Journal of Psychiatric Research 111 (2019) 121–127

Contents lists available at ScienceDirect

Journal of Psychiatric Research

journal homepage: www.elsevier.com/locate/jpsychires

An examination of the relationship between hoarding symptoms and hostility

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ARTICLE INFO

Keywords:
Hoarding disorder
Saving
Hostility
Interpersonal

ABSTRACT

Hoarding disorder (HD) is a persistent and severe psychiatric condition in which individuals are unable to discard possessions, which results in considerable clutter. Individuals who hoard often endorse interpersonal difficulties and social isolation. However, little research has examined mechanisms that may help to explain this relationship. One possible mechanism is hostility, which is characterized by increased sensitivity to real or perceived social threats. The current study examined the relationship between hoarding symptoms and hostility across two undergraduate samples. In study 1, unselected undergraduates ($N = 195$) were administered measures of hoarding symptoms, hostile interpretations, and depression and anxiety symptoms. Participants in study 2 ($N = 117$) were selected for reporting elevated hoarding symptoms. Study 2 participants were administered the same measures as in study 1, and were additionally randomized to an inclusion or exclusion condition in a social exclusion manipulation. Total hoarding symptoms and hostile interpretations were positively associated across both samples, even when controlling for depression and anxiety. Further, greater hoarding symptoms were associated with increased feelings of hostility in response to social exclusion in study 2. Results suggest that increased sensitivity to social threat may confer risk for hoarding. These findings add to a growing body of research implicating interpersonal factors in the development and maintenance of hoarding disorder.

1. Introduction

Hoarding disorder (HD) is characterized by excessive saving behaviors, including having difficulty discarding and excessively acquiring possessions, which contributes to severe clutter (Frost and Hartl, 1996). One of the core features of HD is an extreme emotional attachment to possessions, such that individuals who hoard develop strong bonds with possessions that interferes with their ability to part with them (Frost and Hartl, 1996; Steketee et al., 2003). Indeed, individuals who hoard report viewing their possessions as loved ones, extensions of themselves, and a primary source of comfort (Frost and Hartl, 1996; Frost et al., 1995; Steketee et al., 2003). Hoarding symptoms are also associated with anthropomorphism (Timpano and Shaw, 2013), which is defined as the tendency to attribute human characteristics to non-human beings (Epley et al., 2007), and is thought to be a key component of one's attachment to possessions.

Though little is known about why maladaptive attachments to possessions develop, preliminary work suggests that relationships with possessions may be an attempt to compensate for maladaptive attachments with people (Grisham et al., 2018; Keefer et al., 2012; Kleine et al., 1995). Individuals with HD often report interpersonal difficulties, are socially isolated, and endorse insecure attachments with others (Grisham et al., 2008; Tolin et al., 2008). Further, when compared to healthy controls, individuals who hoard report significantly higher levels of insecure attachment (Grisham et al., 2018) and lower perceived social support (Medard and Kellett, 2014). The occurrence of interpersonal stressors, such as the sudden change in a relationship, is associated with worsening of hoarding symptoms (Tolin et al., 2010), and interpersonal trauma, in particular, is associated with greater hoarding symptoms (Mathes et al., 2017). Despite a growing body of research indicating interpersonal dysfunction in HD, existing treatments focus primarily on intrapersonal, rather than interpersonal, factors that maintain symptoms (Steketee and Frost, 2014). Moreover, little research has examined cognitive-affective factors that may underlie these difficulties and provide potential novel treatment targets.

