

Research Article

EXPLORATION OF ANXIETY SENSITIVITY AND DISTRESS TOLERANCE AS VULNERABILITY FACTORS FOR HOARDING BEHAVIORS

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Background: *The phenomenon of compulsive hoarding, characterized by the acquisition of and failure to discard a large number of possessions, is increasingly recognized as a significant public health burden. Despite the magnitude of the impairment associated with this condition, empirical research is still in the nascent stages and many facets of the phenomenology, underlying vulnerability and risk factors for hoarding, are as of yet unknown.* **Method:** *The overall aim of the current investigation was to examine the association between hoarding behaviors and two potential vulnerability factors—anxiety sensitivity (AS) and distress tolerance (DT). In addition, we investigated the robustness of these associations as well as the interaction between the two hypothesized risk factors. Three studies (total N = 745) involving independent nonclinical samples assessed hoarding, AS, DT, and relevant covariates using a range of measures.* **Results:** *Findings revealed that AS and hoarding are significantly and robustly associated with one another beyond general depressive, anxiety, and nonhoarding obsessive–compulsive symptoms. Hoarding was also found to be associated with low DT. Consistent with prediction, AS and DT interacted such that DT may play a less important role among individuals with low AS. By contrast, low DT appears to increase vulnerability to hoarding symptoms among individuals high in AS. Results are discussed with regard to future research and treatment implications.* *Depression and Anxiety 26:343–353, 2009. Published 2009 Wiley-Liss, Inc.[†]*

Key words: *compulsive hoarding; anxiety sensitivity; distress tolerance*

INTRODUCTION

Obsessive–compulsive disorder (OCD), an anxiety disorder characterized by distressing and recurrent obsessions and compulsions, has been identified as one of the most chronic and costly forms of psychopathology.^[1,2] Within the larger construct of OCD, compulsive hoarding has emerged as an even more severe, problematic, and impairing clinical phenomenon.^[3–5]

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Hoarding is defined as the acquisition of and failure to discard a large number of possessions, which results in debilitating clutter and subsequent impairment and distress.^[6] Individuals who hoard often demonstrate low insight into their problem. When coupled with elevated symptom severity, treatment resistance, and marked disability across social, family, and work domains, hoarding represents a severe form of psychopathology, which creates a considerable public health burden.^[7] Despite the magnitude of impairment associated with this clinical phenomenon, empirical research on hoarding, particularly with regard to vulnerability factors, is still in its nascent stages.

Frost and Hartl^[6] were the first to develop a cognitive behavioral model of hoarding. According to this conceptualization, problems with executive functioning (i.e., information processing), as well as unusual beliefs about the nature of possessions and the self, lie at the root of hoarding problems.^[8] Together, these deficits make otherwise ordinary decisions—regarding the organization, acquisition, and saving of possessions—a significant challenge. Patterns of behavioral avoidance have been observed in a substantial proportion of hoarding patients.^[6] For example, acquisition may be a means of avoiding the aversive and negative emotional states that could emerge from *not* collecting an object or making a wrong decision regarding the value of the item.^[9] In regard to discarding, rather than parting with a worthless object and facing the anxiety and frustration that this action may cause, an individual may opt to save the item.^[4] Thus, a central tenet of the cognitive behavioral conceptualization of hoarding is the notion that the features of saving, acquisition, and to some extent clutter (i.e., not organizing), are all forms of avoidance of distress. Patterns of behavioral avoidance, in turn, play an important maintaining and etiological role across anxiety disorders as they prevent fear-related extinction processes.^[10] That is to say, avoidance is particularly problematic because it prevents exposure to distressing or feared situations and therefore negatively reinforces maladaptive behaviors (in this case hoarding).

A number of individual difference variables have been theorized to underlie the avoidance component of hoarding. For example, a small but growing number of investigations have established that information-processing deficits, including memory and decision-making biases, may be related to a reluctance to part with items.^[8] Anxiety sensitivity (AS) is an additional factor that appears particularly relevant to the discussion of vulnerabilities for avoidance behavior, as it has been found to robustly influence and predict panic and other anxiety-related symptoms.^[11,12] AS has been described as “the fear of fear,” and high levels are associated with beliefs that anxiety-related sensations are dangerous or harmful and carry negative consequences within the physical, psychological, and social domains.^[13] Higher levels of AS can magnify anxious reactions and may also amplify the conditionability of fear-related responding,

which in turn can lead to greater levels of avoidance.^[14,15] A series of recent investigations have found that AS predicts Axis I pathology as well as functioning as an important predictor of anxiety disorders in particular.^[16,17] There is also evidence suggesting that higher levels of AS are associated with increased general OCD symptoms. Taylor et al.^[15] assessed AS levels in a range of anxiety disorders, as well as in nonclinical controls, and found that individuals with OCD scored significantly higher on the Anxiety Sensitivity Index (ASI; the predominant measure of AS) than nonclinical controls or those with a simple phobia. This finding was generally replicated in subsequent investigations.^[18,19] Unfortunately, none of these studies assessed specific symptom subtypes of OCD and therefore no empirical conclusions are viable regarding the relationship between AS and hoarding.

