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Saving inventory – Revised: Psychometric performance across the lifespan

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Abstract

Background: The Saving Inventory – Revised (SI-R) is the most widely used self-report measure of hoarding symptom severity. The goal of this study is to establish a firm empirical basis for a cutoff score on the SI-R and to examine the functioning of the SI-R as a screening tool and indicator of hoarding symptom severity across the lifespan.

Methods: This study used archival data from 1,116 participants diagnosed with a clinical interview in 14 studies conducted by research groups who focus on hoarding. We used receiver operating characteristic (ROC) analysis and the Youden's *J* statistic to determine optimal cutoff scores for classifying participants who would be likely to receive a hoarding diagnosis.

Results: Overall, the discriminant performance of the SI-R Total score and each of the three subscales was high, confirming the status of the SI-R is an excellent screening tool for differentiating hoarding from non-hoarding cases. The optimal SI-R Total cutoff score is 39, although analyses suggested that older adults require a significantly lower cutoff and adults younger than 40 years require a significantly higher cutoff score.

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CRediT authorship contribution statement

Kirstie Kellman-McFarlane: Conceptualization, Data curation, Formal analysis, Visualization, Writing - original draft. **Brent Stewart:** Conceptualization, Data curation, Formal analysis, Visualization, Writing - original draft. **Sheila Woody:** Conceptualization, Funding acquisition, Methodology, Project administration, Supervision, Writing - original draft. **Catherine Ayers:** Investigation. **Mary Dozier:** Data curation, Investigation. **Randy O. Frost:** Investigation. **Jessica Grisham:** Investigation. **Simone Isemann:** Investigation. **Gail Steketee:** Investigation, Writing - review & editing. **David F. Tolin:** Investigation. **Alison Welsted:** Data curation, Investigation.

Declarations of interest

None.

Limitations: The confidence interval around the optimal cutoff for the SI-R Total score for oldest age group was wide in comparison to those reported for the younger groups, creating more uncertainty around the optimal cutoff score for this group.

Conclusions: This paper provides investigators and clinicians with the data necessary to select evidence-based cutoff scores on the SI-R that optimally suit their relative need for sensitivity and specificity in different age groups.

Keywords

Hoarding; Lifespan; Older adults; Psychological assessment

1. Introduction

Hoarding disorder is characterized by an accumulation of posses sions that is so excessive as to inhibit or prevent the use of at least some parts of the home for routine domestic activities such as sleeping in the bed, preparing food in the kitchen, or socializing (American Psychiatric Association, 2013). This accumulation occurs as a result of persistent difficulty discarding possessions regardless of actual value, and for most affected individuals, regular acquisition of additional possessions (Frost et al., 2013). In addition to physical dangers such as fire or avalanche hazards, severe domestic clutter can lead to social stigma, social or occupational impairment, and housing insecurity (Frost et al., 2000; Tolin et al., 2008a,b). There is also some evidence that the phenomenon of hoarding may shift over the lifespan. Some researchers suggest hoarding is more prevalent in later life (Marx and Cohen-Mansfield, 2003; Samuels et al., 2008), and older adults with hoarding report a steady worsening of symptoms as they age, particularly in relation to clutter accumulation (Dozier et al., 2016).

The most widely used self-report tool for assessing hoarding symptom severity is the Saving Inventory – Revised (SI-R; Frost et al., 2004). The SI-R is used in both clinical and research settings and has been translated into six languages (Grisham and Williams, 2014). Using a 0–4 scale for each item, the 23-item measure consists of three subscales that measure the core diagnostic components of hoarding: difficulty discarding, clutter, and excessive acquisition. The SI-R has demonstrated excellent psychometric properties including good internal consistency and test-retest reliabilities in both treatment and research samples (Frost et al., 2004). The measure shows good convergent validity with other scales of hoarding, such as the Hoarding Rating Scale (Tolin et al., 2010) and Clutter Image Rating Scale (Frost et al., 2008), and discriminant validity with measures such as the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS) and Positive and Negative Affect Scale (PANAS; Frost et al., 2004). The SI-R has also been found to discriminate between hoarding and healthy controls, and between hoarding and non-hoarding OCD (Frost et al., 2004).