One factor that may confer risk for HD is hostility, which is a multifaceted construct comprising cognitive, emotional, and behavioral aspects (Buss and Durkee, 1957; Buss and Perry, 1992). Hostile cognitions can include the interpretation of others' actions as intentionally aggressive or threatening, expectation that others will behave in a hostile manner, and sensitivity to real and perceived social threat, and hostile behaviors can be characterized as aggressive, oppositional, and

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https://doi.org/10.1016/j.jpsychires.2019.01.025
Received 7 October 2018; Received in revised form 11 January 2019; Accepted 30 January 2019

antagonistic (Dillon et al., 2016; Dodge and Newman, 1981). Individuals high on hostility may interpret ambiguous situations, such as a shopping cart bumping into them, as intentionally harmful rather than accidental. As a result, they may then experience greater feelings of hostility and may be more likely to engage in hostile behavior, such as yelling at the other person. In addition to heightened sensitivity to perceived social threats, individuals high on hostility may also experience greater reactivity to objective social threats. Indeed, feelings of hostility are a common reaction to social threat, such as social exclusion, and increased hostility after social exclusion are associated with greater subsequent aggressive behaviors (DeWall et al., 2009; Twenge et al., 2007).

Importantly, increased hostility may interfere with the formation or maintenance of interpersonal relationships (Coyne, 1976; Joiner and Metalsky, 1995). Indeed, hostile individuals commonly report experiencing interpersonal difficulties, and hostility is associated with increased loneliness, which is a known risk factor for a variety of negative health outcomes, such as depression and heart disease (Jones et al., 1981; Holt-Lunstad et al., 2015). Further, hostility has been significantly and moderately associated with other disorders characterized by interpersonal difficulties, such as depression ($r = 0.38$; Smith et al., 2016) borderline personality disorder ($r = 0.57$; Evren et al., 2011), and social anxiety ($r = 0.37$; Dixon et al., 2017). Taken together, hostility is a multifaceted construct characterized by maladaptive interpretations and reactions to real or perceived social threats that can result in increased aggression, interpersonal difficulties, and social isolation.

In regards to HD, it may be that hostile interpretations of and feelings of hostility toward other people help to explain why individuals who hoard experience interpersonal difficulties. Indeed, there is some evidence to suggest that hoarding may be associated with increased hostility. HD is often comorbid with depression and social anxiety, which are associated with increased hostility (DeWall et al., 2010; Frost et al., 2011; Smith et al., 2016). Further, increased hostility is associated with decreased distress tolerance (Matheny et al., 2017), which has been proposed to be an important risk factor for HD (Norberg et al., 2015; Shaw and Timpano, 2016; Timpano et al., 2014). Specifically, prior work suggests individuals who hoard perceive themselves as being unable to tolerate potential distress from discarding valued possessions, thereby resulting in avoidance of discarding (Shaw and Timpano, 2016). Similarly, individuals with poor distress tolerance may have difficulty regulating emotions in interpersonal situations, thereby resulting in increased hostility toward others (Matheny et al., 2017). Therefore, it may be that individuals with HD experience low distress tolerance, which underlies both their discarding and interpersonal difficulties. More direct evidence for the association between hoarding and hostility can be found in a recent study in which aggression, a construct closely related to hostility, was positively associated with hoarding symptoms and statistically mediated the association between interpersonal trauma and hoarding symptoms in a community sample (Mathes et al., 2017). However, no study to date has examined associations between hoarding symptoms and hostility specifically.

Taken together, initial work suggests that hoarding symptoms are associated with interpersonal difficulties, though further work is needed to delineate specific mechanisms that may help to explain this association. Notably, given that treatment for HD is only moderately effective (Tolin et al., 2015), the identification of novel treatment targets, such as hostility, may bolster outcomes and reduce burden. The current study therefore assessed the relationship between hoarding symptoms and hostility, with a particular focus on the interpretation of hostility in situations of perceived and real social threat. We first examined cross-sectional associations between hoarding symptoms and hostile interpretations across two samples, including a non-selected sample of undergraduate students and a sample of undergraduates who reported elevated hoarding symptoms. We hypothesized that hoarding symptoms would be positively associated with hostile interpretations, even when accounting for symptoms of depression and anxiety, which have been shown to be positively associated with hoarding symptoms and hostility (Frost et al., 2011; Smith et al., 2016). Of note, HD is dimensional in nature, such that symptoms range from non-clinical to severely distressing and impairing (Timpano et al., 2013). As such, it is imperative to examine associations between hoarding symptoms and potential risk factors across varied degrees of severity.

