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Assessing psychological inflexibility in hoarding: The Acceptance and Action Questionnaire for Hoarding (AAQH)

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Abstract

Psychological inflexibility is a psychopathological process referring to the tendency for behavior to be overly controlled by internal experiences to an extent that interferes with quality of life. Some studies indicate that psychological inflexibility is linked to hoarding, but findings have been mixed. This inconsistency may be due to reliance on general measures of psychological inflexibility in prior research as there was previously no validated measure to assess psychological inflexibility as it relates to hoarding. The present study developed and validated a measure of hoarding-related psychological inflexibility, the Acceptance and Action Questionnaire for Hoarding (AAQH) in a college student sample with elevated hoarding symptoms (n = 201). The AAQH demonstrated a two-factor structure and good internal consistency, construct validity, and incremental validity over a general measure of psychological inflexibility, the AAQ-II. The potential research and clinical utility of the AAQH as well as limitations of this preliminary validation study are discussed.

Keywords*: psychological inflexibility, hoarding, assessment, validation*

Assessing psychological inflexibility in hoarding: The Acceptance and Action Questionnaire for Hoarding (AAQH)

Hoarding disorder (HD) is characterized by difficulty letting go of possessions, resulting in clutter that precludes the use of living spaces for their intended purpose, and is accompanied by clinically significant distress and/or functional impairment (American Psychiatric Association, 2013). Beliefs about the meaning of possessions, emotional attachment to possessions, and emotional distress related to loss of possessions can result in hoarding when individuals regard such cognitions as true or attempt to avoid the distress arising from letting go of possessions by saving (Steketee & Frost, 2003). Individuals with HD have been found to report higher levels of negative affect and anticipate experiencing a longer duration of negative affect prior to a discarding task, compared to controls (Frost, Ong, Steketee, & Tolin, 2016), which suggests that the act of discarding may be more emotionally activating for these individuals. In addition, emotion dysregulation and intolerance of distress appear to be linked to hoarding severity (Timpano, Buckner, Richey, Murphy, & Schmidt, 2009; Timpano, Shaw, Cougle, & Fitch, 2014). Thus, research indicates that hoarding may develop and be maintained due to both internal experiences (e.g., cognitions, distress) and how individuals respond to these internal experiences.

The inability to respond to internal experiences in an effective way can be described as psychological inflexibility, wherein behaviors are controlled by thoughts and feelings, rather than important life domains or values (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). Psychological inflexibility is hypothesized to be a primary cause of psychopathology, and includes multiple component processes: experiential avoidance, cognitive fusion, attachment to a conceptualized self, unclear values, lack of valued action, and inflexible attention to the

conceptualized past/future (Hayes et al., 2006). In the context of hoarding, psychological inflexibility may manifest as responding to thoughts as if they reflect reality (e.g., "I would not be able to live without this diary") rather than as thoughts that show up in the mind, which then leads to saving. Individuals may also hoard as a means to control distress (e.g., saving to avoid sadness from discarding), at the expense of valued life outcomes, which would be a form of experiential avoidance. Psychological inflexibility has been associated with a range of mental health concerns and life outcomes, including anxiety, depression, and job performance (Bluett et al., 2014; Bond et al., 2011; Kashdan & Rottenberg, 2011; Levin, MacLane et al., 2014).

Psychological inflexibility is a promising pathological process to study in hoarding because treatments have been developed to specifically target inflexibility, most notably acceptance and commitment therapy (ACT; Hayes et al., 2006). ACT has been used with individuals with anxiety disorders, obsessive-compulsive and related disorders, and depression, with clinical findings indicating that ACT performs similarly to existing treatments (e.g., cognitive behavioral therapy) for those conditions (A-Tjak et al., 2015; Bluett et al., 2014; Forman, Herbert, Moitra, Yeomans, & Geller, 2007). Of note, these disorders are often comorbid with HD; 50.7% of a sample of individuals with HD were assigned a diagnosis of major depressive disorder, and 53.5% had an anxiety disorder diagnosis (Frost, Steketee, & Tolin, 2011). Furthermore, mediational analyses consistently demonstrate that the impact of ACT on clinical outcomes in depression and anxiety disorders is mediated through reductions in psychological inflexibility (Twohig & Levin, 2017).

Psychological inflexibility may be an overarching pathological process relevant to treatment that accounts for how distress, maladaptive cognitions, and other internal experiences contribute to hoarding. However, empirical results on the relationship between psychological

inflexibility and hoarding are mixed. One study did not find a significant association between psychological inflexibility and hoarding severity among individuals with HD, controlling for general psychopathology and hoarding beliefs (Wheaton, Fabricant, Berman, & Abramowitz, 2013). Yet, another study reported significant positive relations between psychological inflexibility and difficulty discarding as well as acquisition in a clinical sample, even after accounting for anxiety and depression (Ayers, Castriotta, Dozier, Espejo, & Porter, 2014). These studies have differed in multiple ways, including the samples examined and the covariates included. However, one possible explanation for these inconsistent findings is that the generalized measure of psychological inflexibility used in these studies, the Acceptance and Action Questionnaire – II (AAQ-II; Bond et al., 2011) failed to adequately capture the construct of psychological inflexibility as it relates to hoarding.

The AAQ-II is designed to be used in various samples, spanning nonclinical and clinical populations (Bond et al., 2011). As such, it operationalizes psychological inflexibility broadly, with items asking about responses to thoughts and feelings in general. The lack of domain specificity in the AAQ-II may obscure the function of psychological inflexibility in the context of a particular condition. For example, individuals with problematic hoarding may struggle more specifically with thoughts about possessions and feelings about parting with possessions, rather than “worries” and “painful memories” (selected phrasing from the AAQ-II; Bond et al., 2011).

