



A Comparison of Cognitive Restructuring and Thought Listing for Excessive Acquiring in Hoarding Disorder

Hannah C. Levy¹ · Randy O. Frost² · Elizabeth A. Offermann^{2,3} · Gail Steketee⁴ · David F. Tolin^{1,5}

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Abstract

Excessive acquiring is a common symptom of hoarding disorder (HD). Little is known about subjective distress associated with acquiring in HD. The present study examined acquiring-related distress and reactions to cognitive restructuring (CR) in 92 individuals with HD and 66 community control (CC) participants. All participants identified an item of interest at a high-risk acquiring location and then decided whether or not to acquire the item. HD participants completed the acquiring task while receiving a CR-based intervention or a thought-listing (TL) control condition. Results showed that HD participants reported more severe distress and greater urges to acquire the item of interest than did CC participants. Nevertheless, subjective distress decreased in both groups following the acquiring task. There were no differences in acquiring-related distress between the CR and TL conditions. The findings indicate that subjective distress may decrease after relatively short periods of time in individuals with HD, but that a single session of CR may not alleviate acquiring-related distress in HD participants.

Keywords Hoarding · Acquiring · Cognitive restructuring · Collecting

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Hoarding disorder (HD) is characterized by difficulty discarding personal possessions due to a perceived need to save the items and/or significant distress when attempting to discard the items (American Psychiatric Association, 2013). The majority (85%) of individuals with HD also engage in excessive acquiring behavior (Frost et al. 2013, 2009). Difficulty discarding and excessive acquiring both contribute to the accumulation of clutter in the home, making these

symptoms important treatment targets for HD patients. A study by Frost et al. found that individuals with HD anticipated more severe distress and a longer duration of distress when discarding personal possessions than did community control (CC) participants (Frost et al. 2016). Nevertheless, subjective distress decreased significantly over the course of a 30-min discarding task in both the HD participants and the control participants.

Less is known about distress associated with excessive acquiring. To our knowledge, no prior studies have examined changes in emotional responses when participants with HD acquire or refrain from acquiring items of interest. In a related study, Miltenberger et al. (2003) assessed the severity of subjective negative affect (e.g. sadness, guilt, anxiety) before, during, and after buying episodes among individuals who met criteria for compulsive buying. Results showed that negative affect tended to decrease over the course of buying episodes, although some comparisons between time points did not reach statistical significance. To fill this gap in the literature, the purpose of the present study was to assess changes in subjective distress following the decision not to acquire an item of interest in participants with HD.

A secondary aim of the current study was to examine whether cognitive restructuring (CR), an intervention component in cognitive-behavioral therapy (CBT) for HD that

✉ Hannah C. Levy
hannah.levy@hhchealth.org

¹ Anxiety Disorders Center, Institute of Living/Hartford Hospital, 200 Retreat Avenue, Hartford, CT 06106, USA

² Department of Psychology, Smith College, Northampton, MA, USA

³ Department of Neuropsychology, Kennedy Krieger Institute, Baltimore, MD, USA

⁴ Boston University School of Social Work, Boston, MA, USA

⁵ Department of Psychiatry, Yale University School of Medicine, New Haven, CT, USA

aims to identify and alter maladaptive hoarding-related thoughts, may decrease subjective distress when resisting acquiring. Prior research suggests that reduction in saving beliefs (e.g. emotional attachment to possessions, inflated responsibility for possessions) mediates reduction in hoarding symptoms (including excessive acquiring) over the course of CBT (Levy et al. 2017). Therefore, it is reasonable to expect that an intervention specifically aimed at modifying acquiring-related thoughts would decrease acquiring-related distress in HD patients. On the other hand, a prior study comparing CR and a thought-listing (TL) control condition during a discarding task actually found less change in subjective distress in the CR intervention condition than in the control condition (Frost et al. 2016). As such, we aimed to determine whether CR would be beneficial or potentially detrimental in the context of acquiring-related distress.

Despite the findings of Frost et al. (2016), we have good reason to suspect that CR may be effective in reducing acquiring-related distress in HD patients. Decisions to acquire among people with HD have been hypothesized to be largely impulsive (Tolinet et al. 2007a). During acquiring episodes, attentional processes may be narrowed to such an extent that only information consistent with the current mood state is processed, with little or no processing of information that would incorporate life context (e.g. do I have room for this item? Money for it? Do I already have this somewhere at home?). CR is a strategy to bring these life context issues into the decision-making process.