Next, we examined the association between hoarding symptoms and feelings of hostility in the context of a real social threat among our sample of undergraduates endorsing elevated hoarding symptoms. Specifically, we investigated whether hoarding symptoms moderated hostile responses to a social exclusion manipulation. It was predicted that individuals with elevated hoarding symptoms who were socially excluded would report greater feelings of hostility in response to social exclusion than would individuals with lower hoarding symptoms.

2. Study 1 method

2.1. Participants

The sample comprised 195 unselected undergraduate students (76.1% female). The mean age of the sample was 19.14 years ($SD = 1.27$). Of the sample, 81.4% self-reported as White, 7.4% as African-American, 4.3% as Asian, 1.1% as Pacific Islander, 1.1% as American Indian, and 4.8% as Other (e.g., biracial).

2.2. Measures

Saving Inventory Revised (SIR; Frost et al., 2004). The SIR is a 23-item measure of hoarding symptoms. Participants are asked to rate the extent to which statements regarding difficulty discarding, acquiring, and clutter apply to them using a 5-point scale (0 = not at all, 4 = extremely). Items are summed for three subscale scores and a total score, in which higher scores indicate greater hoarding symptoms. There are 7 items in the discarding subscale, 7 items in the acquiring subscale, and 9 items in the clutter subscale. The SIR exhibited excellent internal consistency in the current sample ($\alpha = 0.94$).

Word Sentence Association Paradigm for Hostility (WSAP-H; Dillon et al., 2016). The WSAP-H is a 32-item measure of hostile interpretation bias, or one's tendency to interpret ambiguous social situations as hostile. Participants are presented with 16 scenarios followed by a hostile or benign word, and are asked to rate the degree to which the word applies to the scenario (1 = not at all related, 6 = very related). Each scenario is presented twice such that it is paired with one hostile and one benign word. For example, participants were presented with the scenario “someone bumps into you,” and the hostile word pairing was “aggressive” whereas the benign word was “accidental.” Mean scores are calculcated for both subscales. Of note, because the primary aim of the study was to investigate hostile cognitions, only hostile, not benign, interpretations were assessed in primary analyses. The hostile ($\alpha = 0.92$) and benign ($\alpha = 0.86$) subscales demonstrated excellent internal consistency.

Depression, Anxiety, and Stress Scale-21 (DASS-21; Lovibond and Lovibond, 1995). The DASS-21 is a 21-item self-report measure that assesses depression, anxiety, and general stress. Participants are asked to use a 4-point scale (0 = did not apply to me at all, 3 = applied to me very much or most of the time) to indicate the extent to which symptoms apply to them in the past week. Higher scores indicate more severe symptoms. For the current study, we only used the depression and anxiety subscales to account for the presence of those symptoms. The depression and anxiety subscales each consist of 7 items. The depression ($\alpha = 0.92$) and anxiety ($\alpha = 0.88$) subscales demonstrated good to excellent internal consistency in the current sample.

2.3. Procedure

Participants were recruited from introductory psychology classes at a large university in the southeastern United States. All data were collected online. Participants provided informed consent prior to completing questionnaires and received course credit for participation. All procedures were approved by the university's Institutional Review Board.

2.4. Data analytic plan

Correlation analyses were used to examine relationships among hoarding symptoms (as measured by the SIR), hostile and benign interpretations (as measured by the WSAP-H), and depression and anxiety symptoms (as measured by the DASS-21-Depression and DASS-21-Anxiety). Hierarchical multiple regression analyses were used to examine associations between WSAP-H hostile interpretation average scores and SIR total scores. In step one, DASS-21-Depression and DASS-21-Anxiety scores were entered. In step two, WSAP-H scores were entered. The aforementioned analysis was then repeated in three separate equations predicting SIR subscale scores, including difficulty discarding, acquiring, and clutter.