From a psychometric standpoint, the SI-R also has some weaknesses reflecting gaps in knowledge. Although the three subscales assess the main features of hoarding disorder described in DSM-5, some factor analytic studies suggest that they do not provide a good fit to the data in some populations, such as older adults (Ayers et al., 2017; Lee et al., 2016; Tang et al., 2012; Tortella-Feliu et al., 2006).

Although diagnoses are not made on the basis of a self-report questionnaire, an empirically established clinical cutoff serves as a guide for determining whether the severity of symptoms represents a clinically significant level of psychopathology. A clinical cutoff score of 41 for the Total score of the SI-R has been used to distinguish between hoarding and non-hoarding populations for both research (Novara et al., 2016) and clinical purposes (Steketee and Frost, 2014). The rationale underlying this cutoff score is a brief mention in a paper on another topic (Tolin et al., 2011) that references an unpublished receiver operating characteristic (ROC) analysis distinguishing 74 hoarding participants from 58 community controls on the basis of SI-R scores. The optimal cutoff score was selected in order to maximize sensitivity and specificity (i.e., the score where sensitivity and specificity meet). Given the importance of the SI-R in the assessment of hoarding symptom severity, we undertook an investigation to establish a firm empirical basis for a cutoff score and to examine the degree to which the SI-R functions well across the life span as a screening tool or indicator of severity of hoarding symptoms. Accordingly, the present study employed archival data from clinical and subclinical hoarding participants and from controls to examine the psychometric properties of the SI-R across the age span.

2. Method

We used ROC analysis to detect participants who were given a diagnosis of hoarding disorder in comparison with all other participants who did not receive such a diagnosis, including healthy controls with no diagnoses, clinical controls with non-hoarding diagnoses, and subclinical participants who had hoarding symptoms but did not receive a diagnosis on the basis of clinical interview. Archival data were obtained for 14 studies conducted in five independent research groups. All studies received prior institutional ethical review board approval, and all participants provided informed consent. Because the purpose of this study was to identify an optimal SI-R cutoff score for determining hoarding disorder diagnosis, we included only studies that used a clinical interview to determine presence or absence of hoarding disorder diagnosis. Aggregated data included 541 individuals diagnosed with hoarding disorder and 575 non-hoarding cases that included clinical and healthy community controls but no student samples. Clinical controls ($N = 256$) received diagnoses of primary OCD ($n = 127$) or other Axis I disorders ($n = 43$). Subclinical hoarding ($N = 86$) was defined as endorsement of hoarding symptoms in the context of collecting behavior without evidence of clinically significant functional impairment. Healthy community controls ($N = 319$) included participants who denied current treatment for psychological disorders or screened negative for acute psychopathology. Table 1 reports sample sizes, demographics, and descriptive statistics for different hoarding measures. What follows is a brief description of the method of data collection for each data source.

2.1. Ayers and Dozier

Catherine Ayers's research program on hoarding disorder among older adults provided data from six studies of 179 participants over the age of 55 (Ayers et al., 2018a,b, 2014, 2010, 2012, 2011). Hoarding diagnoses ($n = 156$) were made using one of two structured interviews: the UCLA Hoarding Disorder Severity Scale (Saxena et al., 2007) or the Structured Interview for Hoarding Disorder (SIHD; Nordsletten et al., 2013). Healthy

controls (n = 23) were screened with the MINI International Neuropsychiatric Interview (Sheehan et al., 1998).