There are several aspects of hoarding that may contribute to difficulty in accurately measuring hoarding-related psychological inflexibility using a general measure. People who hoard have lower emotional clarity (Fernández de la Cruz et al., 2013) and are frequently described as having poor insight (see Frost, Tolin, & Maltby, 2010 for a review). This may make it particularly difficult for people with hoarding disorder to accurately report their overall stance

towards their emotional experiences, while it might be easier to report their stance toward hoarding-related thoughts and feelings specifically. In addition, AAQ-II items are largely focused on how one responds to distressing experiences (e.g., "My painful memories prevent me from having a fulfilling life"), but hoarding involves symptoms that are both distress-related and urge-related (e.g., feeling compelled to acquire something; Raines, Allan, Oglesby, Short, & Schmidt, 2015), and flexibility in response to urges may not be well-captured by the AAQ-II or other distress-focused measures of psychological flexibility.

Although psychological inflexibility is a transdiagnostic process, it is theorized to vary in its form (e.g., someone may be fused with thoughts about clutter, but relatively defused from thoughts about substance use) and accordingly treatment may focus on psychological inflexibility in a specific domain if it fits the client's concerns (e.g., obsessions in OCD; Twohig, 2009). A domain-specific measure is expected to more accurately measure the role of psychological inflexibility in hoarding and provide more useful information for using ACT to address hoarding. Domain-specific measures for other conditions, including trichotillomania and body image concerns (Houghton et al., 2014; Sandoz, Wilson, Merwin, & Kellum, 2013), seem to provide a more precise measurement of their respective constructs of interest. For instance, the trichotillomania-specific version of the AAQ was found to be more strongly correlated with trichotillomania severity than the AAQ-II, whereas the AAQ-II was more strongly correlated with general psychopathology (Houghton et al., 2014). These measurement issues have also been found in the context of treatment, with domain-specific versions of the AAQ being more sensitive to detecting treatment effects in targeted populations than the general AAQ (e.g., Lillis, Hayes, Bunting, & Masuda, 2009).

Currently, no measure of hoarding-specific psychological inflexibility exists, which makes it difficult to accurately assess the contribution of psychological inflexibility to hoarding. Most measures of hoarding are outcome-focused, including the Saving Inventory-Revised (SI-R; Frost, Steketee, & Grisham, 2004), which measures overall hoarding severity; the Clutter Image Rating (CIR; Frost, Steketee, Tolin, & Renaud, 2008), which measures clutter; and the Activities of Daily Living for Hoarding (ADL-H; Frost, Hristova, Steketee, & Tolin, 2013) scale, which measures functional impairment. To the best of our knowledge the only existing process measure for hoarding disorder is the Saving Cognitions Inventory (SCI; Steketee, Frost, & Kyrios, 2003), which assesses the degree to which certain thoughts occur when considering discarding. The SCI is a highly focused on the content of thoughts, and is therefore a useful process measure for cognitive-behavioral treatment (CBT) for hoarding, which is intended to work in part through changing hoarding-related thoughts (Steketee & Frost, 2007). However, it would not be appropriate as a process measure for a contextual CBT such as ACT, since it examines whether or not certain thoughts occur rather than how one responds to those thoughts.

Given that there is a solid theoretical basis to hypothesize a relationship between psychological inflexibility and hoarding, a precise means of testing this hypothesis via empirical methods is needed. In light of the mixed findings that have been obtained with general AAQ measures and the unique clinical aspects of hoarding such as low insight, a hoarding-specific version of the AAQ may be necessary to measure psychologically inflexible responses to thoughts and feelings pertinent to hoarding (e.g., distress related to discarding). Such a measure could also be used for future clinical trial research evaluating the efficacy of ACT in reducing psychological inflexibility and symptoms related to hoarding.

The aims of the present study were to (1) develop a measure of psychological inflexibility for hoarding (AAQH) and (2) evaluate the preliminary psychometric properties of the AAQH in a nonclinical sample with elevated hoarding symptoms.

Methods

Participants and Procedures

This study used a sample of 201 undergraduate students scoring above the mean on a measure of hoarding symptoms (Saving Inventory-Revised; Frost et al., 2004) who participated in an online survey to receive research participation credit. This sample was selected from a larger sample of undergraduate students (N = 489) in order to provide sufficient sample size for factor analysis while ensuring that participants were experiencing at least average levels of acquisition and saving behaviors (SI-R; M = 32.32, SD = 9.03, range: 22-61).

For factor analysis, experts have recommended at least 5 participants per variable and a minimum total sample of 100 (Streiner, 1994) or 200 (Gorsuch, 1983). Factor solutions depend not just on sample size, but also on the number of items per factor and the item loadings (Guadagnoli & Velicer, 1988) and it has also been demonstrated that samples of 150 provide stable solutions in factor analysis when 1) a minimum of 10 variables load .4 on each factor or 2) when each component has a minimum of four variables loading .6 or higher (Guadagnoli & Velicer, 1988). As such, we anticipated that a sample of 200 would likely be sufficient.

The mean score of 21.27 on the SI-R in the larger sample is similar to previous studies with unscreened college students (e.g.,(Coles, Frost, Heimberg, & Steketee, 2003; Oglesby et al., 2013; Timpano et al., 2014; Timpano, Rasmussen et al., 2013). Participants were recruited through fliers and the online SONA research participation platform. To be eligible participants had to be at least 18 years of age and fluent in English. The mean age in the sample was 20.20

(SD=4.09, range: 18-54) and this sample was 73.6% female (26.4% male), and ethnically homogeneous (90.0% White, 3.5% Hispanic/Latino, 2.5% biracial/multiracial, 1.5% Asian American, 1.0% Native Hawaiian/Pacific Islander, 0.5% Native American, and 1.0% other).

The survey was hosted on the secure Qualtrics platform and completed anonymously online. Participants received research participation credit for their participation according to course policies. Participants were required to provide informed consent at the start of the survey, and all study procedures were approved by the Institutional Review Board of the authors' university.