Despite this lack of empirical evidence, there are indications that AS might be linked to hoarding behaviors. More specifically, it seems plausible that hoarders with high AS may engage in maladaptive hoarding behaviors to avoid anxiety-related sensations and their supposed negative consequences. In their clinical case observations of hoarders, Frost, Steketee, and colleagues noted that when asked to discard a treasured object, individuals would frequently experience intense anxiety and almost grief-like physical reactions to the loss.^[6] Only one empirical study to date has assessed the potential association between higher levels of AS and hoarding behavior.^[20] Within a nonclinical sample, hoarding symptoms were found to be significantly associated with greater AS. Of note, AS was a substantial and unique predictor of hoarding behavior. Moreover, the magnitude of the hoarding and AS relationship was comparable to that between obsessive-compulsive (OC) symptoms (e.g., washing) and hoarding.

Distress tolerance (DT) may be one additional individual difference variable that acts as a vulnerability factor for hoarding behaviors. Although DT is similar to AS, there are conceptual distinctions.^[21] Whereas AS reflects fears about anxiety-related sensations, DT refers to a decreased capacity to withstand negative emotional states.^[22] Although the focus of AS is on fearful cognitions about the consequences of primarily bodily sensations, DT encompasses all aspects of emotion and whether these states are considered manageable versus unmanageable.^[23] Further, DT refers to the ability to tolerate any negative emotional state (not just anxiety-related ones). An ancillary component of DT involves the behavioral tendency to persist toward a goal despite affective discomfort caused by perceived emotional distress.^[24] Distress *intolerance*, then, is associated with perceiving distress as unbearable, unacceptable, and uncontrollable.^[22] Important to the consideration of avoidance, individuals low in DT will display pervasive efforts to circumvent the negative emotional state (i.e., avoidance). DT has been investigated extensively in

disorders of affect dysregulation (e.g., borderline personality disorder^[25]), yet little research has directly examined DT within the anxiety disorders. Although the extant empirical literature is sparse, clinical case reports have shown that hoarders experience a great deal of distress in relation to making decisions about their possessions and consequently report intense feelings of loss in response to discarding or not acquiring an object.^[26] If individuals with hoarding do have lower levels of DT, as these examples seem to reflect, hoarding behaviors (i.e., refusing to throw anything away) may represent an effort to avoid distressing emotions.

Apart from the role these two factors (i.e., AS and low DT) may play as discrete risk variables for hoarding, they may equally interact with one another. Within such a model, a combination of risks may lead to a special pathological synergy that in turn results in the maladaptive behavior.^[27,28] Accordingly, one factor may interact with the other variable in such a way that one would expect individuals with *both* vulnerability factors to be at an amplified risk for the particular form of psychopathology. A growing number of studies have begun to assess interactive models in relation to behaviors thought to regulate negative emotions. For instance, AS has been found to moderate the link between aversive life conditions and problematic drinking.^[29]

Consistent with such models, individuals who are high on AS and low in DT would display greater hoarding symptoms. We propose that if individuals are low in their tolerance of distress, and they also interpret anxiety-related sensations as dangerous, they may revert to greater avoidance behaviors (i.e., greater saving behaviors) in an effort to circumvent distressing emotional and bodily sensations associated with stress. Within this interactive model, we hypothesize that low DT (i.e., distress intolerance) will only play an integral role with regard to hoarding behaviors when AS is high. In other words, if potentially distressing sensations are not feared, there would be very little to react to (in essence) and tolerance of these sensations and emotions would therefore be relatively easier to adopt (i.e., avoidance behaviors would be less likely). That is to say, hoarding behaviors may ultimately be moderated by the degree to which distressing emotions and sensations are tolerated (DT) particularly when they are feared (AS).

The studies outlined in this report examined the proposed association between AS, DT, and hoarding within nonclinical samples. The use of nonclinical samples in the investigation of hoarding is defensible given research suggesting a dimensional view of hoarding symptoms^[30] as well as the fact that many past investigations that have also utilized undergraduate populations.^[20,31,32] Study 1 set out to replicate prior work that found AS to be linked to hoarding.^[20] Specifically, we investigated the robustness of that association by examining the link between hoarding

and AS after controlling for other OC symptoms as well as depression and anxiety symptoms. In an effort to speak to the generalizability of the findings presented in the Coles et al. report, we utilized a different measure of hoarding symptoms in this study and examined the subfactors of AS. Study 2 was designed to investigate the, as of yet, unexplored relationship between DT and hoarding. Lastly, Study 3 aimed to assess the relationship between hoarding, AS, and DT utilizing a separate sample and a more refined measure of hoarding behavior. Study 3 also examined the interaction between the two hypothesized vulnerability factors in relation to hoarding symptoms.

STUDY 1—METHODS

PARTICIPANTS

The sample consisted of 270 (52% female) undergraduate students. Ages ranged from 18 to 28 ($M = 19.2$, $SD = 1.83$). The racial/ethnic composition of the sample was generally representative of the university population at large: African American (10.4%), Asian American (3.1%), Caucasian (75.8%), Hispanic/Latino (5.4%), and other (5.3%).

PROCEDURE

Participants were informed that they would complete measures about their emotions, behaviors, and self-perceptions. Informed consent was obtained prior to completing a battery of self-report questionnaires. The experiment was conducted in a group setting. At the completion of the experimental session, participants were debriefed and thanked for their time. All experimental guidelines were in accordance with American Psychological Association standard ethical guidelines. This study was approved by the Florida State University Institutional Review Board prior to data collection.