We are not aware of any prior studies that directly tested the efficacy of CR in the context of HD-related acquiring. However, CR is a primary intervention strategy in most evidence-based treatment protocols for HD (Gilliam et al. 2011; Muroff et al. 2012; Steketee et al. 2010; Tolin et al. 2007b). A meta-analysis of CBT for HD found a large effect size ($g=0.72$) for pre- to post-treatment reductions in excessive acquiring (Tolin et al. 2015), indicating that CBT is effective for acquiring behaviors specifically. Furthermore, CR is an evidence-based treatment for many disorders that are commonly comorbid with HD, such as major depressive disorder (MDD; DeRubeis et al. 2005, 2008; Hollon et al. 2005), obsessive-compulsive disorder (OCD; McLean et al. 2001; Whittal et al. 2008, 2005), and anxiety and related disorders (Forman et al. 2007; Resick et al. 2008; Stangier et al. 2011).

A third aim of the present study was to examine predictors of distress related to resisting acquiring. A better understanding of factors and mechanisms relevant to acquiring behaviors may provide unique targets for intervention. Based on previous research, we expected that higher anxiety and depressed mood would predict greater acquiring-related distress and influence acquiring decisions (i.e. whether to acquire an item of interest or resist doing so). MDD is the most common comorbid disorder, present in up to 50% of participants with HD (Frost et al. 2011). Similarly,

prior research suggests that anxiety disorders co-occur in at least 50% of individuals with HD (Frost et al. 2011). A latent class analysis in a large sample of individuals with self-identified HD showed three latent classes, including a “depressed hoarding” group, an “inattentive depressed” hoarding group, and a “non-comorbid” group (Hall et al. 2013). The “depressed hoarding” group was associated with greater compulsive acquiring behaviors than were the other groups. Kyrios et al. (2004) theorized that people with HD may acquire impulsively to avoid the experience of anxiety, suggesting that they may be especially sensitive to anxiety states. Anxiety sensitivity and intolerance to distress have been found to be associated with hoarding symptoms in both nonclinical (Coles et al. 2003; Medley et al. 2013; Timpano et al. 2009) and clinical (Grisham et al. 2018) hoarding samples. These findings suggest that further examination of anxiety sensitivity in clinical HD samples is warranted. Therefore, we also investigated anxiety sensitivity as a potential predictor of acquiring and related distress.

To accomplish these aims, we assessed acquiring behaviors in a clinical sample of participants with HD and a non-clinical comparison group of participants without psychiatric diagnoses. Participants made decisions about acquiring items of interest, and then provided subjective distress ratings for 30-min following the acquiring decisions. During the follow-up period, participants provided subjective distress ratings for 7 days following the acquiring task. In line with prior research (Frost et al. 2016), we predicted that the HD group would predict a longer duration of distress and greater overall distress after resisting acquiring than the control group. To examine the impact of CR on acquiring-related distress, we compared a CR intervention with a TL control condition as done in a similar study of responses to discarding (Frost et al. 2016). We predicted that those in the CR condition would report greater decreases in subjective distress after resisting acquiring than would those in the control condition. Finally, we predicted that depression, anxiety, and anxiety sensitivity would predict changes in subjective distress following the acquiring task.

Method

Participants

Participants were 92 individuals with HD who were recruited through news media, mental health clinics, and via word of mouth. HD did not have to be the primary diagnosis, but it had to be of at least moderate severity as determined by the Hoarding Rating Scale-Interview (HRS-I; Tolin et al. 2010). An additional 66 CC participants were recruited via media advertisements and word of mouth. CC participants could not have any current mental health diagnoses except

for specific phobia. Exclusion criteria for both groups were suicidal ideation or other risk factors requiring immediate clinical attention, current psychosis, substance use disorder within the past 3 months, and significant cognitive impairment that could interfere with the capacity to understand study assessments and/or provide informed consent.

Participants ranged in age from 20 to 81 ($M = 51.95$, $SD = 11.03$) years old and were primarily female (78.5%), White (84%), and non-Hispanic (90.5%). See Table 1 for demographic characteristics of the sample.

Measures

The *Anxiety Disorder Interview Schedule for DSM-IV lifetime version* (ADIS-IV-L; Brown et al. 1994) was used to determine participants' diagnoses. Interviewers were master's level clinical psychologists or postdoctoral fellows supervised by licensed psychologists. The ADIS-IV has demonstrated good to excellent reliability for most DSM-IV diagnoses (Brown et al. 2001).

The HRS-I (Tolin et al. 2010) is a 5-item semi-structured interview that assesses the severity of clutter, difficulty discarding, and acquiring, as well as current distress and functional impairment associated with these symptoms. Items are scored on a 9-point scale [$0 = \text{No problem}$; $8 = \text{Extreme, very often (daily) acquires items not needed, or acquires large numbers of unneeded items}$], with higher scores indicating more severe hoarding symptoms. The HRS-I was administered with the ADIS-IV-L to determine HD diagnosis, and showed excellent internal consistency in the present sample ($\alpha = 0.97$).