Initial Scale Development

A pool of 39 items was developed to assess psychological inflexibility related to hoarding. Items were written to assess all facets of psychological inflexibility (experiential avoidance, cognitive fusion, rigid attention/inattention, self-as-content, disconnection from values, and lack of committed action) in relation to major features of hoarding (difficulty discarding, acquisition, and clutter). As in other studies developing domain-specific measures of psychological flexibility (Levin, Luoma, Lillis, Hayes, & Vilardaga, 2014; Luoma, Drake, Kohlenberg, & Hayes, 2011) some items were developed through adaptation from existing measures such as the AAQ-II (Bond et al., 2011), the AAQ for Substance Abuse (Luoma et al., 2011), the AAQ for Weight (Lillis & Hayes, 2007), and the Social Anxiety AAQ (MacKenzie & Kocovski, 2010) in addition to novel items written for this measure. Items that were adapted were selected not for similarity to hoarding as a problem area, but for 1) construct validity in assessing psychological inflexibility, 2) clarity, and 3) if the item could be altered to refer to problematic hoarding. Novel items were written by the first and second authors with the goal of both valid content (i.e., assessing psychological inflexibility or one or more of its component

processes, in relation to hoarding) and clarity (i.e., easy to comprehend and evaluate oneself on the item).

The initial 39 items were reviewed by four expert judges, one professor and three doctoral students with extensive experience and training in ACT and obsessive-compulsive and related disorders. Items were discarded and revised through a consensus process, which resulted in 37 items selected for validation. Each item was reviewed and discussed by all judges in relation to face validity as well as clarity and appropriateness for the sample. That is, judges only evaluated items based on whether they appeared to capture psychological inflexibility in the context of hoarding and readability; other aspects of construct validity have to be assessed based on empirical data. Items that any judge considered inappropriate for the measure were either discarded or revised according to this feedback until all judges agreed that items were appropriate, and that the remaining items adequately captured the relevant construct.

We define hoarding-related psychological inflexibility as a pattern of inflexible responding to internal experiences related to possessions (e.g., avoidance of discarding-related distress, fusion with beliefs about importance of saving, inattention to present-moment experience when acquiring) that leads acquiring, saving, and related behaviors to be rigidly controlled by internal experiences rather than chosen values and natural consequences of behavior. In other words, hoarding-related psychological inflexibility describes a way of interacting with possession-related internal experiences that produces behaviors incongruent with a fulfilling life. Consistent with this intended construct, the final items included assessment of fusion with hoarding-related beliefs (e.g., “My thoughts or feelings about my things control my actions”), inattention to the present (e.g., “I get lost in my thoughts about buying or finding something I really want”), experiential avoidance (e.g., “I can’t stand feeling like I might make a

mistake if I get rid of something"), and values obstruction (e.g., "I continue to collect items, even when they cause problems for me").

All items were worded to assess psychological inflexibility rather than psychological flexibility (i.e., no items were designed for reverse scoring), which is consistent with the recommended scoring of the AAQ-II that only includes negatively worded items assessing inflexibility (Bond et al., 2011). Instructions asked participants to assess to what degree each item was true for their experience over the past week from 1 ("Never true") to 7 ("Always true"). Instructions also clarified that the AAQH items refer to "how you feel about the things you own" (see Appendix for complete instructions).

Symptom Measures

Saving Inventory-Revised (SI-R; Frost et al., 2004). The SI-R is a 23-item measure of hoarding symptoms with three subscales measuring the three major components of hoarding: difficulty discarding, acquisition, and clutter. Responses are scored on a scale of 0 ("Never/Not at all/None") to 4 ("Very often/Almost all/Complete/Extreme"). Higher scores indicate more severe hoarding symptoms. Items include "To what extent does the clutter in your home cause you distress?" and "To what extent do you have difficulty throwing things away?" The SI-R has good internal consistency, test-retest reliability, and convergent and divergent validity (Frost et al., 2004) and has previously been used in college student samples (e.g., Coles et al., 2003; Timpano et al., 2014). Internal consistency for this sample was $\alpha = 0.80$ for the total scale and ranged from $\alpha = 0.70$-0.82 for the subscales.

Depression Anxiety Stress Scales (DASS-21; Henry & Crawford, 2005). The DASS-21 is a 21-item measure with three subscales measuring depression, anxiety, and stress. A total score can also be calculated indicating general psychological distress. Items are rated from 0

("Did not apply to me at all") to 3 ("Applied to me very much or most of the time"), and higher scores indicate greater distress. Example items include "I felt I was close to panic," "I found it difficult to relax," and "I felt down-hearted and blue." This measure has demonstrated adequate internal consistency as well as good convergent and divergent validity (Henry & Crawford, 2005). Internal consistency was excellent for the total score ($\alpha = 0.90$) and ranged between 0.78-0.87 for DASS subscales in this sample.

Satisfaction with Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985). The SWLS is a 5-item scale that measures overall life satisfaction. Each item is rated from 1 ("Strongly disagree") to 7 ("Strongly agree") with higher scores indicating higher life satisfaction. Items include "In most ways my life is close to my ideal." The SWLS has high internal consistency and test-retest reliability as well as good convergent validity in college student samples (Diener et al., 1985). Internal consistency was good in the present sample ($\alpha = 0.89$).

Psychological Inflexibility Measures

A range of measures were used to assess various features of psychological inflexibility, including key facets such as acceptance, cognitive fusion, mindful awareness, and valued living.

Acceptance and Action Questionnaire – II (AAQ-II; Bond et al., 2011). The AAQ-II is a unidimensional 7-item measure of psychological inflexibility. Each item is rated from 1 ("Never true") to 7 ("Always true"). Higher total scores indicate greater psychological inflexibility. Items include "Worries get in the way of my success" and "I'm afraid of my feelings." The AAQ-II has demonstrated adequate internal consistency and test-retest reliability as well as convergent and divergent validity in both clinical and college student samples (Bond et al., 2011). Internal consistency in this sample was $\alpha = 0.91$.

Philadelphia Mindfulness Scale (PHLMS; Cardaciotto, Herbert, Forman, Moitra, & Farrow, 2008) – Acceptance. The acceptance subscale of the PHLMS is a 10-item measure of mindful acceptance. Each item is rated from 1 ("Never)" to 5 ("Very often"). All items are reverse scored such that higher scores indicate greater acceptance. Items include "I try to distract myself when I feel unpleasant emotions." The PHLMS has demonstrated adequate internal consistency, in addition to convergent and divergent validity in both clinical and normative college student samples (Cardaciotto et al., 2008). Internal consistency in this sample was excellent ($\alpha = 0.90$).