MEASURES

Anxiety Sensitivity Index (ASI). The ASI^[33] is a 16-item self-report measure of the fear of bodily sensations associated with arousal. Each item consists of a possible negative consequence of anxiety symptoms (e.g., It scares me when I feel faint) and is rated using a 5-point Likert scale ranging from 0 (very little) to 4 (very much). The ASI has three subscales including *physical concerns*, *cognitive dyscontrol*, and *social concerns*. In the present sample, the ASI demonstrated excellent internal consistency ($\alpha = .94$). The ASI has demonstrated high internal consistency and satisfactory test-retest reliability.^[34]

Obsessive–Compulsive Inventory—Revised (OCIR). The OCIR is an 18-item self-report measure of common OCD symptoms.^[35] Respondents rate the degree to which they have been bothered by each symptom using a scale from 0 (not at all) to 4 (very much). The OCIR has been found to demonstrate good test-retest reliability, good internal consistency, and to differentiate between patients with and without OCD.^[36] In the present sample, the OCIR demonstrated excellent internal consistency ($\alpha = .91$) and scores ranged from 0 to 62. For this study a modified OCIR total score was used. Specifically, the total score was calculated without the three hoarding items, to reflect a measure of all OCD symptoms other than hoarding. The three hoarding items of the OCIR were summed to obtain a measure of hoarding symptoms.

Depression, Anxiety, and Stress Scale (DASS-21). The 21-item short-form (DASS-21^[36]) was used to assess depressive and anxious symptoms. Participants rate on a 4-point Likert scale (0 = did not apply to me at all; 3 = applied to me very much) how much a given statement has applied to them over the past week. The DASS-21 is composed of three relatively independent subscales measuring levels of depression, anxiety, and stress. The total score and each of the subscales also tap a broader dimension of psychological distress or neuroticism. In the present sample, the DASS demonstrated excellent internal consistency ($\alpha = .91$).

STUDY 1—RESULTS

Zero-order correlations among the key variables, in addition to means, and standard deviations are presented in Table 1. ASI scores were significantly and positively correlated with hoarding symptoms ($r = .26, P < .001$). To assess the robustness of this association, we next entered ASI scores into a hierarchical linear regression equation with hoarding symptoms as the dependent variable, while covarying for OCIR nonhoarding scores. Consistent with initial predictions, the association between ASI scores and the OCIR hoarding items remained significant ($\beta = .12, t(227) = 1.99, P < .05$) even after controlling for nonhoarding OC symptoms. We then constructed a similar regression equation covarying for DASS-21 scores to determine if general depressive and anxiety symptoms might account for the link between AS and hoarding. Results revealed that after controlling for DASS-21 total scores, the association between the OCIR hoarding items and ASI scores was still significant ($\beta = .18, t(227) = 2.72, P < .01$). In our third and final regression equation we included both DASS-21 scores and the nonhoarding OCIR total scores as covariates. We found that the relationship between the ASI and hoarding behaviors remained significant ($\beta = .12, t(227) = 1.99, P < .05$). Importantly, ASI scores were not significantly associated with nonhoarding OCIR total scores after controlling for the DASS-21 and the OCIR hoarding items.

Within a more exploratory framework, we furthermore wanted to determine whether there might be a differential relationship between hoarding symptoms

and the three subcomponents of AS: *physical concerns*, *cognitive dyscontrol*, and *social concerns*. Past research has found that the ASI factors often demonstrate different sensitivity in predicting symptoms and behavioral responses.^[37] As can be seen in Table 1, all three subscales of the ASI were significantly correlated with the OCIR hoarding items (all P s $< .01$). We next constructed a simultaneous linear regression equation with the OCIR hoarding items as the dependent variable and all three ASI factors entered into Step 1. Results revealed that the association with hoarding only remained significant for the *cognitive dyscontrol* factor ($\beta = .32, t(227) = 4.42, P < .001$). Finally, we again constructed a regression equation with both DASS-21 scores and the nonhoarding OCIR total scores as covariates, and found that the relationship between the ASI *cognitive* factor and hoarding behaviors remained significant ($\beta = .16, t(227) = 2.41, P < .05$).

STUDY 2—METHODS

PARTICIPANTS

The sample consisted of 265 (62% female) undergraduate students who received research credit for participation. This sample is completely independent from those reported in Studies 1 and 3. Ages ranged from 18 to 26 ($M = 18.7, SD = 1.18$). The racial/ethnic composition of the sample was as follows: African American (7.9%), Asian American (3.0%), Caucasian (78.1%), Hispanic/Latino (7.9%), and other (2.3%).

PROCEDURE

The procedure for Study 2 was identical to that of Study 1.