3. Study 1 results

3.1. Descriptive statistics and correlation analyses

The means, standard deviations, and zero-order correlations for all variables are displayed in Table 1, including total and subscale scores for the SIR, as well as hostile and benign scores for the WSAP-H. Scores on the SIR and WSAP-H were consistent with prior studies using undergraduate samples (Dillon et al., 2016; Timpano and Schmidt, 2013). SIR total scores were significantly correlated with WSAP-H hostile interpretation scores, $r = 0.27$, $p = < .001$.

3.2. Regression analyses

Please see Table 2 for full regression statistics, including total and subscale scores for the SIR. In step 1, DASS-21-Depression and DASS-21-Anxiety scores were entered, which accounted for 20.4% of the variance in SIR total scores, $F(3,194) = 25.88$, $p < .001$. In step 2, WSAP-H hostile interpretation scores were entered and contributed 2.7% additional variance, $F(3,194) = 20.01$, $p < .001$.

4. Study 2 method

4.1. Participants

The sample comprised 117 undergraduate students (89.0% female) selected for reporting hoarding symptoms at or above the non-clinical mean on the SIR (i.e., 23; Frost et al., 2004). The mean age of the sample was 18.70 years ($SD = 1.29$). Of the sample, 79.1% self-reported as White, 11.0% as African-American, 6.6% as Asian, 1.1% as Pacific Islander, 1.1% as American Indian, and 1.1% as Other (e.g., biracial).

Table 2
Hierarchical regression equations predicting SIR total and subscale scores in study 1.

	R^2 Change	t	β	sr^2
Predicting SIR-T				
Step 1				
DASS-Dep	.21***	.81	.08	.003
DASS-Anx		3.59***	.35	.05
Step 2				
WSAP-H	.03**	2.59**	.17	.03
SIR-D				
Step 1				
DASS-Dep	.15***	.67	.07	.002
DASS-Anx		2.83**	.29	.03
Step 2				
WSAP-H	.03*	2.57*	.17	.03
SIR-A				
Step 1				
DASS-Dep	.13***	-.68	-.07	.022
DASS-Anx		3.46**	.35	.05
Step 2				
WSAP-H	.05**	3.45**	.23	.05
SIR-C				
Step 1				
DASS-Dep	.23***	1.87	.06	.01
DASS-Anx		3.13**	.31	.04
Step 2				
WSAP-H	.004	1.03	.07	.004

Note. SIR-T: Saving Inventory Revised- Total; SIR-D: Saving Inventory Revised- Difficulty Discarding Subscale; SIR-A: Saving Inventory Revised- Acquiring Subscale; SIR-C: Saving Inventory Revised- Clutter Subscale; WSAP-H: Word Sentence Association Paradigm-Hostility; DASS-D: Depression, Anxiety, and Stress Scale- Depression; DASS-D: Depression, Anxiety, and Stress Scale- Anxiety. *$p < .05$, **$p < .01$, ***$p < .001$.

4.2. Measures

As in Study 1, participants completed the SIR, WSAP-H, and DASS-21. All three measures demonstrated acceptable to excellent internal consistency in the sample (SIR: α = 0.94; WSAP-H: α = 0.85; WSAP-B: α = 0.83; DASS-Depression: α = 0.89; DASS-Anxiety: α = 0.78).

4.3. Behavioral tasks

Cyberball (Williams and Jarvis, 2006). Cyberball is a computerized task aimed to elicit feelings of social exclusion. Participants are told

Table 1
Pearson correlations, means, and standard deviations for all variables in study 1.

	1	2	3	4	5	6	7	8	M(SD)
1. SIR-T	___								17.97(13.79)
2. SIR-D	.89***	___							5.77(4.96)
3. SIR-A	.88***	.73***	___						6.93(4.72)
4. SIR-C	.88***	.65***	.63***	___					5.27(5.93)
5. WSAP-H	.27***	.25***	.30***	.17*	___				3.19(.97)
6. WSAP-B	-.25***	-.20**	-.21**	-.24**	.07	___			4.16(.80)
7. DASS-D	.34***	.28***	.20**	.39***	.22**	-.05	___		3.86(4.65)
8. DASS-A	.39***	.33***	.28***	.40***	.23**	-.06	.75***	___	3.34(4.00)