2.2. Grisham lab

Jessica Grisham's research group contributed data from two studies. The first includes 40 participants (20 with hoarding disorder and 20 healthy controls with no current Axis I disorder) from their information processing study (Grisham et al., 2010). Diagnoses were determined using the Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV; Brown et al., 1994) and the Hoarding Rating Scale (HRS) Interview (Tolin et al., 2010). A second sample from this lab included 49 clients diagnosed with hoarding disorder who were participating in a *Buried in Treasures* treatment program (the first 49 particpants enrolled in Grisham et al., 2018). This group was diagnosed using the SIHD.

2.3. Frost, Steketee, and Tolin

This collaborative research group contributed data from 384 participants in two overlapping studies of the psychopathology and treatment of hoarding disorder (Frost et al., 2011). All participants were diagnosed using the ADIS-IV. The HRS Interview was used to diagnose 163 participants with hoarding disorder, most of whom were assessed in their home as well as in the clinic. Non-hoarding diagnoses were determined with the ADIS-IV for 95 participants who had a primary diagnosis of obsessive-compulsive disorder (OCD); 119 were age-matched community controls, and 7 participants had subclinical hoarding.

2.4. Tolin clinic—Data were collected as part of an fMRI study (Tolin et al., 2012). All participants were diagnosed using the ADIS-IV. Hoarding (n = 46) was diagnosed on the basis of the HRS Interview, supplemented if necessary with a home visit or Clutter Image Rating from photographs of the home (CIR; Frost et al., 2008). Non-hoarding participants included 37 age-matched healthy controls with no history of psychiatric or neurological disorder and 32 participants with current OCD without hoarding symptoms.

2.5. Woody lab

Three studies provided data from 349 participants, including two unpublished theses that shared recruitment procedures as well as data from a third ongoing study. From one study, 85 participants were screened by telephone using the HRS Interview plus the CIR (Kellman-McFarlane, 2013). A second study (N = 119) used the same recruitment and diagnostic procedures (Welsted, 2014). Finally, from an ongoing study, 145 participants were diagnosed using the MINI with an added hoarding disorder module assisted by photographs of the home. Across these studies, there were 107 participants with hoarding disorder and 79 participants with subclinical levels of hoarding who were designated as "not hoarding" in analyses below. Other non-hoarding participants across these studies included 120 psychiatrically healthy participants who denied having current treatment or screened as negative on the MINI for current disorders and 43 participants who met criteria for other mental health disorders.

3. Results

Internal consistency of the SI-R was excellent; alpha = 0.93 for the 734 participants for whom individual item data were available. To assess evidence for convergent and divergent validity of the SI-R for the sample as a whole, correlations were computed for SI-R Total scores and hoarding-related measures as well as measures of depression, anxiety, ADHD, and OCD (see Table 4). The SI-R correlated highly with other measures of hoarding and less so with other constructs. To investigate the relationship between age and hoarding behavior across the full sample, correlations were computed for SI-R Total scores as well as each of the three subscales. Age was positively related to SI-R Total ($r = 0.28$) and to the subscales: difficulty discarding ($r = 0.26$), excessive acquisition, ($r = 0.17$), and clutter ($r = 0.30$). For each of the three SI-R subscales, there was a small positive correlation with reported gender ($r = 0.15$ for each), such that participants identifying as female scored significantly higher. Participants who identified as female scored significantly higher than those identifying as male on each of the subscales.

Receiver operating characteristic (ROC) analyses were conducted using MedCalc 17.6 (MedCalc, 2017). The area under the curve (AUC) was calculated for the SI-R Total score and each subscale separately to evaluate relative performance and utility as diagnostic screening tools. The discriminant performance of the SI-R Total score was high, AUC = 0.93 ($SE = 0.007$, 95% CI [.92, 0.95], $p < .001$), confirming the notion that the SI-R Total score is an excellent screening tool for differentiating hoarding from non-hoarding cases. The AUC with this large and diverse sample, however, was somewhat lower than that of Tolin et al., (2011), who reported AUC = 0.98 for the SI-R Total score. The SI-R subscales also showed good discriminant performance (all ps < 0.001); the Difficulty Discarding, Clutter, and Acquisition subscales showed AUC = 0.89 ($SE = 0.009$, 95% CI [0.87, 0.91]), AUC = 0.94 ($SE = 0.007$, 95% CI [.92, 0.95]), and AUC = 0.87 ($SE = 0.011$, 95% CI [.85, 0.89]), respectively. Again, these figures were slightly lower than those provided by Tolin et al.'s ROC analysis, which also yielded high AUC estimates for the SI-R subscales (Difficulty Discarding = 0.947, Clutter = 0.975, Acquiring = 0.915).