MEASURES

Distress Tolerance Scale (DTS). The DTS is a 15-item self-report measure of one's ability to tolerate psychological distress.^[22] Items are rated on a 5-point scale ranging from 1 (strongly agree) to 5 (strongly disagree). High scores on the DTS indicate that an individual can tolerate high levels of distress. Low scores reflect low DT (i.e., distress intolerance). The scale has been found to demonstrate good internal consistency,^[38] good test-retest reliability, and discriminant validity with measures of negative affect.^[22] Four

TABLE 1. Zero-order correlations, means, standard deviations, and ranges for Study 1

	1	2	3	4	5	6	7	Mean	SD	Range
1. OCIR-H	—							3.3	2.8	0–12
2. ASI	.26**	—						33.8	8.9	0–47
3. ASI- <i>physical</i>	.19**	.91**	—					16.6	5.9	0–31
4. ASI- <i>cognitive</i>	.30**	.70**	.45**	—				6.3	2.5	0–13
5. ASI- <i>social</i>	.17**	.71**	.45**	.43**	—			10.9	2.6	0–13
6. OCIR-NH	.47**	.30**	.23**	.36**	.17*	—		11.5	10.4	0–52
7. DASS	.31**	.35**	.28**	.45**	.17**	.52**	—	11.1	10.9	0–51

Note: OCIR-H, Obsessive–Compulsive Inventory—Revised: three hoarding items total score; ASI, Anxiety Sensitivity Index; ASI-*physical*, ASI Physical Concerns subscale; ASI-*cognitive*, ASI Cognitive Dysregulation subscale; ASI-*social*, ASI Social Concerns subscale; OCIR-NH, Obsessive–Compulsive Inventory—Revised: 12 nonhoarding items total score; DASS, Depression, Anxiety, and Stress Scale; SD, standard deviation. ** $P < .01$.

TABLE 2. Zero-order correlations, means, standard deviations, and ranges for Study 2

	1	2	3	4	5	6	7	8	9	Mean	SD	Range
1. OCIR-H	–									3.3	2.9	0–12
2. DTS	–.22**	–								3.3	0.9	1–5
3. DTS- <i>tol</i>	–.21**	.86**	–							3.1	1.1	1–5
4. DTS- <i>absorb</i>	–.21**	.92**	.78**	–						3.2	1.2	1–5
5. DTS- <i>apprais</i>	–.17**	.87**	.63**	.76**	–					3.6	1.0	1–5
6. DTS- <i>reg</i>	–.16*	.81**	.55**	.62**	.66**	–				3.2	1.1	1–5
7. OCIR-NH	.54**	–.38**	–.27**	–.36**	–.41**	–.28**	–			10.5	10.2	0–51
8. BDI	.25**	–.51**	–.40**	–.47**	–.53**	–.38**	.43**	–		8.6	8.1	0–48
9. STAI	.31**	–.53**	–.41**	–.50**	–.54**	–.41**	.44**	.69**	–	46.6	11.0	30–83

Note: DTS, Distress Tolerance Scale; DTS-*tol*, DTS Tolerance subscale; DTS-*absorb*, DTS Absorption subscale; DTS-*apprais*, DTS Appraisal subscale; DTS-*reg*, DTS Regulation subscale; OCIR-H, Obsessive–Compulsive Inventory—Revised: three hoarding items total score; OCIR-NH, Obsessive–Compulsive Inventory—Revised: 12 nonhoarding items total score; BDI, Beck Depression Inventory; STAI, Spielberger Trait Anxiety Inventory; SD, standard deviation. * $P < .05$; ** $P < .01$.

subscales have been identified for the DTS including *tolerance*, *absorption*, *appraisal*, and *regulation*. In the present sample, the DTS demonstrated excellent internal consistency ($\alpha = .93$).

Obsessive–Compulsive Inventory—Revised (OCIR). Please see Study 1 for a full description of this measure. In the present sample, the OCIR demonstrated excellent internal consistency ($\alpha = .91$).

Beck Depression Inventory (BDI). The BDI is a 21-item self-report measure of global depression. Participants rate their current mood over the past 2 weeks using a 4-point Likert scale. Higher scores reflect greater levels of depressive symptoms. The BDI is a reliable and validated measure of depressive symptoms.^[39,40] In the present sample, the BDI demonstrated good internal consistency ($\alpha = .88$).

Spielberger Trait Anxiety Inventory (STAI). The STAI was used to assess trait anxiety. The trait form is a 20-item self-report measure in which participants rate from 1 to 4 the degree to which each item (e.g., “I feel frightened”) reflects how they generally feel.^[41] Excellent reliability and convergent validity have been reported and individuals with anxiety disorders score significantly higher than nonclinical participants.^[41] In the present sample, the STAI demonstrated excellent internal consistency ($\alpha = .93$).

STUDY 2—RESULTS

Zero-order correlations among the key variables, in addition to means, and standard deviations are presented in Table 2. DTS scores were significantly and negatively correlated with hoarding symptoms ($r = -.22, P < .01$). The robustness of this association was tested using a series of hierarchical linear regression equations with hoarding symptoms (i.e., OCIR hoarding items) as the dependent variable and DTS scores as the primary independent variable. We found that the relationship between the OCIR hoarding items and DTS scores did not remain significant after controlling for depressive symptoms as measured by the BDI. Similarly, the relationship was not significant after including either STAI scores or nonhoarding OCIR scores as covariates. It therefore appears that the association between hoarding and low DT does not

remain after controlling for general OC, anxiety, or depression symptoms.