The self-report *Saving Inventory-Revised* (SI-R; Frost et al. 2004) is a 23-item measure that assesses the three core symptoms of HD (excessive clutter, saving, and acquiring). The SI-R has shown adequate internal consistency and effectively discriminates HD from other clinical groups (Frost et al. 2004). In the current study, internal consistency estimates for the three subscales were excellent (clutter, $\alpha = 0.98$; saving, $\alpha = 0.96$; acquiring, $\alpha = 0.94$).

The 21-item *Beck Depression Inventory-II* (BDI; Beck et al. 1996) assessed severity of depressive symptoms on 4-point Likert scales, with higher scores indicating more severe symptoms. Internal consistency for the BDI was excellent in the current sample ($\alpha = 0.95$).

The *Beck Anxiety Inventory* (BAI; Beck & Steer, 1993) is a 21-item measure that assesses anxiety severity. Items are rated on a 4-point Likert scale and higher scores indicate greater anxiety severity. Internal consistency was excellent in this sample ($\alpha = 0.93$).

The *Anxiety Sensitivity Index* (ASI; Reiss et al. 1986) assessed fear of the sensations and consequences of anxiety; 16 items were rated on a 5-point Likert scale ($0 = \text{Very little}$; $4 = \text{Very much}$). The ASI showed excellent internal consistency in this sample ($\alpha = 0.95$).

Participants were asked to rate their *subjective distress* on a 10-point scale ($1 = \text{Not at all distressed}$; $10 = \text{Most distress imaginable}$) at various points during the acquiring task, including immediately after the decision to acquire the item of interest and at 5-min intervals after this decision. Using the same 10-point scale, they also rated their urges to acquire the item of interest, as well as their anxiety, sadness, guilt, and anger at the same 5-min intervals post-acquiring

Table 1 Sample characteristics

	HD-CR ($n = 43$)	HD-TL ($n = 49$)	CC ($n = 66$)	$F/\chi^2 (p)$
Age, $M (SD)$	51.50 (7.64)	52.06 (11.72)	52.17 (12.43)	0.05 (0.952)
Female sex, $n(\%)$	31 (73.8)	42 (87.5)	51 (78.5)	2.79 (0.248)
Race, $n(\%)$	3 (7.1)	6 (13.0)	5 (7.8)	6.15 (0.631)
Black	38 (90.5)	37 (80.4)	58 (90.6)	
White	1 (2.4)	1 (2.2)	1 (1.6)	
Asian	0 (0.0)	1 (2.2)	0 (0.0)	
American I/Alaska N	0 (0.0)	1 (2.2)	0 (0.0)	
Other				
Hispanic ethnicity, $n(\%)$	0 (0.0)	1 (2.2)	2 (3.2)	1.28(0.529)
SI-R total, $M (SD)$	65.72 (11.38)	63.02 (13.01)	9.97 (10.03)	419.10(<0.001)
SI-R clutter, $M (SD)$	27.68 (5.09)	25.85 (6.09)	2.96 (4.75)	332.32(<0.001)
SI-R saving, $M (SD)$	20.08 (5.07)	19.31 (4.69)	3.96 (4.08)	192.20(<0.001)
SI-R acquiring, $M (SD)$	17.64 (4.29)	17.74 (5.24)	3.35 (2.89)	196.81(<0.001)
Beck Dep. Inventory, $M (SD)$	18.10 (11.35)	17.44 (9.37)	1.87 (3.86)	57.61(<0.001)
Beck Anx. Inventory, $M (SD)$	13.24 (9.63)	13.23 (10.14)	1.25 (2.08)	39.41(<0.001)
Anxiety Sens. Index, $M (SD)$	26.22 (13.69)	22.98 (12.30)	9.93 (7.51)	29.46(<0.001)

HD-CR hoarding disorder cognitive restructuring group, HD-TL hoarding disorder thought-listing control group, CC community control group, American I/Alaska N American Indian/Alaska Native, SI-R saving inventory-revised, Dep depression, Anx anxiety, Sens sensitivity

decision. Participants also rated their predicted duration of distress prior to the acquiring task using a 10-point scale ($1 = a\ few\ minutes\ or\ less$; $10 = several\ months\ or\ more$). For 7 days following the acquiring task, participants provided subjective distress, urges to acquire, and regret ratings using 10-point scales. Participants were not provided with anchors for “5” (i.e. halfway between the two anchors provided).