To identify optimal cutoff points for differentiating hoarding from non-hoarding cases, the Youden (1950) index J was computed for each possible score on the SI-R Total and subscales. 95% confidence intervals for J were calculated based on bootstrap resampling with 2000 iterations. Youden's J is widely used in ROC analysis for determining optimal diagnostic cutoff scores, defined as the score that most efficiently maximizes specificity and sensitivity independent of prevalence. (See examples for depression: (Dolle et al., 2012; Viinamäki et al., 2004; Watson et al., 2011). The formula for the Youden index is $J =$ sensitivity + specificity − 1. Accordingly, $J = 0$ when a given cutoff score gives the same proportion of true and false results for those with and without the diagnosis. $J = 1$ when the test is perfect in the sense of having no classification errors (no false positives or false negatives). J is independent of the relative sizes of the groups with and without the diagnosis.

Based on maximizing J, the optimal SI-R Total cutoff score for the current analysis is 39 (95% CI [35, 41]), which is 2 points lower than the cutoff of 41 suggested by Tolin et al.

(2011). The optimal cutoffs based on maximal *J* for the SI-R subscales were 13 (95% CI [13, 15]) for difficulty discarding, 17 (95% CI [15, 18]) for clutter, and 11 (95% CI [9, 12]) for acquisition. (Compare with the Tolin et al. analysis recommendations of 14, 17, and 9, respectively.) As shown in Table 2, selection of a single SI-R subscale (rather than the Total score) as a screening tool in place of the full scale will require a choice between optimizing sensitivity versus specificity.

Importantly, choosing a cutoff score based on *J* weights false positives and false negatives equally. However, researchers may prefer a different balance of the risk of these misclassifications, for example, prioritizing specificity over sensitivity. To assist researchers in choosing a cutoff score that suits their needs, Table 2 shows the Youden index as well as sensitivity and specificity for a range of potential cutoff scores. Note that the cutoff score for Acquisition is noticeably less sensitive compared to other subscales.

3.1. Differences across the lifespan

To investigate the impact of age on the relative sensitivity and specificity of different cutoff values on the SI-R, ROC curves and associated cutoff points were calculated separately for three age groups: young adults (<40 years; 14.2% positive for hoarding), midlife adults (40–60 years; 56.1% positive), and older adults (>60 years; 66.6% positive). The age-span of different groups were chosen to map onto two of the life transitions conceptualized by Levinson (1986) – the midlife transition (starting at age 40) and the late adult transition (at age 60) – while ensuring a comparable N in each group. As shown in Table 3, the optimal SI-R Total cutoff score for the older adult group falls below of the lower bound cutoff scores for the two younger groups, suggesting that older adults require significantly lower cutoffs to most accurately differentiate hoarding and non-hoarding groups. Furthermore, the optimal SI-R Total cutoff scores for the younger (43) and older groups (33) fall outside of the 95% Cl calculated using the full sample [35, 41]. As with the other analyses, optimal cutoffs were based on Youden's *J*. The SI-R Total cutoff for the youngest age group had somewhat lower sensitivity than the corresponding values in the older age groups.