Cognitive Fusion Questionnaire (CFQ; Gillanders et al., 2014). The CFQ is a 7-item measure of cognitive fusion, defined as "the tendency for behavior to be overly regulated and influenced by cognition" (Gillanders et al., 2014, p. 84). Each item is scored from 1 ("Never true") to 7 ("Always true") with higher scores indicating greater cognitive fusion. Items include "I struggle with my thoughts." The CFQ has demonstrated excellent internal consistency and good test-retest reliability in addition to convergent and divergent validity in both student and clinical samples (Gillanders et al., 2014). Internal consistency was excellent in the present sample ($\alpha = 0.92$).

Mindful Attention Awareness Scale (MAAS; Brown & Ryan, 2003). The MAAS is a 15-item measure of mindful awareness. Each item is rated from 1 ("Almost always") to 6 ("Almost never"), and all items are reverse scored such that higher scores indicate greater mindful awareness. Items include "I find it difficult to stay focused on what's happening in the present." The MAAS has shown adequate internal consistency and test-retest reliability as well as convergent and divergent validity in both student and community samples (Brown & Ryan, 2003). The MAAS had good internal consistency in this sample ($\alpha = 0.88$).

Valuing Questionnaire (VQ; Smout, Davies, Burns, & Christie, 2014). The VQ is a 10-item measure that assesses valued living. The measure includes two distinct subscales, each with 5 items: Progress (clarity and perseverance towards personal values) and Obstruction (the extent to which avoidance and inattention interfere with valued living). An example Progress item is "I felt like I had purpose in life" and an example Obstruction item is "Difficult thoughts, feelings, or memories got in the way of what I really wanted to do." Each item is rated from 0 ("Not at all true") to 6 ("Completely true") for the past week. Higher scores indicate greater progress towards valued living and greater obstruction in valued living respectively. The VQ has demonstrated adequate internal consistency and convergent validity in a college student sample (Smout et al., 2014). Both subscales had adequate internal consistency in this sample ($\alpha = 0.80$ for both).

Results

Scale Refinement

Analyses were conducted on the pool of 37 AAQH items selected in the initial phase of scale development. First, the distribution of individual items was examined in accordance with the recommendations of Clark & Watson (1995). A total of 8 items were removed at this stage for skewness and/or kurtosis more extreme than ±2.00, leaving 29 items (see Table 2 for a list of excluded items).

The remaining 29 items were examined for correlations to the total AAQH score (calculated by summing responses to all 29 items), and to all other individual items. It is recommended that inter-item and item-total correlations should be at least moderate ($r = 0.2$) before proceeding with factor analysis (Floyd & Widaman, 1995). Every item was significantly

correlated with the AAQH total with a value above $r = 0.2$. A total of 8 items were removed for having inter-item correlations less than $r = 0.2$ (see Table 2), leaving 21 items.

A maximum likelihood exploratory factor analysis with geomin oblique rotation was conducted to identify the factor structure of the instrument while allowing for correlation among factors. Three factors were obtained with eigenvalues greater than 1. However, given that using this criterion tends to overestimate number of factors (Zwick & Velicer, 1986), we extracted two factors based on visual inspection of the scree plot (see Figure 1). The two-factor solution showed adequate model fit (normed chi square ($\chi 2$/df) = 2.129, RMSEA 95% CI = 0.064 to 0.086, CFI = 0.911, TLI = 0.889, SRMR = 0.045; Bollen, 1989; Hu & Bentler, 1999). Criteria for item retention were: (1) loading > 0.5 on one factor and (2) no cross-loadings above > 0.3. Applying these criteria resulted in retention of 14 items total (seven items per factor; see Table 1). The correlation between factors was 0.59 ($p < .05$), supporting use of oblique rotation. Factor 1 consists of items that reflect psychological inflexibility related to difficulty discarding, while Factor 2 consists of items that reflect psychological inflexibility related to acquiring and possessing belongings. We labeled Factor 1 “Saving” and Factor 2 “Acquisition.”

Cronbach’s alpha was calculated for the scale with each item deleted, and the value remained between 0.89 and 0.90 in each analysis, compared to 0.90 for all items, indicating no items that should be deleted to improve reliability. This resulted in 14 items being retained for the final scale. Inter-item correlations ranged from 0.22 to 0.65 with a mean of 0.40. Some inter-item correlations are higher than the range typically recommended (0.15-0.5; Clark & Watson, 1995). However, higher correlations are appropriate for assessing a relatively specific construct and the range of correlations is narrowly clustered around the mean, suggesting good internal consistency (Clark & Watson, 1995).

Measurement Invariance

Further analyses were conducted to determine whether the factor structure remained stable among those lower in hoarding symptoms. A confirmatory factor analysis was conducted to evaluate the fit of the obtained factor structure among individuals who scored at or below the mean of 21 on the Saving Inventory-Revised in the larger sample (n = 276). Model fit was poor (normed chi square = 3.434, RMSEA 95% CI = 0.082 to 0.107, CFI = 0.841, TLI = 0.810, SRMR = 0.064; Bollen, 1989; Hu & Bentler, 1999). Measurement invariance was tested further by comparing the fit of an unconstrained model (with factor loadings allowed to vary) and a constrained model (with equality constraints placed on factor loadings) across the two samples (Hirschfeld & von Brachel, 2014). Model fit decreased significantly in the constrained model compared to the unconstrained model (χ^2 diff (12) = 94.77, p <.001) and the CFI decreased from 0.890 to 0.856 (a change of .01 or greater is used as a benchmark indicating poor measurement invariance; Cheung & Rensvold, 2002). It appears that the factor structure of this measure does not hold for those low in hoarding symptoms.

Scale Scoring and Characteristics

The final AAQH includes 14 items (see Appendix). No items are reverse scored; for each item a higher score indicates greater hoarding-related psychological inflexibility. The total AAQH score is calculated by summing the 14 item scores, resulting in a possible range of scores of 14 to 98. Subscale scores for Saving and Acquisition can also be obtained by summing the items on each subscale.