Note. SIR-T: Saving Inventory Revised- Total; SIR-D: Saving Inventory Revised- Difficulty Discarding Subscale; SIR-A: Saving Inventory Revised- Acquiring Subscale; SIR-C: Saving Inventory Revised- Clutter Subscale; WSAP-H: Word Sentence Association Paradigm-Hostile subscale; WSAP-H: Word Sentence Association Paradigm-Benign subscale; DASS-D: Depression, Anxiety, and Stress Scale- Depression; DASS-D: Depression, Anxiety, and Stress Scale- Anxiety. *$p < .05$, **$p < .01$, ***$p < .001$.

Table 3
Pearson correlations, means, and standard deviations for all variables in study 2.

	1	2	3	4	5	6	7	8	M(SD)
1. SIR-T	____								29.96(10.50)
2. SIR-D	.88***	____							11.24(4.16)
3. SIR-A	.86***	.70***	____						10.65(3.94)
4. SIR-C	.84***	.59***	.55***	____					7.60(4.46)
5. WSAP-H	.42***	.36***	.40***	.33***	____				3.13(.76)
6. WSAP-B	-.06	.01	-.08	-.08	-.05	____			4.26(.75)
7. DASS-D	.20*	.15	.22*	.15	.33**	-.06	____		4.14(3.99)
8. DASS-A	.32**	.23*	.28**	.30**	.24*	-.08	.54***	____	3.62(3.42)

Note. SIR-T: Saving Inventory Revised- Total; SIR-D: Saving Inventory Revised- Difficulty Discarding Subscale; SIR-A: Saving Inventory Revised- Acquiring Subscale; SIR-C: Saving Inventory Revised- Clutter Subscale; WSAP-H: Word Sentence Association Paradigm-Hostile subscale; WSAP-H: Word Sentence Association Paradigm-Benign subscale; DASS-D: Depression, Anxiety, and Stress Scale- Depression; DASS-D: Depression, Anxiety, and Stress Scale- Anxiety. *$p < .05$, **$p < .01$, ***$p < .001$.

they are engaging in a ball-tossing game with two other individuals in which the object of the task was to examine the relationship between mental visualization and task performance. The Cyberball software was programmed to generate two conditions: exclusion and inclusion. In the exclusion condition, participants were included during the first three ball tosses, then excluded for the remainder of the game. In the inclusion condition, participants were included throughout the entire game. Each player avatar included a picture of an undergraduate student and a username in order to enhance the perception that the participant was playing against real people. Participants were asked to use a scale from 1 (very little) to 5 (extremely) to rate affective states, including distress and hostility (e.g., indicate the degree to which you feel hostile right now), before and after the game.

4.4. Procedure

Participants were recruited from introductory psychology classes at a large university in the southeastern United States. The current study is part of a larger study examining the relationship between interpersonal stress and saving behaviors. Given the use of Cyberball as a deception strategy, participants were not told the primary aim of the study until debriefing, but rather were told the study was examining the relationship between personality factors, consumer behavior, and task performance. Participants read and signed an informed consent, which emphasized confidentiality and privacy, and highlighted the participants' option to discontinue participation at any time without penalty. Participants completed baseline self-report measures and were randomized to the exclusion or inclusion condition of Cyberball. Participants were then debriefed. All procedures were approved by the university's Institutional Review Board.

4.5. Data analytic plan

Please see the data analytic plan from study 1 for correlation and regression analyses. In addition to the aforementioned analyses, hierarchical multiple regression analyses were used to examine the extent to which SIR total scores, condition, and the interaction between SIR total scores and condition predicted post-manipulation feelings of hostility. Following the recommendations of Aiken and colleagues (1991), SIR total scores were centered and then multiplied with condition to generate an interaction term. In step one, pre-manipulation feelings of hostility was entered. In step two, DASS-21-Depression and DASS-21-Anxiety scores and post-manipulation feelings of distress were entered. In step three, condition and the centered term for SIR total scores were entered. In step four, the centered interaction term of SIR total scores and condition was entered.