To investigate convergent and divergent validity of the SI-R using the cutoff scores suggested above, we calculated correlation coefficients between the SI-R Total score and well-established measures of hoarding symptoms and other measures. As shown in Table 4, the SI-R showed consistently good convergent validity across the age groups, correlating well with other measures of hoarding, including the Saving Cognitions Inventory (Steketee et al., 2003), the Hoarding Rating Scale – Interview (Tolin et al., 2010), and Clutter Image Rating (Frost et al., 2008). In terms of divergent validity, the results are more mixed. While the two younger age groups showed consistent moderate correlations across different measures of depression, anxiety, stress, ADHD, and OCD, the participants over 60 show some anomalies in correlations between anxiety measures and the SI-R, including a surprisingly higher correlation for older adults with OCD symptoms according to the OCI-R.

4. Discussion

The purpose of this study was to develop empirically based cutoff scores for the Saving Inventory – Revised to facilitate its use as a screening tool in research and clinical settings.

Although commonly used, previous SI-R cutoff scores were supported by limited empirical research. The current study included combined data from over 1000 research participants in five laboratories from three countries; all were highly experienced in the assessment and treatment of hoarding. Furthermore, the data were of high quality as all diagnostic group assignments were based on clinical interviews, many of them supplemented with photographs of the home or home visits. Importantly, the non-hoarding participants in this study were diverse, as they included a variety of healthy and clinical controls rather than less representative student samples. The diversity of the comparison group enabled the cutoff scores to be derived under similar conditions to which they are applied in the real world (i.e., detecting hoarding in unscreened groups of participants), rather than discriminating hoarding participants from psychologically healthy participants. Furthermore, analyses utilizing the full sample also provided a confirmation of the strong psychometric properties of the SI-R in a much larger sample than the original validation study.

ROC analysis suggested that the optimal cutoff for the SI-R total score is 39, which detected 93% of participants who received a diagnosis of hoarding disorder on the basis of a clinical interview. Unfortunately, however, this cutoff score falsely diagnosed 19% of those without hoarding disorder. Compared to the Total scale score, the clutter subscale (optimal cutoff = 17) showed notably better specificity (i.e., it triggered fewer false positives), while the excessive acquisition subscale (optimal cutoff =11) had significantly poorer sensitivity (i.e., it identified fewer persons who had problems with hoarding). The difficulty discarding subscale had comparable sensitivity to the total score cutoff but poorer specificity, indicating that it failed to screen out a larger number of non-hoarding individuals, suggesting a potential disadvantage to its use in place of the total SI-R score. The clutter subscale may be the best option for investigators who want to use a single SI-R subscale to screen out non-hoarding participants. Although the acquisition subscale cutoff had comparable specificity to the difficulty discarding subscales, its substantially lower sensitivity (false negatives) compared to other subscales makes it less useful as a stand-alone screening tool.

Examining the performance of the SI-R across the lifespan is important because hoarding disorder is typically associated with midlife and older individuals, but appears to onset at considerably younger ages (Grisham et al., 2006). The average age of treatment-seeking samples is consistently in the 50 s (e.g., Frost et al., 2012; Muroff et al., 2012; Saxena and Sumner, 2014; Steketee et al., 2010). Older adults also frequently come to clinical attention, many because they are community-referred, although some actively seek treatment (Ayers et al., 2014, 2011; Luu et al., 2018; Turner et al., 2010). Furthermore, although clinical hoarding is associated with older age, researchers often study hoarding using much younger student analogue samples (e.g., Burgess et al., 2018; Oglesby et al., 2013). The large sample in the present study permitted stratification by different age groups and investigation of how age may impact self-reported hoarding symptoms on the SI-R.