In the present sample the mean AAQH total score was 45.17 (*SD* = 13.49), the mean AAQH-Saving score was 26.60 (SD = 8.31) and the mean AAQH-Acquisition score was 18.56 (SD = 6.96). Cronbach's alpha for the 14-item scale was 0.90, indicating excellent reliability.

The reliability of the subscales was also good (AAQH Saving $\alpha = 0.89$; AAQH Acquisition $\alpha = 0.84$). The two subscales are highly correlated with one another ($r = 0.56$, $p < .001$) and with the AAQH total score ($r = 0.90$, $p < .001$ for Saving; $r = 0.86$, $p < .001$ for Acquisition).

Validity

Convergent/divergent validity. The convergent/divergent validity of the 14-item AAQH was tested by examining correlations with measures of psychological inflexibility and its components (acceptance, mindful awareness, cognitive fusion, values progress, and values obstruction), hoarding symptoms, other symptoms of psychological disorders (depression, anxiety) and life satisfaction. Correlations were significant in the expected directions for all measures except depression, progress towards values, and life satisfaction (see Table 3). Higher hoarding-related psychological inflexibility (measured by high scores on the total AAQH) was associated with higher hoarding symptoms with correlations between 0.31 and 0.64, higher psychological inflexibility processes with correlations between -0.07 and 0.49, higher anxiety symptoms ($r = 0.23$), and higher overall distress ($r = 0.28$).

To further assess divergent validity, the correlation between the AAQH and the SI-R was compared to the correlations between the AAQH and DASS-depression as well as DASS-anxiety using recommended methods (Meng, Rosenthal, & Rubin, 1992). The correlation between the AAQH and SI-R was significantly higher than the correlation between the AAQH and DASS-depression ($Z = 6.28$, $p < .001$) as well as the correlation between the AAQH and DASS-anxiety ($Z = 5.60$, $p < .001$) showing initial support for divergent validity. That is, the AAQH does not appear to be measuring general distress or psychopathology and is more relevant to hoarding symptomatology specifically.

Incremental validity. Next, several analyses were conducted to determine whether or not the AAQH has incremental validity over a general measure of psychological inflexibility in predicting hoarding, as the AAQ-II and AAQH have a large correlation ($r = 0.49$, $p < .001$) and the AAQ-II also had a significant correlation with the SI-R ($r = 0.42$, $p < .001$).

First, the strength of correlations between the AAQH and SI-R were compared to the AAQ-II and SI-R. The correlation between the AAQH and SI-R was found to be significantly higher than the correlation between the AAQ-II and SI-R ($Z = 3.78$, $p < .001$). The AAQH correlation was also significantly higher than the AAQ-II correlation with SI-R acquisition ($Z = 2.83$, $p < .01$) and SI-R difficulty discarding ($Z = 4.40$, $p < .001$), although not SI-R clutter ($p = .52$).

In a series of hierarchical linear regressions, we investigated whether a model including the AAQH predicted significant additional variance in hoarding symptoms above and beyond a model with only the AAQ-II as a predictor. The results showed that for each dependent variable the AAQH significantly predicted hoarding symptoms after entering the AAQ-II, and adding the AAQH resulted in a significant change in R^2, ranging from 4 to 25% (see Table 4). Furthermore, the AAQ-II shifted from a significant to a non-significant predictor of hoarding symptoms for three of the four dependent variables after the AAQH was added as a predictor. Thus, it appears that the AAQH is more strongly related to hoarding symptoms than the AAQ-II and accounts for a large amount of variance in hoarding symptoms beyond what is predicted by a more general measure of inflexibility. All tolerance statistics exceeded 0.2, indicating no problematic multicollinearity.

Mediational analysis. As an additional test of construct validity, a mediational analysis was conducted to determine whether or not the AAQH mediates between distress (DASS total)

and hoarding symptoms (SI-R total). Theoretically, hoarding behaviors are linked to distressing thoughts and emotions (Frost & Hartl, 1996; Steketee & Frost, 2003), and the impact of distressing thoughts and emotions on behavior depends on one's degree of psychological inflexibility (Bond et al., 2011). Thus, we would expect the relationship between distress and hoarding symptoms to be mediated by hoarding-related psychological inflexibility.

First, the total effect of distress on hoarding symptoms was calculated (c path: $B = 0.24$, $SE = 0.06$, $p < .001$), which indicated that greater distress was related to greater hoarding symptoms. Next, a cross product of coefficients mediation model was used to estimate path coefficients and bootstrapped 95% confidence intervals for the total and indirect effects of distress on hoarding in the current sample. Hoarding-related psychological inflexibility significantly mediated the effect of distress on hoarding symptoms (indirect effect = 0.12, SE = 0.05, 95% CI [.04, .20]). When including this mediational path, the direct effect of distress on hoarding symptoms decreased but remained significant (c' path, $B = 0.11$, $SE = 0.05$, $p = .02$; see Figure 2).

Discussion

This study sought to develop a measure of hoarding-related psychological inflexibility and provide a preliminary evaluation of its psychometric properties in a sample of 201 undergraduate students endorsing above-average levels of hoarding symptoms. A single factor solution was expected based on previous domain-specific AAQ variants often finding one factor or a second factor only for reverse scored items (e.g., Luoma et al., 2011; MacKenzie & Kocovski, 2010; Sandoz et al., 2013) and the fact that all items were designed to measure facets of one overarching construct, psychological inflexibility (Hayes et al., 2006). However, other structures were also plausible given that 1) items measured multiple components of hoarding

(difficulty discarding, clutter, and acquisition; Frost et al., 2004) and 2) items measured different facets of psychological inflexibility and some multifaceted psychological inflexibility measures have been found to have multiple, clearly differentiated factors (Francis, Dawson, & Golijani-Moghaddam, 2016). A two-factor solution was selected following exploratory factor analysis with the factors reflecting psychological inflexibility related to difficulty discarding items (Saving subscale) and psychological inflexibility related to acquiring and owning belongings (Acquisition subscale). Fourteen items were retained for the final AAQH, and the measure was found to have excellent internal consistency in the present sample.

