found that fear of decision-making interacted with general emotional reactivity to predict total hoarding symptoms and difficulty discarding. Additionally, confidence in memory interacted with general emotional reactivity to predict total hoarding symptoms and acquisition. Altogether, our results provide support for cognitive-behavioral theories of hoarding, which highlight the role intense emotional reactions have in contributing to hoarding symptomatology, and, in particular, how they may interact with other cognitive factors (Frost and Hartl, 1996).

The finding that both general and hoarding-related emotional reactivity were associated with difficulty discarding and acquisition, but not clutter, is in line with previous work using emotional films in a nonclinical population (Timpano, Shaw, 2014a), but extends this finding to a sample with self-identified serious hoarding difficulties. We also expanded upon previous imaging work that used symptom provocation paradigms (An, Mataix-Cols, 2009, Mataix-Cols, Wooderson, 2004, Tolin, Kiehl, 2009, Tolin, Stevens, 2012), by finding that the intensity of various negative emotions (i.e., anger, disgust, fear, sadness, NJREs) during imagined discarding were all related to greater hoarding symptoms. These findings support the idea that HD individuals experience a wide array of negative emotions more intensely. The association between general emotional reactivity and hoarding suggests that these intense emotional reactions may not be limited to hoarding contexts. These results have interesting implications for the classification of HD, which is currently grouped with obsessive-compulsive (OC) spectrum disorders in the DSM-5. Since hoarding symptoms were also linked with negative emotions not traditionally associated with OC symptoms (e.g., sadness and anger) in the current study, researchers should continue to examine the relationship of HD with affective disorders, such as depression.

This study also found support for synergistic relations between general emotional reactivity and two cognitive factors, fear of decision-making and confidence in memory, in predicting hoarding symptoms. Specifically, the relationship between general emotional reactivity and hoarding severity was strongest for those who also experienced high levels of fear of decision-making or low levels of confidence in memory. These results suggest the importance of addressing emotional reactivity, fear of decision-making, and poor confidence in memory in hoarding interventions, as each of these factors directly and synergistically predicted hoarding severity. Treatment development research should consider examining the effectiveness of adding alternative strategies to current hoarding interventions to lessen these intense emotional reactions, such as teaching patients how to use distress tolerance strategies both within the context of hoarding and in other life domains.

In examining these interactions as predictors of specific facets of hoarding, some intriguing findings emerged. General emotional reactivity interacted with fear of decision-making to predict difficulty discarding, but not acquisition. Yet, given the large sample size and that this finding was only marginally significant, it should be interpreted with caution. Nevertheless, this finding is in line with cognitive-behavioral theories of hoarding that describe the joint influence of negative emotions and decision-making difficulties in chronic saving (Frost and Gross, 1993, Frost and Hartl, 1996). It suggests that conducting exposures to making decisions might be particularly helpful in reducing distress associated with discarding. We also found that general emotional reactivity interacted with confidence in memory to predict acquisition, but not difficulty discarding. This finding was unexpected, given that memory beliefs are strongly tied to saving behaviors (Steketee and Frost, 2003). However, the finding is in line with the compulsive buying literature, which has linked greater compulsive buying behaviors with emotional reasons for buying objects, such as buying to remember items encountered while shopping (Kyrios et al., 2004). Future studies should be conducted to replicate both of these findings.

Results of the current study should be interpreted in light of several limitations. First, the sample was primarily female and Caucasian. Given that HD is equally prevalent across genders (Timpano, Exner, 2011a), it is unclear whether these results would generalize to the overall HD population, and particularly to males who hoard. Second, the current study relied on a cross-sectional examination of self-reported measures of emotional reactivity and hoarding. Future studies should include a repeated measures design, objective indicators of emotional reactivity, and the Structured Interview for Hoarding Disorder (Pertusa et al., 2010) to confirm diagnoses of HD. While the HRS-SR addresses most DSM-5 criteria, it is unable to determine whether hoarding symptoms are due to another medical or mental health condition, and thus, some of the participants in the sample may not meet full diagnostic criteria for HD. Thus, using the HRS-SR rather than a diagnostic interview may limit the generalizability of our findings. Third, the psychometric properties of the MDES are unknown, and should be examined in future studies. Fourth, this study limited its investigation to the intensity of negative emotions, and future work should examine the role of positive emotions in hoarding. Finally, although this study used a novel imaginal discarding paradigm by asking participants to imagine how they would feel when discarding certain items, future work should examine behavioral measures, such as an actual discarding or acquiring task.