We determined that the optimal cutoff scores developed using the full sample did not perform equally well across age groups. A substantially higher cutoff score was optimal for detecting likely hoarding disorder in younger adults (< 40 years) than in adults over the age of 60. The recommended cutoffs for the younger (SI-R ≥ 43) and older (SI-R ≥ 33) age groups varied significantly from the SI-R total cutoff generated using the full sample, falling

outside the confidence interval from 35 to 41 for the full sample cutoff. Overall, the cutoff scores recommended for the SI-R total score and the difficulty discarding subscale were a good fit only for midlife adults (age 40–60). Accordingly, applying a cutoff score of 39 in younger samples would prioritize sensitivity at the expense of specificity. Our data suggest this cutoff score (SI-R ≥ 39) will correctly identify more than 90% of young adults with hoarding but will also result in more than 20% false positives, adding error variance to studies of younger adults. In contrast, using the same cutoff of 39 in older adults would sacrifice sensitivity, which might be an issue for screening in clinical settings.

In sum, the current study has practical applications for researchers and clinicians seeking to use the SI-R for screening purposes. First, investigators can use the information in this paper to select cutoff scores that optimally suit the sensitivity and specificity needs of their specific study rather than defaulting to a cutoff that weights these concerns equally. Second, we have contributed some data on age-specific groups, which enables clinicians and researchers to adapt the cutoff they use to optimally suit their target population.

Some researchers use a hard cutoff on the SI-R as an inclusion or exclusion criterion for selecting hoarding samples, often in addition to meeting diagnostic criteria based on clinical interview. Based on our findings, such investigators may wish to vary the cutoff on the basis of the age group they are studying. For example, a study of older age individuals may wish to use a lower cutoff score than the score of 41 that has customarily been used. Using a lower cutoff score in this scenario can avoid rejecting individuals who should be included based on their clinical hoarding symptoms. Similarly, a study using a college-aged population may wish to use a higher cutoff score to decrease the probability of erroneously including subclinical or non-clinical participants in their clinical group. Understanding that cutoff scores may vary with age may help clinicians make sense of SI-R scores that seem lower or higher than expected given a participant's responses during a clinical interview. Finally, the age-related findings in this study provide more evidence in support of the existence of variation in hoarding symptoms over the lifespan and suggest the importance of continued investigation in this area.

More broadly, the lifespan course of hoarding needs research attention. Some evidence from epidemiological, community, and retrospective self-report studies suggests that hoarding is more prevalent in later life (Cath et al., 2017; Dozier et al., 2016; Marx and Cohen-Mansfield, 2003; Samuels et al., 2008), but other population-based research suggests the prevalence may decline throughout the decades of older adulthood (Dong et al., 2012). The present research, as well as previous work on the SI-R, suggests that the core features of hoarding may vary across the lifespan (Ayers et al., 2017; Lee et al., 2016; Tang et al., 2012; Tortella-Feliu et al., 2006). Perhaps the psychology of ownership changes for different cohorts during their lives. The relations between difficulty discarding, clutter volume, and acquisition might also shift over time. For example, older people might have accumulated more possessions over their lifetime than would a young cohort, despite having similar difficulty discarding objects. Midlife adults in their prime earning years may have a different attitude about acquisition and discarding than younger or older adults with similar levels of clutter.

Clearly, much remains to be discovered about hoarding and ownership over the lifespan, but the current findings suggest that there may be utility in adjusting cutoff scores when participant samples are principally composed of specific age groups. The SI-R psychometric properties are strong in all age groups, and participants classified as "hoarding" by the age-appropriate cutoff score do not differ in other measures of hoarding. Similarly to the full sample cutoff scores, we have provided information necessary for researchers and clinicians to choose cutoff scores that suit their purposes when working with different age groups. The data presented in this paper will permit evidence-based justification of such choices.

4.1. Limitations

With regard to limitations of the current work, the confidence interval around the optimal cutoff for the SI-R Total score for older adults was rather wide in comparison to that reported for the younger age groups, despite the comparability of confidence intervals for the subscales across age groups. As the area under the curve did not differ across age groups, this result indicates that the SI-R still does an excellent job of correctly classifying those with and without hoarding disorder, but the optimal cutoff score for older adults has more uncertainty around it than the cutoff score for younger and midlife adults. Furthermore, due to the fact that participants were drawn from multiple studies, there was variability in manner in which hoarding was assessed and diagnosed. Several of the studies from which data were drawn were conducted before the publication of the DSM-5, which marked a significant shift in how hoarding was conceptualized and diagnosed. However, many of the investigators who conducted the original studies were integrally involved in the development of the DSM-5 criteria for hoarding disorder. We were also unable to examine demographic characteristics beyond age that may be relevant to hoarding symptoms, such as socioeconomic status.