The AAQH correlated significantly in expected directions with other measures of hoarding symptoms and psychological inflexibility. In addition, the AAQH has a significantly higher correlation with hoarding symptoms compared to symptoms of depression and anxiety, indicating divergent validity. Although the AAQ-II and AAQH were highly correlated, incremental validity of the measure was also supported as the AAQH predicted significant additional variance in hoarding symptoms after controlling for general psychological inflexibility. The AAQH was also found to partially mediate the relationship between the DASS and SI-R, consistent with the theoretical construct of hoarding-related psychological inflexibility. Of note, this is a cross-sectional analysis and is presented to help evaluate construct validity rather than to test a mediational model, which would require longitudinal data. These analyses support the validity of the AAQH as a measure of hoarding-related psychological inflexibility.

Overall, these findings indicate that the AAQH is a reliable and valid measure of hoarding-related psychological inflexibility in a nonclinical population with elevated hoarding symptoms. The AAQH has incremental validity over a general measure of psychological inflexibility, and therefore may enable improved measurement of psychological inflexibility as it

relates to hoarding behavior. This incremental validity is consistent with previous domain-specific versions of the AAQ (e.g., Houghton et al., 2014; Sandoz et al., 2013), further demonstrating the importance of developing and validating psychological flexibility measures for specific psychological disorders and areas of functioning. In addition, the AAQH may have clinical utility in mindfulness and acceptance-based treatment of hoarding (e.g., routine outcome monitoring) as it could be more sensitive to hoarding-related processes than a general measure such as the AAQ-II. Accordingly, the AAQH may be useful in better understanding how psychological inflexibility is theoretically related to the development and maintenance of hoarding as well as the relevance of hoarding-related psychological inflexibility as a potential mechanism of change in the treatment of hoarding. For instance, future research could use the AAQH to determine whether changes in hoarding-related psychological inflexibility predict change in hoarding symptoms and/or quality of life, both in cognitive-behavioral therapy for hoarding and mindfulness and acceptance-based treatment of hoarding.

One limitation of this measure is that some individual items have limited face validity in assessing hoarding-related *psychological inflexibility* versus merely hoarding symptoms. Psychological inflexibility is inherently linked to individual context and values, such that the processes of avoidance, inattention, and fusion are considered problematic only when they are rigidly engaged to the extent that they interfere with valued living (Hayes et al., 2006). This naturally overlaps with hoarding symptoms themselves in which hoarding behaviors are pervasive and persistent despite negative consequences (e.g., “I struggle to get rid of items that feel important to me”). That said, the AAQ-H more specifically focuses on assessing psychologically inflexible hoarding behaviors and ways individuals inflexibly respond to internal experiences related to hoarding. Future research would benefit from continuing to examine the

divergent and incremental validity of the AAQ-H in relation to symptom measures of hoarding to further clarify distinctions in measures and constructs. In addition, some AAQH items describe a specific component process (e.g., inflexible attention in "I am always thinking about my things") and do not assess psychological inflexibility on their own. Items were written in this manner to prevent double-barreled questions and with the goal that a combination of these items would accurately measure the overarching construct of psychological inflexibility. However, the majority of the items in the final measure refer to fusion and avoidance, and as such the measure may lack balance in assessing other components of psychological inflexibility.

Although the original AAQ (Hayes et al., 2004) and AAQ-II (Bond et al., 2011) are very commonly used in ACT research (e.g., Bluett, Homan, Morrison, Levin, & Twohig, 2014; Krafft, Ferrell, Levin, & Twohig, 2018), recent studies have suggested that the AAQ-II has excessive overlap with distress (e.g., Francis et al., 2016; Rochefort, Baldwin, & Chmielewski, 2018). As the AAQH was developed based on the AAQ-II and uses similar items, it is possible that it also has excessive overlap with general distress or with hoarding symptoms specifically. One promising result from this study is that although the AAQH is correlated with general distress, the size of the correlation is medium (r = 0.26) and significantly smaller than the correlation of the AAQ-II with distress in the same sample (r = 0.57). However, this issue is important for divergent validity and future studies should empirically test if the AAQH items function differentially from items measuring distress and/or hoarding symptoms.

This study has limitations that should be taken into consideration. The primary limitation is the use of an undergraduate student sample from a single university for validation purposes. Although hoarding symptoms are dimensionally distributed in the population (Timpano, Broman-Fulks et al., 2013) and the average reported age of onset of hoarding symptoms is

between 14 and 20 (Tolin, Meunier, Frost, & Steketee, 2010), experiences of hoarding-related psychological flexibility could be qualitatively different in a clinical population in a manner that would affect the factor structure, reliability, validity, or utility of this measure. As such, further validation in clinical samples is necessary to determine the consistency of this measure across populations, and the factor structure should be replicated in both clinical and subclinical hoarding samples using confirmatory factor analysis. Furthermore, model fit was only adequate in our subsample of participants with elevated hoarding, which could be due to lack of specification of inter-item correlations. Further testing of this proposed factor structure of the AAQH using confirmatory factor analysis with fewer model restrictions would clarify how observed item scores relate to each other as well as the hypothesized latent variables. The measure does not appear to have good fit in those with below-average hoarding symptoms, which suggests that its use is most appropriate among those who have above-average hoarding symptoms and its generalizability may be limited. In addition, this sample was young and ethnically homogeneous, and it is unclear if the results would generalize to populations more diverse in ethnicity or age. Finally, this study relied solely on self-report measures, which are vulnerable to problems of social desirability (e.g., Paulhus, 1984) and retrospective recall biases (e.g., Bradburn, Rips, & Shevell, 1987). It would be beneficial to validate the measure against additional criterion variables not subject to the same biases (e.g., informant report of clutter).

The present study did not examine the sensitivity of the AAQH to intervention, its potential utility in treatment, or the temporal stability of this measure. Further validation is necessary to evaluate these properties. Evaluating treatment sensitivity is particularly important, as psychological inflexibility is a primary mechanism of change in interventions such as ACT

and changes in psychological inflexibility have mediated outcomes in several studies of ACT (Hayes et al., 2006).