Similar to the ASI, the DTS includes several subscales including *tolerance*, *absorption*, *appraisal*, and *regulation*. As in Study 1, we wanted to determine if there might be differential associations between hoarding and these facets of DT. Although all four subscales were significantly correlated with the OCIR hoarding items (Table 2; all P s $< .05$), when we ran an analysis simultaneously regressing all DTS factors onto hoarding symptoms, none of the associations were significant.

STUDY 3—METHODS

PARTICIPANTS

The sample consisted of 409 (57.4% female) undergraduate students who received research credit for participation. This sample is completely independent from those reported in Studies 1 and 2. Ages ranged from 17 to 29 ($M = 19.18, SD = 2.4$). The racial/ethnic composition of the sample was as follows: African American (6.7%), Asian American (4.1%), Caucasian (74.9%), Hispanic/Latino (9.1%), and other (5.2%).

PROCEDURE

The procedure for Study 3 was identical to that of Study 1.¹

MEASURES

Anxiety Sensitivity Index (ASI). Please see Study 1 for a full description of this measure. In the present sample, the ASI demonstrated good internal consistency ($\alpha = .88$).

¹Study 3 was part of a larger genetics investigation and not all measures were included during the entire study. During the first wave of the investigation, we collected responses on the SIR, the ASI, and the BDI for 278 individuals. During wave two of data collection, the BAI and the DTS were added, and 132 more individuals were included, resulting in a final N of 410. Given these methods, the N for each of the analyses included in Study 3 differs somewhat depending on what measures were included.

Distress Tolerance Scale (DTS). Please see Study 2 for a full description of this measure. In the present sample, the DTS demonstrated good internal consistency ($\alpha = .89$).

Obsessive–Compulsive Inventory—Revised (OCIR). Please see Study 1 for a full description of the OCIR. In the present sample, this measure demonstrated excellent internal consistency ($\alpha = .89$).

Saving Inventory—Revised (SIR). The SIR^[42] is a 23-item self-report questionnaire used to assess hoarding behaviors. Participants are required to answer items using a 5-point Likert scale, higher scores reflecting elevated hoarding symptoms. The measure includes three factor analytically derived subscales including acquisition, clutter, and difficulty discarding. The SIR has been found to have strong internal consistency,^[20] good test–retest reliability, and satisfactory convergent validity.^[42] In the present sample, the SIR demonstrated good internal consistency ($\alpha = .94$).

Beck Depression Inventory (BDI). Please see Study 2 for a full description of this measure. In the present sample, the DTS demonstrated good internal consistency ($\alpha = .89$).

Beck Anxiety Inventory (BAI). The BAI is a 21-item self-report measure of severity of anxiety symptoms.^[39] Participants rate on a 4-point Likert scale the degree to which they have been bothered by anxiety symptoms (e.g., “shaky”) in the past week (0 = not at all; 3 = severely). The BAI demonstrates excellent internal consistency as well as convergent and discriminant validity.^[39] In the present sample, the BAI demonstrated good internal consistency ($\alpha = .93$).

STUDY 3—RESULTS

REPLICATION OF FINDINGS FROM STUDIES 1 AND 2

Zero-order correlations among the key variables, in addition to means, and standard deviations are presented in Table 3. Consistent with our findings from Study 1, analyses revealed that greater SIR scores were significantly associated with increased ASI total scores. To determine the strength of this relationship, a series of hierarchical linear regression analyses were conducted in which ASI served as the independent variable and SIR total score served as the dependent variable. In the first model, nonhoarding OCIR scores were covariates. Results indicated that even after controlling for general OC symptoms, hoarding symptoms were significantly associated with ASI total scores ($\beta = .24$, $t(409) = 5.0$, $P < .001$). In the second regression equation, BAI total score served as the

covariate and hoarding symptoms remained significantly linked with AS ($\beta = .22$, $t(127) = 2.8$, $P < .001$). In the third model, we included both nonhoarding OCIR and BDI scores as covariates. Again, results revealed that even after controlling for depressive and general OC symptoms, hoarding behaviors remained significantly and positively associated with ASI total scores ($\beta = .16$, $t(409) = 3.2$, $P < .01$). When all three covariates (BDI, BAI, and nonhoarding OCIR scores) were included into the equation, we found that the relationship between AS and hoarding was reduced to a trend ($\beta = .15$, $t(127) = 2.0$, $P = .05$).

Similar to Study 1, we also examined the association between hoarding symptoms and the ASI subscales. All three factors were significantly correlated with SIR scores (all P s $< .01$). After regressing three facets simultaneously on hoarding symptoms, we found that both *physical concerns* ($\beta = .20$, $t(409) = 3.1$, $P < .01$) and *cognitive dyscontrol* ($\beta = .19$, $t(409) = 3.0$, $P < .01$) were significantly associated with the SIR, though only *physical concerns* remained significant after controlling for covariates ($\beta = .19$, $t(127) = 2.6$, $P < .01$).

One final set of analyses with regard to the association between AS and hoarding was to determine if there was a differential association between the ASI and the three components of hoarding: *clutter*, *difficulty discarding*, and *acquisition*. All three subscales of the SIR were significantly correlated with ASI scores. Similar to our analysis for the ASI subscales, we constructed a regression equation with ASI total scores as the dependent variable, and all three SIR subscales simultaneously entered into the model. Both *difficulty discarding* ($\beta = .16$, $t(409) = 2.4$, $P < .05$) and *acquisition* ($\beta = .23$, $t(409) = 3.8$, $P < .001$) remained significantly associated with ASI, though only *acquisition* did so after controlling for BDI, BAI, and nonhoarding OCIR scores ($\beta = .22$, $t(127) = 2.2$, $P < .05$).