Finally, these data did not include sufficient numbers of college-age participants to conduct a meaningful analysis specifically of that age group. Accordingly, we cannot say with certainty that our recommendation of using the clutter subscale as a stand-alone hoarding screener would be an ideal choice for studies using undergraduate samples. One potential concern is that hoarding cases within college-age samples would be different from older samples in that they would be characterized by relatively lower levels of clutter due to having had fewer years to accumulate possessions. Therefore, investigators using undergraduate samples may be inclined to choose a cutoff with greater sensitivity. However, our analysis suggests this choice would come at the expense of specificity and would thus raise the risk of false positives.

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Table 1

Demographic characteristics and means (and standard deviations) for hoarding measures.

	Full sample		Hoarding participants by age group		
	Non-hoarding	**Hoarding**	**<40 years**	**40–60 years**	**> 60 years**
Sample size	575	541	42	279	203
Female%	60%	72%	76%	78%	61%
Age	43.26 (13.56)	56.48 (11.84)	30.69 (5.71)	52.54 (5.75)	67.22 (5.89)
Saving Inventory – Revised					
Total score	21.57 (18.22)	59.17 (13.56)	57.81 (13.74)	60.72 (13.52)	57.21 (13.62)
Difficulty discarding	7.91 (6.81)	19.09 (4.60)	18.86 (4.04)	19.40 (4.45)	18.68 (4.90)
Clutter	7.25 (7.61)	24.85 (6.70)	22.86 (6.31)	25.41 (6.55)	24.32 (7.08)
Acquisition	6.43 (5.51)	15.22 (5.35)	16.26 (5.87)	15.87 (5.37)	14.20 (5.05)
Hoarding Rating Scale	4.28 (5.67)	25.02 (5.40)	23.91 (5.66)	25.39 (5.19)	24.27 (5.95)
Clutter Image Rating	1.55 (0.56)	3.91 (1.64)	3.19 (1.02)	3.91 (1.60)	4.05 (1.75)
Saving Cognitions Inv.	57.49 (26.31)	103.78 (33.41)	116.93 (37.68)	108.55 (32.05)	92.83 (29.70)

Note: Hoarding age group subsamples do not include 17 hoarding participants for whom age data were missing.

Table 2

SI-R cutoff choices: Youden J Index, sensitivity, and specificity.