Although effective treatment for hoarding exists, there is a need to improve our understanding of how hoarding develops and is maintained in order to enhance its efficiency and impact (Tolin, Frost, Steketee, & Muroff, 2015). Psychological inflexibility is a promising area for future research in hoarding, as it could provide a novel treatment target that explains how ineffective ways of responding to distress and maladaptive cognitions contribute to hoarding behaviors, and it can be targeted with ACT (Hayes et al., 2006). Preliminary validation indicates that the AAQH is a reliable and valid measure of hoarding-related psychological inflexibility. As such, this measure may help to guide and support further research on the relevance of psychological inflexibility in the development, maintenance, and treatment of hoarding.

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Table 1
Factor loadings for AAQH items using exploratory factor analysis

	1	2
Factor 1:		
1. I need to stop feeling so attached to my things.	**0.685***	0.027
2. I can't stand feeling like I might make a mistake if I get rid of something.	**0.710***	0.009
8. I have a hard time getting rid of things even when I know I should.	**0.645***	0.142
14. My thoughts or feelings make it hard for me to get rid of my things.	**0.714***	0.169
27. I struggle to get rid of items that feel important to me.	**0.813***	-0.103
28. If I am worried I might need something in the future, I keep it.	**0.767***	-0.104
31. I keep my things because I am attached to them.	**0.765***	-0.040
Factor 2:		
3. I get lost in my thoughts about buying or finding something I really want.	0.005	**0.552***
4. My thoughts or feelings about my things control my actions.	0.098	**0.638***
6. My things are a central part of who I am.	0.140	**0.515***
7. I need to get rid of my urges to acquire new things.	0.106	**0.529***
10. I am always thinking about my things.	-0.051	**0.753***
23. I continue to collect items, even when they cause problems for me.	-0.003	**0.784***
32. I collect or buy objects when I feel distressed.	-0.055	**0.699***

* $p < .05$.

Note. The instructions for responding to this measure clarified that "things" refers to "the things you own" and asked respondents to rate their agreement with these statements from 1 (never true) to 7 (always true) over the past week.

Table 2
Excluded items and reasons for exclusion

Items excluded due to skewness/kurtosis:
13. Worries about my things get in the way of living the life I want.
18. My things are the most important part of my life.
19. I care more about my things than anything else.
22. My clutter prevents me from living the life I want.
26. Who I am depends on the things I have.
34. My things take up so much time that they interfere with my life.
36. Discarding something that is no longer useful is too painful for me to bear.
37. The time I spend thinking about what to do with my things interferes with my life.
Items excluded due to low inter-item correlations:
5. My feelings about my things get in the way of living a fulfilling life.
11. The time I spend on my things gets in the way of doing what is important to me.
15. I am unable to let go of things that remind me of important memories.
16. When I see something I want, I just get it.
17. I act on my impulses to get the things I want.
21. The value of my things is based on my feelings about them.
24. Losing something important to me would be the worst thing that could happen.
35. When I want an item, I just get it.
Items excluded due to factor loading criteria:
9. I try not to think about the negative effects of my clutter.
12. I can’t make decisions about my things when I feel uncertain.
20. I hate when I have strong reactions to losing my things.
25. My emotions overwhelm me when I think about parting with my things.
29. The desire to keep things is a problem in my life.
30. My saving or collecting habits are inconsistent with the life I want.
33. My mood affects what I do with my things.

Table 3
Correlations with other measures

Measure	AAQH Total	AAQ-II	AAQH-Saving	AAQH-Acquisition
SI-R Total	0.64***	0.42***	0.53***	0.61***
SI-R Acquisition	0.49***	0.30***	0.28***	0.61***
SI-R Difficulty Discarding	0.59***	0.32***	0.61***	0.42***
SI-R Clutter	0.31***	0.26***	0.27***	0.28***
AAQ-II	0.49***	-	0.43***	0.43***
PHLMS Acceptance	-0.41***	-0.66***	-0.38***	-0.34***
CFQ	0.39***	0.75***	0.36***	0.33***
MAAS	-0.34***	-0.38***	-0.27***	-0.34***
VQ Progress	-0.07	-0.24**	-0.05	-0.08
VQ Obstruction	0.35***	0.57***	0.25**	0.37***
DASS Total	0.26***	0.57***	0.16*	0.30***
DASS Depression	0.13	0.53***	0.05	0.19**
DASS Anxiety	0.23***	0.46***	0.14*	0.27***
DASS Stress	0.27***	0.46***	0.19**	0.30***
SWLS	-0.13	-0.45***	-0.06	-0.18*

*p<.05, **p<.01, ***p<.001

Table 4
Incremental validity of AAQH

Model	Variable	*ß*	*t*	*p*	R^2	R^2 change	*p*
Prediction of overall hoarding symptoms (SI-R total score)							
1	AAQ-II	.42	6.49	<.001	.18		<.001
2	AAQ-II	.14	2.30	.022	.42	.25	<.001
	AAQH	.57	9.15	<.001			
Prediction of difficulty discarding (SI-R difficulty discarding subscale)							
1	AAQ-II	.32	4.77	<.001	.10		<.001
2	AAQ-II	.04	0.67	.505	.35	.25	<.001
	AAQH	.57	8.68	<.001			
Prediction of acquisition (SI-R acquisition subscale)							
1	AAQ-II	.31	4.51	<.001	.09		<.001
2	AAQ-II	.09	1.25	.21	.25	.15	<.001
	AAQH	.45	6.28	<.001			
Prediction of clutter (SI-R clutter subscale)							
1	AAQ-II	.27	3.87	<.001	.07		<.001
2	AAQ-II	.15	1.95	.053	.11	.04	.002
	AAQH	.24	3.08	.002			

Note: Model 1 includes only the AAQ-II as a predictor of hoarding symptoms, Model 2 includes both the AAQ-II and AAQ-H as concurrent predictors of hoarding symptoms.