Condition Assignment

HD participants were randomly assigned to a CR (CR; $n = 43$) or a thought listing (TL; $n = 49$) control condition. CC participants were assigned to the TL condition. The CR condition consisted of the experimenter asking a series of questions intended to modify participants’ beliefs about acquiring. For example, they were asked: (1) “Do you have a specific plan to use this item?”; (2) “Will you really use it within a reasonable timeframe?”; (3) “What are the advantages of getting rid of this? What are the disadvantages of keeping it?”; and (4) “Could you get it again if you needed it?” Study experimenters were instructed to elaborate on these questions as needed in order to put them into context and ensure that participants were considering the costs of keeping the item and the benefits of refraining from acquiring it. These questions were adapted from a published self-help manual for HD (Tolin et al. 2007a). In the TL condition, participants were asked to describe their thoughts during the decision-making process out loud to the experimenter.

Procedure

The study was approved by the Institutional Review Boards of Smith College, Hartford Hospital, and Boston University. On the day of the study, participants were provided with a description of the experimental protocol and informed that they would be participating in an experimental study, not a treatment study. They signed the informed consent form and then completed the ADIS-IV-L and HRS-I to determine study eligibility. Participants identified a store in which they typically have difficulty resisting acquiring. Participants were accompanied to the identified store by the study experimenter. At the store, participants identified an item that they were interested in acquiring. They were asked to select an item that would be at least moderately difficult to resist. They were instructed not to make a decision about the item until after the CL or TR intervention. They were asked to think about the item of interest for 4-min and then to provide anticipated distress ratings, subjective distress ratings, and predictions about distress duration if not able to acquire the item. They also provided ratings of the severity of their urge to acquire the item. Participants were then assigned to conditions and completed the experimental manipulation accordingly. The experimental manipulation was voice-recorded.

Afterward, they again provided subjective distress ratings and were asked to make a decision about acquiring the item of interest. If participants chose not to acquire the item, they listened to the CR or TL recording and provided their distress ratings at 5-min intervals for a total of 30-min (see description, above). The purpose of the recording was to standardize the length of time in between distress ratings. If participants chose to acquire the item, they provided their distress ratings immediately after the decision to acquire and were then dismissed from the study and thus did not provide any additional distress ratings. Participants who did not acquire also provided daily distress ratings for 7 days after the experiment. All participants were compensated \$20 per hour to complete the study.

Statistical Analyses

We compared the HD and CC groups on anticipated distress, and urge to acquire the item of interest using independent-samples t tests and Cohen’s d effect sizes. We used chi squares and independent-samples t tests to compare the HD and CC groups on acquiring decisions and post-decision negative affect ratings, respectively. To compare slopes of change across time (negative affect ratings at 5-min intervals after the decision not to acquire the item of interest), a series of two-level regression models were conducted using hierarchical linear and nonlinear modeling (HLM). Only participants who chose not to acquire the item of interest were included in the slope analyses. The negative affect ratings at the 5-min intervals were the dependent variables in all models. At level 1, we included the change slope, which was centered at time zero (i.e. the first negative affect rating, 5-min post-decision). To compare the HD and CC groups on slopes of change across time, we entered the grouping variable at level 2, which was dummy-coded ($0 = CC$, $1 = HD$). To then compare the CR versus thought listing interventions for the HD participants, we replaced the grouping variable with the condition variable at level 2, which was dummy-coded ($0 = TL$, $1 = CR$). We repeated this set of analyses on the daily distress ratings, first examining the group effect (CC vs. HD) and then the condition effect (TL vs. CR). We also compared conditions on acquiring decisions and post-decision negative affect ratings using chi squares and independent-samples t tests, respectively. To examine whether depression, anxiety, and anxiety sensitivity predicted acquiring decisions, we entered BDI, BAI, and ASI scores into a logistic regression model predicting whether or not participants acquired the item of interest. To examine whether these variables predicted change in distress over time, we conducted a series of HLM models with the change slope entered at level 1 and BDI, BAI, or ASI scores (separately) entered at level 2.

Results

Group Comparisons

As expected, HD participants reported stronger urges to acquire the item of interest, greater anticipated distress, and longer anticipated duration of distress, compared to CC participants (see Table 2). Effect size estimates for the group comparisons ranged from $d=0.56$ (urge to acquire) to $d=1.21$ (anticipated distress). Self-reported urges to acquire the item of interest were moderate (5–6/10) and had the lowest between-groups effect size, suggesting that HD and CC participants did not differ markedly in urge severity. HD participants (22%) acquired more items than CC participants (9%), $\chi^2(1)=4.56, p=0.033$.