5. Study 2 results

5.1. Manipulation check

As part of the debriefing process, participants were asked if they believed they were playing against a real opponent. Of the sample, 6 participants (5%) reported knowing they were not playing against a real person and changing their responses on subsequent tasks. Therefore, those participants were excluded, resulting in a final sample of 111 individuals.

To ensure the social exclusion manipulation elicited the expected response, participants were asked to rate their feelings of rejection before and after the manipulation using a 5-point scale ranging from "not at all" to "extremely." A repeated measures ANCOVA was used to assess group differences in feelings of rejection before and after the social exclusion manipulation. Condition was entered as a between subjects variable. Baseline depression and anxiety were entered as covariates. There was a significant interaction between condition and feelings of rejection, $F(1,107) = 13.26$, $p < .001$, partial $\eta^2 = 0.11$. Specifically, individuals who were socially excluded ($M = 1.98$, $SD = 1.22$) reported significantly greater feelings of rejection than did individuals who were socially included ($M = 1.25$, $SD = 0.51$).

There was a significant interaction between condition and feelings of distress, $F(1,107) = 4.93$, $p = .03$, partial $\eta^2 = 0.04$. Specifically, individuals who were socially excluded ($M = 1.76$, $SD = 1.03$) reported significantly greater feelings of distress than did individuals who were socially included ($M = 1.37$, $SD = 0.72$).

There was a significant interaction between condition and feelings of hostility, $F(1,107) = 11.13$, $p = .001$, partial $\eta^2 = 0.09$. Specifically, individuals who were socially excluded ($M = 1.39$, $SD = 0.76$) reported significantly greater feelings of hostility than did individuals who were socially included ($M = 1.14$, $SD = 0.40$).

5.2. Descriptive statistics and correlation analyses

The means, standard deviations, and zero-order correlations for all variables are displayed in Table 3 including total and subscale scores for the SIR, as well as hostile and benign scores for the WSAP-H. Total SIR scores were consistent with prior studies using individuals recruited for reporting elevated hoarding symptoms (Timpano and Schmidt, 2013). Additionally, WSAP-H scores were consistent with prior studies utilizing individuals with elevated clinical symptoms (Smith et al., 2016). Total SIR scores were significantly correlated with WSAP-H hostile interpretation scores, $r = 0.51$, $p = < .001$.

5.3. Regression analyses

Please see Table 4 for full regression statistics, including total and subscale scores for the SIR. In step 1, DASS-21-Depression and DASS-

Table 4
Hierarchical regression equations predicting SIR total and subscale scores in study 2.

	R^2 Change	*t*	β	sr^2
Predicting SIR-T				
Step 1				
DASS-Dep	.10**	-.59	-.06	.003
DASS-Anx		2.59*	.26	.05
Step 2				
WSAP-H	.12***	4.15**	.37	.12
SIR-D				
Step 1				
DASS-Dep	.06**	-.45	-.05	.002
DASS-Anx		1.69	.18	.02
Step 2				
WSAP-H	.10***	3.48**	.33	.10
SIR-A				
Step 1				
DASS-Dep	.09**	-.02	-.002	.00
DASS-Anx		1.92	.20	.03
Step 2				
WSAP-H	.11***	3.83***	.35	.11
SIR-C				
Step 1				
DASS-Dep	.09**	-.92	-.10	.01
DASS-Anx		2.72**	.29	.06
Step 2				
WSAP-H	.07**	3.09**	.29	.07

Note. SIR-T: Saving Inventory Revised- Total; SIR-D: Saving Inventory Revised- Difficulty Discarding Subscale; SIR-A: Saving Inventory Revised- Acquiring Subscale; SIR-C: Saving Inventory Revised- Clutter Subscale; WSAP-H: Word Sentence Association Paradigm-Hostility; DASS-D: Depression, Anxiety, and Stress Scale- Depression; DASS-D: Depression, Anxiety, and Stress Scale-Anxiety.
*$p < .05$, **$p < .01$, ***$p < .001$.