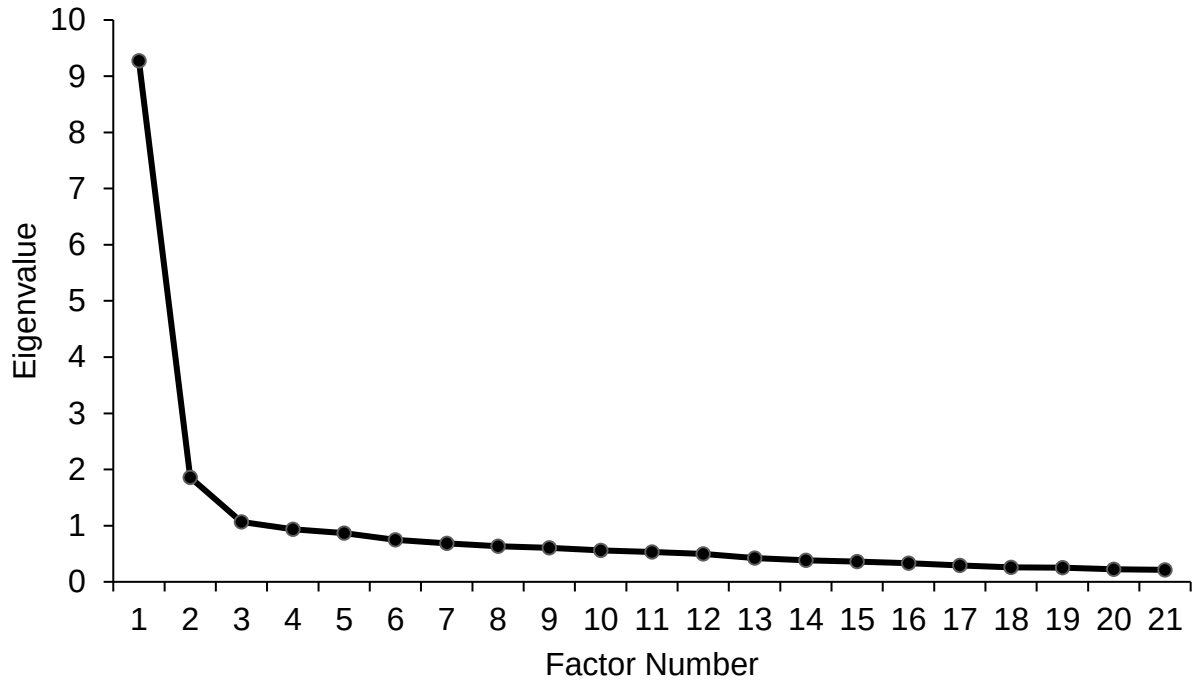
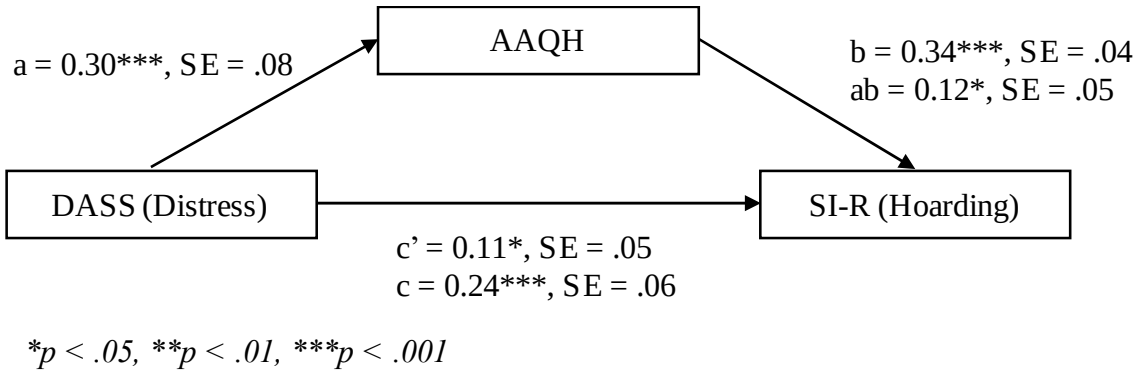


Figure 1. Scree plot



*$p < .05$, **$p < .01$, ***$p < .001$

Figure 2. Mediation model

Appendix
Acceptance and Action Questionnaire for Hoarding (AAQH)

Below you will find a list of statements that have to do with how you feel about the things you own. Some of the statements have to do with acquiring new things (e.g., buying, getting free things) and some of them have to do with discarding or letting go of your things (e.g., throwing them out, giving them away, donating, etc.). Please rate how true each statement is for you within the past week by selecting an option next to it. Use the scale below to make your choice.

1	2	3	4	5	6	7
Never true	Very seldom true	Seldom true	Sometimes true	Frequently true	Almost always true	Always true

1.	I need to stop feeling so attached to my things.	1	2	3	4	5	6	7
2.	I get lost in my thoughts about buying or finding something I really want.	1	2	3	4	5	6	7
3.	I can't stand feeling like I might make a mistake if I get rid of something.	1	2	3	4	5	6	7
4.	My thoughts or feelings about my things control my actions.	1	2	3	4	5	6	7
5.	I have a hard time getting rid of things even when I know I should.	1	2	3	4	5	6	7
6.	My things are a central part of who I am.	1	2	3	4	5	6	7
7.	My thoughts or feelings make it hard for me to get rid of my things.	1	2	3	4	5	6	7
8.	I need to get rid of my urges to acquire new things.	1	2	3	4	5	6	7
9.	I struggle to get rid of items that feel important to me.	1	2	3	4	5	6	7
10.	I am always thinking about my things.	1	2	3	4	5	6	7
11.	If I am worried I might need something in the future, I keep it.	1	2	3	4	5	6	7
12.	I continue to collect items, even when they cause problems for me.	1	2	3	4	5	6	7
13.	I keep my things because I am attached to them.	1	2	3	4	5	6	7
14.	I collect or buy objects when I feel distressed.	1	2	3	4	5	6	7

AAQH-Saving: 1, 3, 5, 7, 9, 11, 13
AAQH-Acquisition: 2, 4, 6, 8, 10, 12, 14