Changes in Negative Affect Across and Between Groups

Among those who did not acquire the item of interest, the slopes of change for all negative affect ratings were significant and negative (all coefficients ≤ -0.08 , all $ps < 0.001$), indicating that negative affect decreased over time across groups. Group was a significant predictor of the intercept (all coefficients ≥ 1.00 , all $ps < 0.001$) for all models, indicating that the HD group had greater distress at the first time point (5-min post-decision). Group significantly and negatively predicted the slope of all models (all coefficients ≤ -0.13 , all $ps < 0.01$) except for urges to acquire (coefficient = 0.13, $p=0.08$), indicating greater decreases in negative affect among HD participants compared to controls. Because of the way in which group was dummy-coded (0 = CC and 1 = HD), the regression coefficients for the group effect are interpreted as the additional decrease in negative affect in the HD group as compared to the CC group. See Fig. 1 for graphical depictions of the slopes of change in distress (the remaining negative affect ratings are not displayed because they showed the same pattern as distress).

A follow-up independent samples t test showed that the HD group ($M=2.32, SD=2.01$) had significantly higher

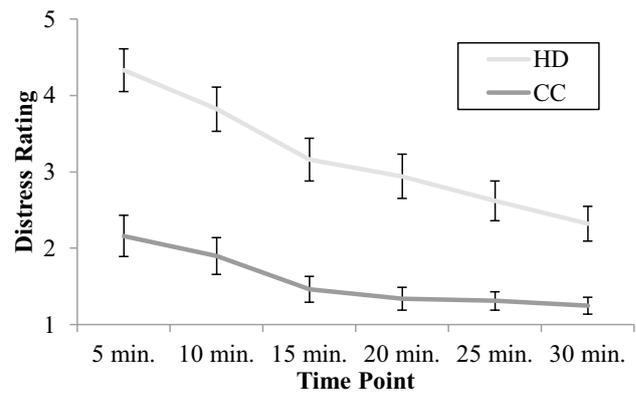


Fig. 1 Change in distress ratings in the hoarding disorder (HD) and community control (CC) groups. Error bars represent standard errors

distress at the final time point (30-min post-decision) than the CC group [$M=1.25, SD=0.85; t(107.01)=4.17, p < 0.001, d=0.69$].

Cognitive Restructuring vs. Thought Listing

For HD participants, with regard to decisions to acquire the item of interest, 29% in CR did so versus 16% in TL, but this difference was not significant [$\chi^2(1)=2.16, p=0.141$]. Conditions also did not differ on any post-decision negative affect ratings (all $ts \leq 1.45$, all $ps > 0.05$). Thus, CR did not appear to influence acquiring decisions or post-acquiring distress. Among those who did not acquire the item of interest, condition was not a significant predictor of the intercept (all coefficients ≤ 0.69 , all $ps > 0.05$) or slope (all coefficients ≤ 0.07 , all $ps > 0.05$), indicating that there were no differences between thought listing and CR on initial negative affect or change in negative affect over time. See Fig. 2 for a graphical depiction of the distress ratings across time and between conditions (remaining negative affect ratings are not displayed).

Table 2 Group differences in urges to acquire and anticipated distress

Rating	HD, $M(SD)$	CC, $M(SD)$	$t(df)$	p	d
Urge to acquire	6.23 (2.14)	5.05 (2.11)	3.52 (165)	0.001	0.56
Anticipated distress	4.79 (2.34)	2.17 (1.99)	7.38 (162)	<0.001	1.21
Anticipated anxiety	4.02 (2.56)	1.61 (1.73)	7.10 (155.97)	<0.001	1.10
Anticipated sadness	3.44 (2.72)	1.31 (1.01)	7.01 (134.02)	<0.001	1.04
Anticipated guilt	2.34 (2.35)	1.11 (0.49)	4.97 (108.73)	<0.001	0.72
Anticipated anger	3.36 (2.75)	1.10 (0.40)	8.00 (103.60)	<0.001	1.15
Anticipated duration	3.43 (2.26)	2.07 (2.19)	3.68 (154)	<0.001	0.61

HD hoarding disorder group, CC community control group

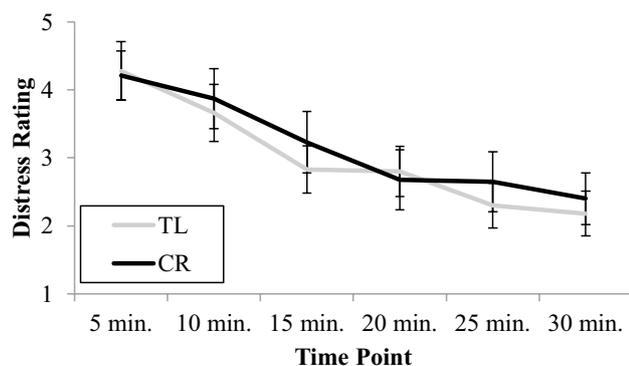


Fig. 2 Change in distress ratings in the thought listing (TL) and cognitive restructuring (CR) groups. Error bars represent standard errors