21-Anxiety were entered, which accounted for 8.8% of the variance in total SIR scores, $F(2,110) = 6.11$, $p = .003$. In step 2, WSAP-H hostile interpretation scores were entered and contributed 12.4% additional variance, $F(3,110) = 10.41$, $p < .001$.

5.4. Moderator analyses

When accounting for pre-manipulation feelings of hostility, post-manipulation distress, and baseline DASS-21-Depression and DASS-21-Anxiety, the interaction between SIR total scores and condition was significantly associated with increased feelings of hostility (β = 0.20, $t = 2.40$, $p = .02$, $sr^2 = 0.03$) following the manipulation, $F(7,110) = 11.56$, $p < .001$. Specifically, the effect of condition was significant at high (β = 0.40, $t = 3.53$, $p = .001$), but not low (β = 0.003, $t = 0.03$, $p = .98$), SIR total scores. As seen in Fig. 1, individuals who were socially excluded and reported elevated symptoms reported the highest feelings of hostility following the manipulation.

6. Discussion

The current study examined the relationship between hoarding symptoms and hostility across two undergraduate samples. Hoarding symptoms were positively associated with greater hostile interpretations across both samples, suggesting that interpreting ambiguous social situations as threatening may be a risk or maintaining factor for HD. Importantly, the association between hoarding symptoms and hostile interpretations remained significant when accounting for other relevant symptoms, namely depression and anxiety. Additionally, in the sample of individuals who reported elevated symptoms, hostile interpretations accounted for 12% of the variance above and beyond depression and anxiety, suggesting it may be a robust predictor, particularly at more severe levels of symptomatology.

The current study also examined associations between hoarding

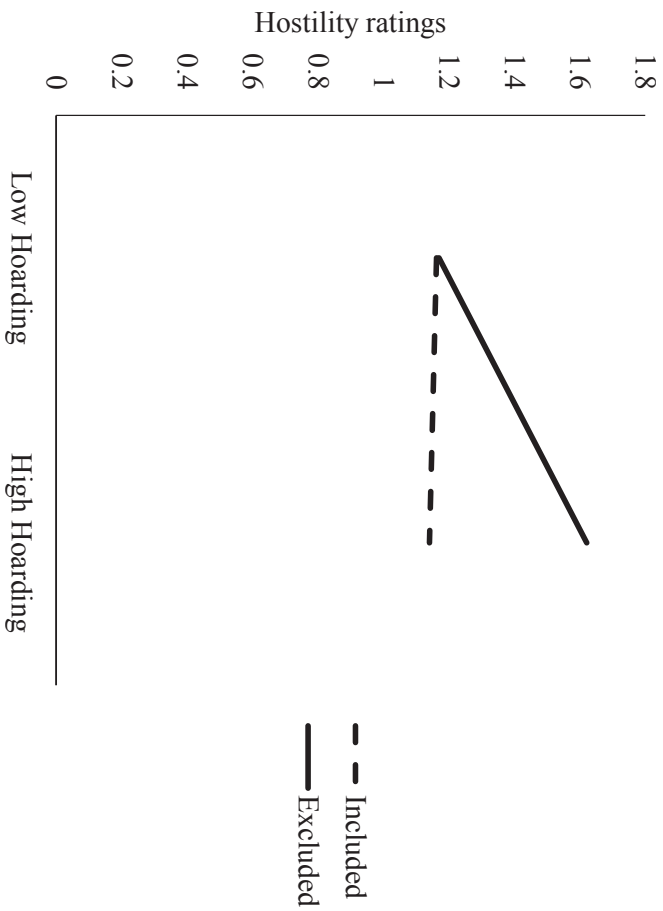

Fig. 1. Interaction between condition and baseline hoarding symptoms in predicting post-manipulation hostility ratings.