The current study examined three inter-related hypotheses that tested key facets of the cognitive-behavioral model of hoarding, and provides support for the synergistic role of emotional reactions and cognitive factors in spurring hoarding. More rigorous methodology is needed to better understand the specific role of emotional reactivity in hoarding. However, given that emotional reactivity is relatively modifiable, it is important to continue to examine its role in hoarding, to inform novel targets of intervention.

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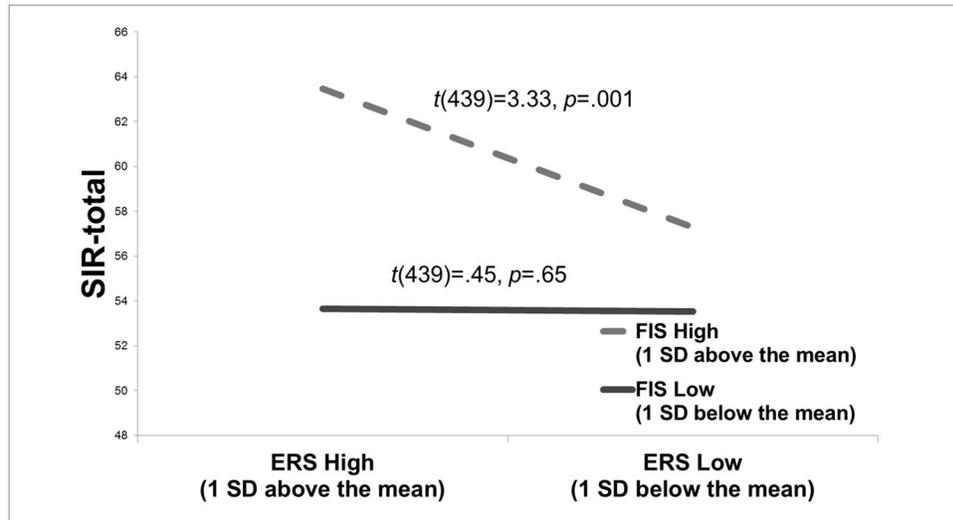
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### Highlights

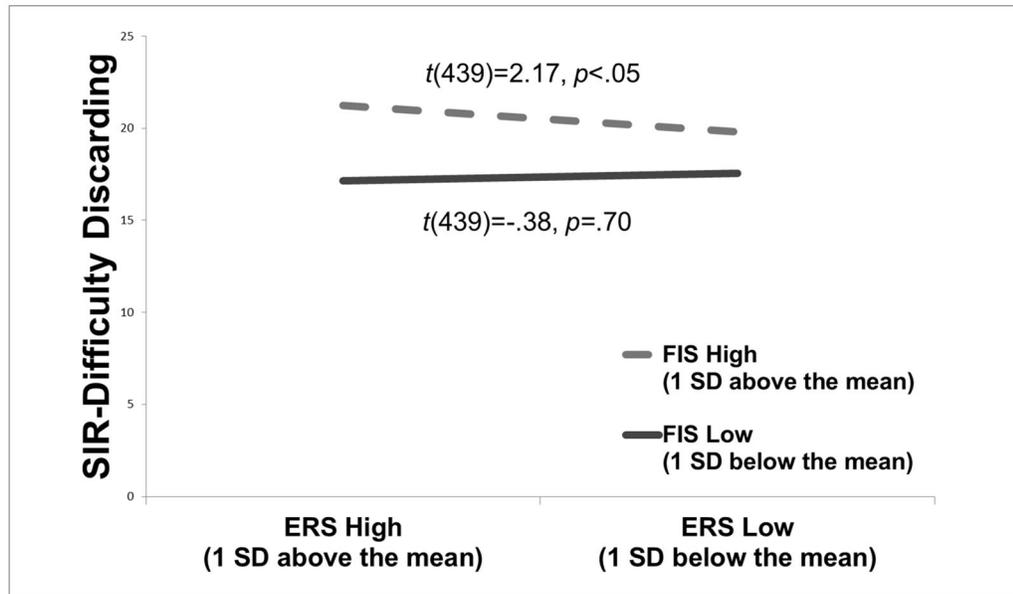
- General emotional reactivity was linked with difficulty discarding and acquisition.
- More intense emotional reactions to imagined discarding were linked to hoarding.
- Fear of decision-making interacted with emotional reactivity to predict hoarding.
- Confidence in memory interacted with emotional reactivity to predict hoarding.
- This investigation provides support for the cognitive-behavioral model of hoarding.