Post-Intervention Daily Ratings

Among participants who did not acquire, the slopes of change for all daily negative affect ratings were significant and negative (all coefficients ≤ -0.12 , all $ps < 0.001$), indicating that the daily negative affect ratings decreased over time across the HD and CC groups. Group was a significant predictor of the intercept (all coefficients ≥ 1.32 , all $ps < 0.001$) for all models, indicating that the HD group had greater distress for the first daily rating. Group significantly and negatively predicted the slope of all models (all coefficients ≤ -0.15 , all $ps < 0.01$), indicating more reductions in daily negative affect ratings among HD participants compared to controls. Given that HD group participants had more severe initial distress during the experiment (see above) and the follow-up period, greater change in distress in this group is likely attributable to a floor effect for the CC group. See Fig. 3 for graphical depictions of the slopes of change in daily distress.

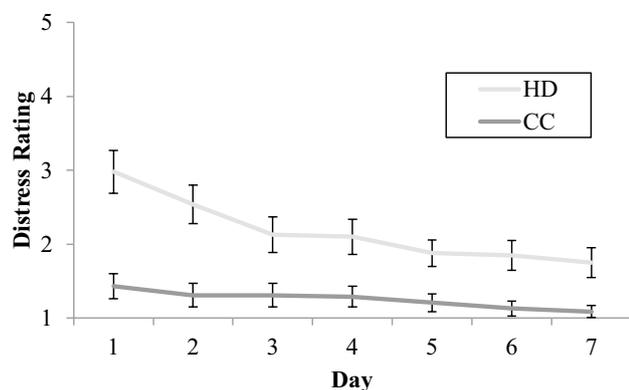


Fig. 3 Change in daily distress ratings in the hoarding disorder (HD) and community control (CC) groups. Error bars represent standard errors

A follow-up independent samples t test showed that the HD group ($M = 1.75$, $SD = 1.58$) had significantly higher distress on the final day than did the CC group [$M = 1.09$, $SD = 0.59$; $t(76.17) = 3.01$, $p = 0.004$, $d = 0.55$].

Again, in HD participants, condition (CR vs. TL) was not a significant predictor of the intercept (all coefficients ≤ -0.12 , all $ps > 0.05$) or slope (all coefficients ≤ 0.01 , all $ps > 0.05$), indicating that there were no differences between thought listing and CR in terms of the first daily negative affect ratings or negative affect over the 7 days. See Fig. 4 for graphical depictions of the slopes of change in daily distress.

Predicting Acquiring Decisions and Distress

The BAI, BDI, and ASI failed to predict acquiring decisions in the full sample (all $Bs < 0.01$, all $ps > 0.05$) or in the HD sample (all $Bs < 0.02$, all $ps > 0.05$). Results of the HLM models predicting change in distress from anxiety, depression, and anxiety sensitivity are displayed in Table 3. As can be seen from the table, anxiety and anxiety sensitivity predicted change in distress during the experiment in the full sample but not in the HD sample. Similarly, anxiety and depression predicted change in daily distress in the full sample but not in the HD participants.

Discussion

To our knowledge, the present study is the first to examine subjective distress and CR during acquiring in participants with HD. Consistent with our predictions and previous research (Frost et al. 2016), the HD group anticipated longer and more severe distress than did the CC

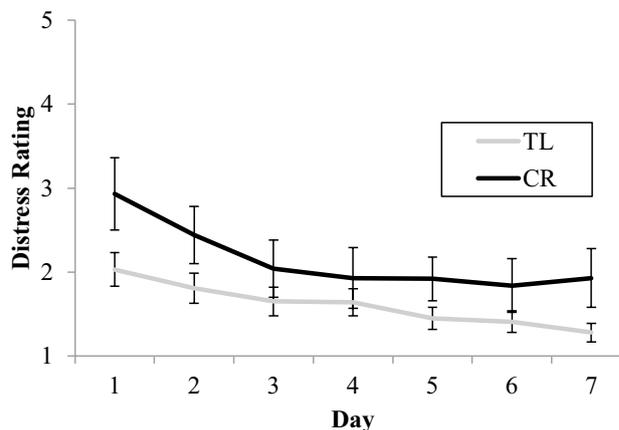


Fig. 4 Change in daily distress ratings in the thought listing (TL) and cognitive restructuring (CR) groups. Error bars represent standard errors