We next assessed the association between DT and hoarding, and found that greater SIR scores were significantly associated with lower DTS scores ($r = -.30$, $P < .001$). That is, greater levels of hoarding behavior were associated with greater degrees of distress intolerance (low DT). Unlike our findings in Study 2, this relationship was found to be significant after controlling

TABLE 3. Zero-order correlations, means, standard deviations, and ranges for Study 3

	1	2	3	4	5	6	7	Mean	SD	Range
1. SIR	–							18.4	12.2	0–81
2. ASI	.35**	–						15.9	9.3	0–52
3. DTS	–.30**	–.36**	–					3.3	1.0	1–5
4. OCIR-H	.65**	.23**	–.28**	–				3.1	2.2	0–12
5. OCIR-NH	.39**	.38**	–.21*	.46**	–			9.7	7.7	0–37
6. BDI	.38**	.43**	–.45**	.30**	.34**	–		5.6	6.0	0–45
7. BAI	.32**	.27**	–.49**	.23**	.26**	.58**	–	6.7	8.7	0–41

Note: SIR, Saving Inventory—Revised; ASI, Anxiety Sensitivity Index; DTS, Distress Tolerance Scale; OCIR-H, Obsessive–Compulsive Inventory—Revised: three hoarding items total score; OCIR-NH = Obsessive–Compulsive Inventory—Revised: 12 nonhoarding items total score; BDI, Beck Depression Inventory; BAI, Beck Anxiety Inventory; SD, standard deviation. * $P < .05$; ** $P < .01$.

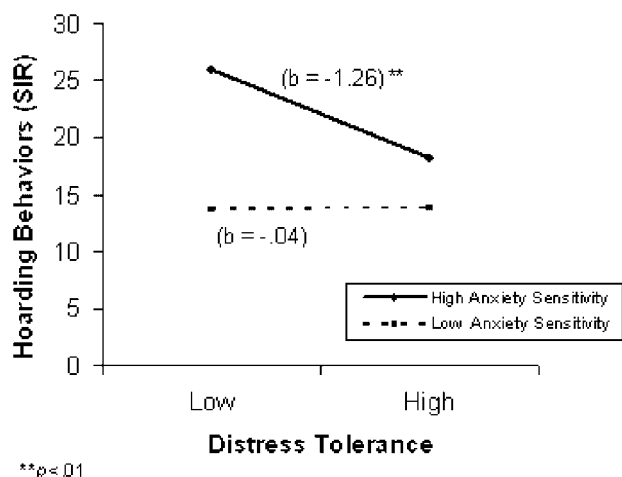


Figure 1. Extent of hoarding behavior among high and low distress-tolerant individuals based on level of anxiety sensitivity.

for general nonhoarding OC symptoms ($\beta = -.19$, $t(133) = -2.58$, $P < .01$), and after controlling for both nonhoarding OCIR and BAI scores ($\beta = -.17$, $t(127) = -2.10$, $P < .05$). Yet after we included BDI scores as a third covariate, the relationship became nonsignificant ($\beta = -.07$, $t(127) = -0.86$, $P = ns$).

With regard to the DTS subscales—*tolerance*, *absorption*, *appraisal*, and *regulation*—only *absorption* ($\beta = -.43$, $t(133) = -3.0$, $P < .01$) remained significantly associated with hoarding when all four sub-components were regressed simultaneously on SIR scores. This relationship remained significant despite controlling for covariates ($\beta = -.18$, $t(127) = -2.3$, $P < .05$).

As with our AS analyses, we also considered the differential association between SIR subscales and DTS. We found that after simultaneously regressing all three SIR factors on DTS scores, only *acquisitioning* ($\beta = -.30$, $t(133) = -2.8$, $P < .01$) remained significant, even after controlling for depression, anxiety, and nonhoarding OCD symptoms ($\beta = -.20$, $t(127) = -2.1$, $P < .05$).

INTERACTION BETWEEN AS AND DT

To determine whether low DT would act as a moderator on the association between AS and hoarding, we first calculated the interaction term between ASI and DTS scores. ASI and DTS scores were centered to reduce multicollinearity.^[43] We then constructed a hierarchical linear regression equation with SIR scores serving as the dependent variable, the main effects of ASI and DTS entered into Step 1 of the equation, and the interaction term entered into Step 2. This model ensures that any observed effects for the interaction in Step 2 cannot be attributed to shared variance with the variables entered into Step 1.^[44] Results revealed that the interaction between DTS and

ASI scores was marginally associated with hoarding behavior ($\beta = -.16$, $t(133) = -1.94$, $P = .05$).