symptoms and hostile reactivity to a social exclusion manipulation. Individuals with greater hoarding symptoms reported greater feelings of hostility following a social exclusion manipulation than did individuals with lower hoarding symptoms. These findings suggest that individuals with elevated hoarding symptoms may be more sensitive to interpersonal stressors and react to such events with hostility. Importantly, hostility has been shown to be a common yet maladaptive response to social exclusion as it hinders, rather than promotes, social connection (Coyne, 1976; Joiner and Metalsky, 1995). Therefore, hostile reactivity may help to explain why individuals with HD experience interpersonal difficulties, though further work is needed to explore this hypothesis. Of note, it is possible that the results of the current study reflect general emotional reactivity, as hoarding symptoms are positively associated with increased sensitivity to negative emotions (Shaw et al., 2015). However, the effect remained significant even when accounting for feelnigs of distress due to the manipulation, as well as baseline depression and anxiety, suggesting it does not simply reflect general emotional reactivity and/or comorbid symptoms.

The current study adds to a growing body of research implicating interpersonal factors in HD. Specifically, theorists have suggested that relationships with people and possessions may interact in their effect on the development and maintenance of symptoms, such that perceiving possessions as safe serves to compensate for viewing people as threatening (Frost et al., 1995; Grisham et al., 2018, 2008). However, little research has explored these potential mechanisms. Therefore, this study provides initial evidence that individuals who hoard may hold interpersonal interpretation biases that underlie their relationships with their possessions. Future work should explore the specific pathways by which hostile interpretations may contribute to or exacerbate hoarding symptoms. Specifically, it may be that individuls who hoard experience

an increased tendency to perceive hostility in their environment and to experience increased sensitivity to real or perceived interpersonal conflicts, which then exacerbate dysfunctional interpretations of both people and possessions.

Importantly, there is evidence to suggest that hostility can be reduced with intervention by changing negative interpretations of ambiguous interpersonal situations in order to reduce distress and subsequent aggressive behavior (Gorenstein et al., 2007; Hawkins and Cougle, 2013). In regards to HD, it is possible that changing hostile interpretations may be a promising adjunctive treatment. Specifically, clinicians may consider assessing the severity of hostility in clients, and subsequently using cognitive restructuring techniques to target maladaptive beliefs about both possessions and people. Given that existing treatment for HD is only moderately effective (Tolin et al., 2015), further work regarding the association between HD and hostility in treatment may prove promising. Additionally, future work should explore the extent to which existing treatments for HD may result in changes in hostile interpretations and related constructs.

It should be noted that there were some disparate findings across samples. To start, in study 1, benign interpretations of ambiguous, anger-related scenarios were significantly and negatively associated with hoarding symptoms, though this finding was not replicated in study 2. Additionally, when accounting for depression and anxiety, hostile interpretations remained significantly associated with clutter symptoms in study 2, but not study 1. These differential results across studies may be due to differences in hoarding symptomatology across samples, as individuals in study 2 were recruited based on elevated responses on the SIR. Nonetheless, further work should further explore these findings.

Our findings should be interpreted in light of limitations. Our samples consisted of mostly female undergraduate students, which may limit the generalizability of results to more diverse and severe samples. Importantly, our results were replicated across both samples and one of our samples was recruited based on elevated hoarding symptoms. Nonetheless, future research should replicate these findings in a more diverse and/or clinical sample. Finally, our findings do not allow for the determination of the directionality of the relationships between hoarding and hostility. It may be that maladaptive interpersonal processes contribute to the development of hoarding symptoms, or vice versa. Indeed, interpersonal difficulties may be a consequence of the disorder as clutter can cause arguments with family members and friends, which may, in turn, contribute to sensitivity to rejection.

Despite the aforementioned limitations, this study provides an initial evaluation of the relationship between HD and hostility. Hoarding symptoms were positively associated with greater hostile interpretations across two samples. Further, greater hoarding symptoms were associated with increased feelings of hostility following a social exclusion manipulation, suggesting individuals who hoard may experience increased hostile reactivity to social stress. Taken together, it may be that hostility one factor that helps to explain why individuals who hoard experience interpersonal difficulties.

7. Conflict of interest

The authors of this manuscript declare no conflict of interest.

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