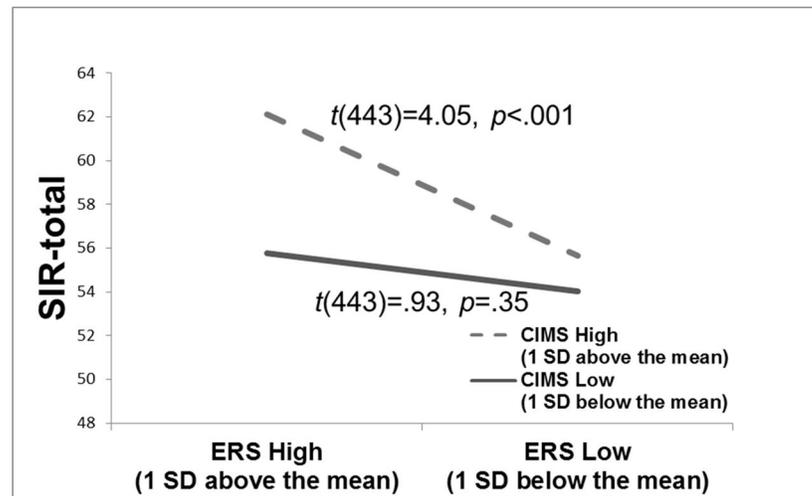
**Figure 1.**

SI-R total scores predicted by the interaction between emotional reactivity (ERS) and FIS-fear of decision-making.

Note: ERS = Emotional Reactivity Scale; FIS = Frost Indecisiveness Scale; SI-R = Saving Inventory Revised.



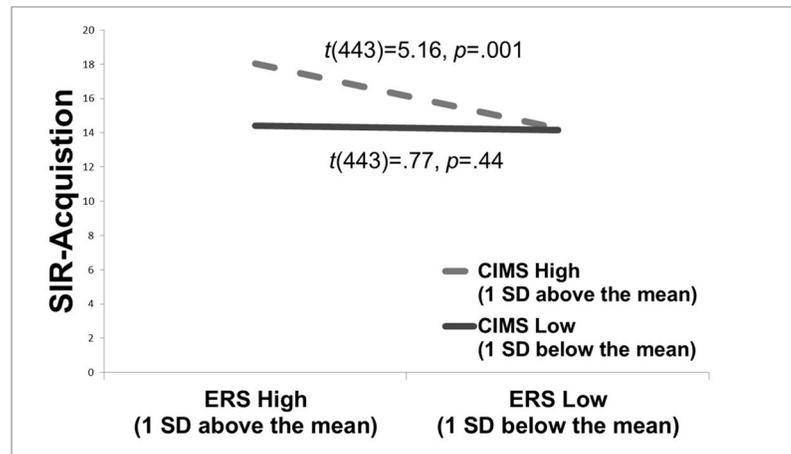
**Figure 2.** SI-R difficulty discarding scores predicted by the interaction between emotional reactivity (ERS) and FIS-fear of decision-making.  
 Note: ERS = Emotional Reactivity Scale; FIS = Frost Indecisiveness Scale; SI-R = Saving Inventory Revised.



**Figure 3.**

SI-R total scores predicted by the interaction between emotional reactivity (ERS) and confidence in memory (CIMS).

Note: ERS = Emotional Reactivity Scale; CIMS = Confidence in Memory Scale (higher scores indicate less confidence in memory); SI-R = Saving Inventory Revised.



**Figure 4.**

SI-R acquisition scores predicted by the interaction between emotional reactivity (ERS) and confidence in memory (CIMS).

Note: ERS = Emotional Reactivity Scale; CIMS = Confidence in Memory Scale (higher scores indicate less confidence in memory); SI-R = Saving Inventory Revised.