Based on the recommendations of Cohen and Cohen^[44] and our a priori hypotheses, the form of the trending interaction was subsequently examined. We inserted ratings of AS (one standard deviation above and below the mean ASI score) and DT (one standard deviation above and below the mean DTS score) into the regression equation associated with the described analysis. As can be seen in Figure 1, low DT symptoms and high AS are associated with increased hoarding symptoms compared to low DT symptoms and high AS, or high DT symptoms regardless of AS levels. As suggested by Holmbeck,^[43] the simple slopes were examined using centered DT symptoms. Only the simple slope of the high AS moderator variable was significant ($t = -2.81$, $P < .01$). The direction indicates that the relationship between DT and hoarding symptoms is significantly different for individuals with high AS but not individuals with low AS ($t = -0.09$, $P = ns$). As depicted in Figure 1, DT seems to be strongly associated with hoarding behaviors only when AS is high. That is, consistent with our prediction, only when anxiety-related symptoms are interpreted as dangerous (high AS) does low DT play a role in hoarding symptoms.

DISCUSSION

The studies presented in this report serve as the first known investigations of the distinct and synergistic roles of AS and DT on hoarding behaviors. In particular, the implication of DT is a novel contribution to our understanding of potential vulnerability factors for hoarding. Taken together, these studies provide at least partial support for our hypotheses that high AS and low DT may serve as important vulnerability factors for maladaptive hoarding behaviors. Three criteria have been identified that can aid in determining whether a variable serves as a risk factor.^[45] First, the proposed vulnerability factor must be correlated with the construct of interest—in this case hoarding. Second, the relationship between a proposed vulnerability factor and hoarding must be nonspurious. More specifically, the association between the two variables should not be better explained by a third factor. Third, the vulnerability factor should demonstrate temporal precedence. Our series of studies set out to investigate whether AS and low DT satisfy the first two criteria, thereby providing partial evidence that these factors may serve as risk factors for hoarding behaviors.

With regard to the unique contribution of AS in relation to hoarding, our studies provide several important lines of evidence supporting the idea that AS appears to act as a vulnerability factor for hoarding. First, and as outlined in Study 1, we replicated the findings that AS and hoarding behaviors covary in a general student population,^[20] thereby satisfying the

first criterion—that is, correlation. Study 1 extended prior work by directly and thoroughly examining the nonspuriousness of this relation. The data suggested that even after controlling for other OCD symptoms and a measure of general distress and depression, AS was significantly associated with hoarding behaviors. Moreover, our findings indicate that the relationship between AS and hoarding was not better accounted for by these relevant variables. Of note, the relationship between AS and nonhoarding OCD symptoms was not significant after accounting for general distress, depression, and hoarding symptoms. This evidence for uniqueness was replicated in Study 3 utilizing a more thorough measure of hoarding in an independent sample, which, taken together with Coles et al.'s findings, speaks to the overall consistency of our results. Findings from these studies therefore suggest that AS meets the first two criteria for establishing risk, and moreover indicate that future prospective investigations are warranted to determine the temporal association between these variables.

Novel to this investigation was the examination of the ASI factors. We found in Studies 1 and 3 that the ASI *cognitive* factor was associated with hoarding, though Study 3 revealed that the ASI *physical concerns* factor may also be associated with hoarding. These findings are unfortunately not consistent, but should be considered from more of an exploratory vantage point, and some of the inconsistency may at least partially be attributed to the divergent measures of hoarding symptoms utilized in Studies 1 and 3.

This investigation is the first known report to examine the relationship between DT and hoarding behavior. Specifically, we found individuals high in hoarding behaviors to be low in DT (i.e., they were more distress *intolerant*). These findings thus provide important empirical support for the case reports and clinical observations that have found hoarders to be less able to cope with distressing emotions and situations. These results construct a foundation for the further empirical investigation of DT, particularly with regard to how it relates to avoidance within the hoarding phenomenon. Results from Studies 2 and 3 indicate that although low DT and hoarding are associated with one another, this relationship may, in part, be explained by variables that are related to *both* low DT and hoarding behaviors. We found that after taking into account depressive symptoms, the relationship between hoarding and low DT was no longer significant. Depressive symptoms have been found to be related to both hoarding^[46] and low DT,^[38] and this shared factor may therefore partially account for the apparent link between low DT and hoarding.

That being said, our DTS subscale analyses revealed that the *absorption* facet was robustly associated with hoarding above and beyond depression, anxiety, and nonhoarding OCD symptoms. This finding allows for the possibility that only particular aspects of low DT

may serve as a risk factor for hoarding behaviors. Absorption refers to the aspect of DT where an individual feels completely overwhelmed and engrossed by an experience of distress. Higher levels of absorption imply that the individual cannot focus on things (or thoughts) outside of the distressing situation. As such, hoarding may represent part of the distress sequelae, in that the saving and, in particular, acquisition behaviors are an attempt to regulate distressed emotions. In this view, hoarding is a form of dysregulation, which fits within our general hypotheses on the relationship between saving behaviors and DT/AS.