Table 3 Multilevel model results for slopes of change in distress during study and across 7 days

	Distress during study coefficient (<i>SE</i>)	Daily distress coefficient (<i>SE</i>)
Full sample		
Predicting intercept		
BDI	0.07** (0.02)	0.06** (0.02)
BAI	0.10*** (0.02)	0.08*** (0.02)
ASI	0.08*** (0.02)	0.04* (0.01)
Predicting slope		
BDI	−0.01 (0.00)	−0.01** (0.00)
BAI	−0.01* (0.00)	−0.01* (0.00)
ASI	−0.01** (0.00)	−0.00 (0.00)
HD Participants Only		
Predicting intercept		
BDI	0.00 (0.03)	0.03 (0.03)
BAI	0.05 (0.03)	0.05 (0.03)
ASI	0.04 (0.02)	0.02 (0.02)
Predicting slope		
BDI	0.00 (0.01)	−0.00 (0.00)
BAI	−0.00 (0.01)	−0.00 (0.00)
ASI	−0.00 (0.00)	0.00 (0.00)

All models were run using random slopes and intercepts and full maximum likelihood estimation

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

HD hoarding disorder

group. Nevertheless, distress decreased over the course of the study and across the follow-up period in both groups, indicating that acquiring-related distress declines in a relatively short period of time, even for HD participants who may experience significant negative affect when resisting acquiring. This reduction in discomfort over time may be helpful information to present when educating patients with HD during CBT. Individuals with HD may erroneously assume that the only way to decrease negative affect is to engage in maladaptive behaviors such as acquiring and saving. In informing patients that their distress may decrease soon after resisting acquiring, they may be more willing to engage in exposure-based interventions such as confronting high-risk acquiring triggers while refraining from acquiring.

Nevertheless, the HD group continued to experience some distress even 7 days after resisting acquiring. Average subjective distress ratings 1 week after the study were significantly higher in the HD group than the CC group, and still noticeably above the initial distress ratings of the latter group. This indicates that resisting acquiring items of interest causes subjective distress that may persist for several days after an exposure-based intervention. Perhaps it would be helpful for clinicians to incorporate acceptance and distress tolerance techniques into treatment for HD to provide

patients with skills to manage difficult emotions that may arise when resisting acquiring.

Contrary to our hypotheses, there were no differences between CR and TL in terms of reductions in negative affect during the study or across the follow-up period. Although these results contrast with cognitive models of anxiety and related disorders (Beck et al. 1985; Hofmann 2008), they are consistent with a prior study that also found no added benefit of CR during discarding in hoarding participants (Frost et al. 2016). There are a number of potential explanations for these findings. First, it is possible that cognitive and executive functioning deficits may undermine HD patients' ability to learn and utilize CR skills. Prior research has shown that HD patients have poorer cognitive flexibility than do healthy control participants (e.g. Ayers et al. 2013; Morein-Zamir et al. 2014), although they do not differ significantly from clinical controls with anxiety-related disorders (Grisham et al. 2010; Tolin et al. 2011). Cognitive inflexibility may interfere with HD patients' ability to identify and modify their negative thoughts. Second, as Frost et al. speculated in comparing CR and TL during discarding (Frost et al. 2016), the questions intended to modify beliefs about acquiring may not have decreased distress because of therapeutic reactance (Brehm 1966), or the tendency to resist therapeutic interventions in order to maintain perceived freedom and control. Participants in the CR condition may have found it distressing to answer the questions and therefore "defended" the necessity of acquiring items of interest. Although the questions were intended to guide discovery about the perceived versus objective need to acquire the item of interest, it is possible that the questions unintentionally elicited further justifications for acquiring the item. The CR condition also did not incorporate all CR skills that are typically provided in cognitive therapy interventions (e.g. examining the evidence, generating alternative thoughts, conducting behavioral experiments, etc.) so it may not represent standard CR in clinical practice.