**Table 1**

Descriptive statistics for key variables

	<b>M (SD)</b>	<b>Range</b>
SIR-total	57.427 (12.526)	3–85
SIR-c	22.841 (5.545)	1–32
SIR-dd	19.060 (4.674)	1–28
SIR-a	15.526 (5.296)	1–28
DASS-dep	9.040 (5.839)	0–21
DASS-anx	5.007 (4.403)	0–21
ERS	43.305 (19.975)	1–84
MDES-angry	2.063 (1.850)	0–8
MDES-disgust	1.306 (1.539)	0–8
MDES-fear	2.222 (1.940)	0–8
MDES-sad	3.013 (1.770)	0–8
MDES-NJRE	2.919 (2.032)	0–8

Note: SIR = Saving Inventory Revised; SIR-c = SI-R clutter subscale; SIR-dd = SI-R difficulty discarding subscale; SIR-a = SI-R acquisition subscale; ERS = Emotional Reactivity Scale; DASS-dep = Depression Anxiety Stress Scales Depression subscale; DASS-anx = Depression Anxiety Stress Scales Anxiety subscale; MDES = Modified Differential Emotions Scale NJRE = Not Just Right Experiences.

Zero-order (and partial correlations controlling for age, gender, depression and anxiety) between ERS & MDES scores and hoarding symptoms

**Table 2**

	ERS	MDES-angry	MDES-disgust	MDES-fear	MDES-sad	MDES-NJRE
SIR-total	.237** (.112*)	.279*** (.236***)	.287*** (.224***)	.347*** (.292***)	.374*** (.314***)	.378*** (.329***)
SIR-c	.104* (-.005)	.048 (.007)	.087 (.030)	.137** (.085)	.130** (.064)	.116* (.063)
SIR-dd	.201** (.151**)	.301*** (.281***)	.274*** (.245***)	.402*** (.384***)	.431*** (.405***)	.443*** (.424***)
SIR-a	.275** (.131**)	.344*** (.296***)	.347*** (.274***)	.322*** (.248***)	.368*** (.306***)	.381*** (.323***)

\*  $p < .05$

\*\*  $p < .01$

\*\*\*  $p < .001$

Note:  $n = 447$  for Zero-Order Correlations;  $df = 441$  for Partial Correlations; SI-R = Saving Inventory Revised; SIR-c = SI-R clutter subscale; SIR-dd = SI-R difficulty discarding subscale; SIR-a = SI-R acquisition subscale; ERS = Emotional Reactivity Scale; MDES = Modified Differential Emotions Scale NJRE = Not Just Right Experiences.

**Table 3**  
Interactions between ERS scores and cognitive factors in predicting hoarding

DV	Predictors	B(SE)	$\beta$	t	df	R	R <sup>2</sup>
<b>SIR-total</b>	ERS	.077(.031)	.121	2.466*	439	.350	.122***
	FIS-fear	.443(.080)	.273	5.544***			
	ERSxFIS	-.008(.003)	.097	2.153*			
<b>SIR-dd</b>	ERS	.013(.012)	.056	1.155	439	.371	.137***
	FIS-fear	.206(.030)	.339	6.939***			
	ERSxFIS	.003(.001)	.086	1.932†			
<b>SIR-a</b>	ERS	-.057(.013)	.211	4.239***	439	.312	.097***
	FIS-fear	.103(.034)	.150	3.009**			
	ERSxFIS	.002(.001)	.073	1.595			
<b>SIR-total</b>	ERS	.104(.031)	.164	3.330***	443	.308	.095***
	CIMS	.133(.042)	.159	3.164**			
	ERSxCIMS	.004(.002)	.108	2.323*			
<b>SIR-dd</b>	ERS	.033(.012)	.140	2.793**	443	.254	.065***
	CIMS	.042(.016)	.136	2.664**			
	ERSxCIMS	.001(.001)	.073	1.558			
<b>SIR-a</b>	ERS	.051(.013)	.191	3.967***	443	.364	.133***
	CIMS	.062(.017)	.176	3.573***			
	ERSxCIMS	.003(.001)	.148	3.274***			

†  $p < .10$

\*  $p < .05$

\*\*  $p < .01$

\*\*\*  $p < .001$

Note: SIR = Saving Inventory Revised; SIR-dd = SIR difficulty discarding subscale; ERS = Emotional Reactivity Scale; FIS-Fear = Frost Indecisiveness Scale Fear of Decision-Making subscale; CIMS = Confidence in Memory Scale.