The finding that *acquisition* was the hoarding facet most robustly associated with low DT is interesting to note and represents one potential avenue for future research. Although hoarding is currently linked with OCD, there is some discussion as to the diagnostic classification of this syndrome, given in part by the comorbidity and shared features between hoarding and the impulse control disorders.^[7] In particular, acquisition, although one of the key facets of hoarding, is also the primary feature of compulsive buying—an impulse control disorder. With regard to DT and impulse control disorders, past research has found DT to be low in disorders with increased impulsivity features, including substance use disorders,^[47] borderline personality disorder,^[25] and pathological gambling.^[48]

Findings from Study 3 also suggest that low DT may act synergistically with AS to increase vulnerability to hoarding behaviors among some individuals. That is to say, DT may not act as a true risk factor when considered independently, but rather might lead to increased hoarding vulnerability when combined with other known risk factors such as AS. Accordingly, we found in Study 3 that individuals with high AS and low DT demonstrated the greatest degree of hoarding behaviors. This is consistent with our expectation that individuals who experience distress in the face of anxiety-related bodily sensations *and* who are the least able to tolerate such distress may be the most vulnerable to engaging in problematic coping strategies such as hoarding.^[7]

Future replications of these findings, utilizing larger samples from nonclinical and clinical populations, are warranted to investigate the exact nature of the relationship between hoarding and AS or hoarding and DT. Of primary importance will be the determination of whether or not these individual difference variables increase the relative risk that an individual will eventually develop hoarding symptoms. In other words, for high AS and low DT to truly act as vulnerability factors for hoarding, they must precede the onset of clinically significant saving behaviors. To this end, future investigations should assess the temporal relationship between hoarding behaviors and these constructs. Pending such research, the third requirement, as per Garber and Hollon's^[45]

suggestions for determining vulnerability factor status, will remain unmet.

Clarification of the role that AS and DT may play in hoarding symptoms is not only relevant from an etiological perspective, but from a classification standpoint as well. Given the substantial heterogeneity of OCD, the identification of unique factors associated with one symptom dimension—in this case hoarding—may speak to the etiological distinctness of the various symptom subtypes. This is particularly interesting when one considers the debate over whether or not hoarding should be considered a symptom of OCD or a syndrome in its own right.^[7] Evidence from brain imaging^[49] and genetic investigations^[46] has provided some initial support for hoarding as a potentially discrete phenomenon. Identifying further individual difference variables that may differentiate hoarding from other OCD symptoms (e.g., washing) could further aid in clarifying this classification question. Elucidating unique risk factors for the various OCD symptom dimensions may also help to ascertain viable endophenotypes, which in turn could greatly inform future genetic investigations.^[50] Although there appears to be solid evidence for a familial component in OCD and hoarding,^[51] definitive underlying genetic mechanisms have not been consistently identified, in part due to the significant heterogeneity of the clinical phenotype.^[52] An endophenotype, which represents an intermediate link between a disorder and the underlying genetic etiology, represents one tool utilized to decrease this heterogeneity. As such, this intermediate phenotype (e.g., AS) is not only more concretely quantifiable, but more homogeneous in nature, which directly aids in our understanding of the genetic underpinnings of the overall clinical phenomenon.^[53] On a final note, an increasing number of investigations have examined endophenotypes for schizophrenia^[54] and mood disorders,^[53,55] though relatively fewer investigations have explored plausible endophenotypes within the OCD research arena.

Our findings of the main and synergistic relationship between AS and DT (with regard to hoarding) are also relevant to treatment implications. Unlike other factors associated with hoarding (e.g., lowered cerebral metabolic patterns^[49]), both AS and DT represent relatively *modifiable* individual difference variables. A growing number of investigations have demonstrated that AS levels can be successfully reduced via interoceptive exposure therapy in a range of disorders including panic disorder^[56] and pain-related anxiety.^[57] Similarly, increasing DT as a component of dialectical behavior therapy has been found to be associated with more promising outcomes for individuals with borderline personality disorder^[58] as well as those with depression.^[59]

This study should be considered in light of limitations that point to further work in this area. For instance, future research should attempt to replicate the specificity of the AS and hoarding behavior

association in clinical populations where thorough diagnostic information is available. As ASI scores have been found to be greater in clinical samples of individuals with OCD, it is possible that the specificity between hoarding and AS seen in this report may be unique to nonclinical samples. Future work on this topic also needs to clarify the association between the ASI subscale and hoarding. To this end, utilizing newer measures of AS, such as the ASI-III,^[60] may be helpful. The present investigations were all cross-sectional in nature and therefore cannot speak to the true causal nature between our construct of interest (hoarding) and AS. The unimethod self-report study design also opens up the possibility that shared method of variance may have contributed partially to the observed results. With regard to Study 3, not all measures were given to the entire sample. This resulted in a dramatically decreased “N” for those analyses including the BAI and DTS. It is therefore likely that these analyses were underpowered. Although it seems more likely that heightened levels of AS over time lead to greater hoarding behaviors, we cannot rule out the alternative that hoarding behaviors lead to greater levels of AS. Work in this area would benefit from longitudinal and experimental work investigating the temporal sequencing of these relations.

Despite these limitations, this study provides useful information pertaining to the unique and synergistic roles of AS and low DT as vulnerability factors for hoarding. Taken together, AS appears to be incrementally related to hoarding behaviors above and beyond relevant variables (e.g., anxiety, depression, and other OC symptoms). Although the relationship between low DT and hoarding is less clear, our data do suggest that the ability to tolerate distressing emotions may be particularly relevant among high AS individuals. In other words, DT may play a less important role among individuals with low AS in the development of hoarding behaviors, whereas in individuals with high AS, DT appears to increase vulnerability to hoarding behaviors. Further explication of the roles of AS and low DT on hoarding behaviors may ultimately inform targeted prevention and treatment programs for high-risk individuals.

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