Third, it could be that the questions were not effective in generating evidence against maladaptive acquiring-related beliefs (e.g. "If I don't acquire this item, I will regret it/feel distressed forever"). Cognitive models of anxiety emphasize the importance of threat disconfirmation, or collecting information during treatment that is inconsistent with patients' erroneous or exaggerated feared predictions (e.g. Beck et al. 1985; Clark 1986; Hofmann 2008). Because the questions used in the CR condition did not explicitly address participants' feared predictions about resisting acquiring the item of interest, they may not have been optimally effective in reducing subjective distress. Additionally, because we did not assess whether or not participants actually modified their acquiring-related thoughts, we were unable to verify whether or not disconfirmation actually occurred. A further possibility is that the thought listing task produced

self-generated cognitive processing that facilitated reduction in beliefs about acquiring. Anecdotal accounts of acquiring episodes in HD indicate very little processing of life context in the decision to acquire. Asking HD participants to talk about the potential acquisition may have delayed the acquiring decision and forced processing of life context (i.e. “Do I need it?”, etc.). Thought listing may have also facilitated cognitive defusion, or the process of distancing from automatic thoughts in order to reduce the distress that is associated with believing or “fusing” with the thoughts. Cognitive defusion is considered to be a central mechanism of change in acceptance and commitment therapy (Eifert and Forsyth 2005), an evidence-based treatment for anxiety disorders (Arch et al. 2012a, b) that aims to reduce anxiety by improving psychological flexibility and distress tolerance. Direct comparisons between CR and cognitive defusion generally find no differences between the two interventions in terms of post-intervention distress (Barrera et al. 2016; Deacon et al. 2011), although this is an understudied area. Finally, it is possible that CR may have been more beneficial for more difficult items. Participants were instructed to select an item that would be moderately difficult to resist acquiring. This instruction may have unintentionally produced a floor effect in distress ratings across the 30-min study period. With these potential explanations in mind, it will be important to replicate these findings to verify whether or not CR may be beneficial in the context of resisting acquiring in HD.

Contrary to our hypotheses, anxiety, depression, and anxiety sensitivity did not predict acquiring decisions or acquiring-related distress in HD participants (although these variables predicted change in distress in the full sample). These findings indicate that self-reported depression and anxiety severity may not be associated with subjective distress during an acquiring episode. It is likely that negative affect (including anxiety, sadness, and guilt as shown here) *in the moment* has more of an impact on acquiring than general negative affect at baseline outside of an acquiring-related task. These results support recent efforts to incorporate acceptance and distress tolerance skills into HD treatment in order to improve patients’ ability to tolerate intense negative emotions and high-risk triggers (Tolin et al. 2017a, b).

The present study had several limitations. First, the CR intervention was conducted by bachelor’s level research assistants who did not have prior clinical experience in delivering CBT for HD. We also did not assess treatment fidelity. Accordingly, it is possible that the efficacy of the intervention would have improved with trained and experienced clinicians and treatment fidelity checks to ensure intervention competency. We also did not explicitly assess whether or not patients modified their acquiring-related thoughts in the CR condition. Thus, we cannot confirm that cognitive reappraisal actually occurred in this condition. Similarly, the present study was a single-session experiment,

not a treatment study, so the results do not speak to the efficacy of CR in standard CBT for HD. Indeed, it is possible that CR may be more effective than TL for acquiring-related distress across multiple sessions; our intervention may not have been long enough to promote the necessary cognitive changes. Dismantling studies comparing outcomes in CBT with and without CR skills and CR-TL comparisons in longer treatment protocols are needed. Longer studies would also provide the opportunity to assess whether the timing of specific interventions makes an impact. It is possible that CR would be particularly beneficial later in treatment, once HD patients practice exposures and have more experience with resisting acquiring and reductions in distress. Second, although the current study took place in settings that participants identified as high-risk acquiring triggers, still, the acquiring task may not have engendered typical acquiring behavior. Along these same lines, the majority of HD participants chose not to acquire their items of interest during the study. Given the prevalence of compulsive acquiring in patients with HD (Frost et al. 2009), we did not expect such a high rate of resisting acquiring. It is possible that HD participants in the study selected settings and items that they could resist and/or were motivated not to acquire due to demand characteristics or social desirability effects.

To conclude, the results of the present study suggest that participants with HD experience subjective distress when resisting acquiring items of interest. This distress may decline after only a brief period of time, but may then persist for several days after refraining from acquiring. CR does not appear to facilitate this reduction in distress, although further replication of these findings will be needed. Based on these results, it may be helpful to educate patients with HD about temporary increases in distress that they may experience when resisting acquiring. Future research should focus on how best to promote distress reduction in acquiring-related situations, which may improve the efficacy of current HD treatments.

Compliance with Ethical Standards

Conflicts of Interest This work was supported by Grants from NIMH to Randy Frost (R01 MH068008) and Gail Steketee (R01 MH068007). Drs. Frost, Steketee, and Tolin receive royalties from sales of books related to hoarding and its treatment.

Research Involving Human and Animal Rights Ethical approval: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal studies were carried out by the authors for this article

Informed Consent Informed consent was obtained from all individual participants included in the study.

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