	Cutoff	*J*	Sensitivity [95%CI]	Specificity [95%CI]
Total score	35	0.72	95.75 [93.7, 97.3]	76.35 [72.7, 79.8]
	36	0.73	95.38 [93.3, 97.0]	77.39 [73.7, 80.7]
	37	0.73	94.09 [91.8, 95.9]	78.43 [74.8, 81.7]
	38	0.74	93.90 [91.5, 95.8]	79.83 [75.7, 82.5]
	39	**0.74**	**93.16 [90.7, 95.1]**	**81.22 [76.3, 83.0]**
	40	0.74	92.24 [89.7, 94.3]	81.91 [77.8, 84.3]
	41	0.74	91.31 [88.6, 93.5]	82.78 [78.5, 85.0]
	42	0.73	89.46 [86.6, 91.9]	83.30 [79.4, 85.8]
Difficulty Discarding subscale	11	0.63	96.31 [94.4, 97.7]	66.96 [63.0, 70.8]
	12	0.66	94.65 [92.4, 96.4]	70.93 [67.0, 74.6]
	13	**0.68**	**92.80 [90.3, 94.8]**	**74.91 [71.2, 78.4]**
	14	0.66	88.75 [85.8, 91.3]	77.16 [73.5, 80.5]
	15	0.65	84.87 [81.6, 87.8]	80.62 [77.2, 83.8]
	16	0.62	79.34 [75.7, 82.7]	82.53 [79.2, 85.5]
Clutter subscale	13	0.74	95.01 [92.8, 96.7]	78.72 [75.2, 82.0]
	14	0.74	93.72 [91.3, 95.6]	80.45 [77.0, 83.6]
	15	0.75	92.24 [89.7, 94.3]	82.87 [79.5, 85.9]
	16	0.75	90.39 [87.6, 92.7]	84.26 [81.0 – 87.1]
	17	**0.76**	**88.72 [85.8, 91.3]**	**86.85 [83.8, 89.5]**
	18	0.75	86.88 [83.7, 89.6]	88.06 [85.1, 90.6]
	19	0.72	82.99 [79.6, 86.1]	89.45 [86.7, 91.8]
Acquisition subscale	8	0.57	91.31 [88.6, 93.5]	65.91 [61.9, 69.8]
	9	0.59	87.62 [84.6, 90.3]	71.13 [67.2, 74.8]
	10	0.59	84.66 [81.3, 87.6]	74.78 [71.0, 78.3]
	11	**0.60**	**80.96 [77.4, 84.2]**	**79.48 [75.9, 82.7]**
	12	0.58	75.42 [71.6, 79.0]	82.96 [79.6, 85.9]
	13	0.55	70.61 [66.6, 74.4]	84.70 [81.5, 87.5]

Note: Bolded rows highlight optimal cutoff scores as determined by the criterion of maximizing *J*.

Table 3

Optimal Cutoffs [95% CI] for SI-R Total and Subscales Across the Lifespan.

	≤40 years (*n* = 296)		40–60 years (*n* = 497)		>60 years (*n* = 305)	
	Cutoff [CI]	**(Se, Sp)**	**Cutoff [CI]**	**(Se, Sp)**	**Cutoff [CI]**	**(Se, Sp)**
SI-R Total	43 [34, 47]	(90.48, 83.46)	39 [36, 46]	(93.55, 84.40)	33 [29, 52]	(95.57, 79.41)
Discarding	15 [13, 17]	(90.48, 78.74)	13 [12, 15]	(93.59, 78.18)	12 [11, 14]	(92.61, 75.49)
Clutter	17 [15, 20]	(88.10, 88.19)	15 [12, 19]	(93.21, 83.18)	16 [13, 18]	(88.18, 87.25)
Acquisition	11 [8, 12]	(85.71, 74.80)	8 [7, 11]	(90.00, 74.77)	9 [7, 11]	(85.22, 84.31)

Table 4

Convergent and divergent validity coefficients for the SI-R total score across the lifespan.

	Full sample	Age group		
		< 40 years	40–60 years	>60 years
Saving Cognitions Inventory (*N* = 317)	.78	.82	.80	.71
Hoarding Rating Scale Interview (*N* = 693)	.90	.84	.92	.87
Clutter Image Rating (*N* = 459)	.74	.74	.76	.69
DASS – Depression (*N* = 293)	.33	.35	.44	.27
DASS – Anxiety (*N* = 293)	.29	.42	.38	.08
DASS – Stress (*N* = 293)	.28	.41	.42	.07
Beck Depression Inventory (*N* = 433)	.51	.42	.59	.60
Beck Anxiety Inventory (*N* = 474)	.39	.38	.46	.61
ADHD Symptom Scale (*N* = 477)	.67	.63	.69	.70
Obsessive Compulsive Inv. – Revised (*N* = 528)	.16	.28	.25	.51

Note: DASS = Depression Anxiety Stress Scales. ADHD = Attention Deficit Hyperactivity Disorder. Sample sizes vary due to differences in which measures were included in the studies from which data were drawn.