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Assessing Older Adults' Obsessive-Compulsive Disorder Symptoms: Psychometric Characteristics of the Obsessive Compulsive Inventory-Revised

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Abstract

The lack of Obsessive-Compulsive disorder (OCD) symptom measures validated for use with older adults has hindered research and treatment development for the age group. We evaluated the Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002) with participants aged 65 and older ($N = 180$) to determine if the measure was an effective tool for evaluating obsessional symptoms. Participants completed the OCI-R and a comprehensive assessment battery up to four times over approximately 18 months. Results supported the well-replicated latent structure of the OCI-R (i.e., Washing, Checking, Ordering, Obsessing, Hoarding, and Neutralizing.). OCI-R total score was robustly associated with OCD symptoms assessed 18 months later by clinical interview, while scores on self-report measures of worry, general anxiety, and depression were not. Results

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indicate the OCI-R is an effective OCD symptom measure for older adults, although replication with additional older adult samples is needed.

Keywords

obsessive-compulsive disorder; aging; older adults; assessment; Obsessive Compulsive Inventory-Revised

Obsessive-Compulsive Disorder (OCD) is a common and often debilitating condition characterized by obsessions or compulsions that are time-consuming and cause significant distress or impairment (American Psychiatric Association [APA], 2013). OCD has been extensively studied in adults, adolescents, and children, while in comparison, research on OCD in older adults has been very limited (Wetherell, Lenze, & Stanley, 2005). Although there are several explanations for why OCD has been understudied in late-life (see Carmin, Calamari, & Ownby, 2012, for a review), the absence of well-validated OCD symptom measures for older adults has constrained research and made clinical evaluation more difficult. In their review of psychological assessment instruments for older adults, Edelstein et al. (2008) identified only one measure of OCD symptoms that had been validated with an older adult sample in a study by Stanley, Beck, and Zebb (1996).

Assessment of Older Adults' Obsessive-Compulsive Disorder Symptoms

Hersen and Van Hasselt (1992) concluded in their review of the assessment of anxiety and related symptoms with older adults that the measures used at the time were of limited value because they had not been directly evaluated with older adult samples. Direct evaluation of symptom measures with older adults is necessary as symptom presentation is often influenced by age cohort attitudes about mental health problems, developmental stage specific stressors (e.g., retirement; death of a spouse), and is often characterized by a greater focus on the somatic symptoms of anxiety (Cully & Stanley, 2008). Ayers, Thorp, and Wetherell (2009) concluded that progress on the assessment of older adults' generalized anxiety disorder (GAD) and posttraumatic stress disorder has been significant, although very limited information was available on the assessment of panic disorder, agoraphobia, specific phobia, social phobia, and OCD.

Stanley et al. (1996) completed the only prior psychometric evaluation of an OCD symptom measure with older adults. Participants completed the Padua Inventory (PI; Sanavio, 1988). An older adult group with GAD scored similarly to younger adults with GAD on all measures, while a nonclinical (NC) older adult group reported lower scores on all measures in comparison to mean scores reported by the younger NC adults. Internal consistency estimates for PI total score were high for both older adult groups, although subscale reliability was more variable for the NC older adult group.

The Obsessive-Compulsive Inventory Revised

The purpose of the present investigation was to evaluate the Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002) with a sample of older adults. The OCI-R is an

important measure to evaluate for possible use with older adults because the scale has shown excellent psychometric properties in evaluations of general adult clinical (e.g., Foa et al., 2002) and nonclinical (e.g., Hajcak, Huppert, Simmons, & Foa, 2004) samples. Further, the OCI-R measures multiple OCD symptom domains, is a sensitive measure of treatment response (Abramowitz, Tolin, & Diefenbach, 2005), and requires only a few minutes to complete (e.g., Grabill et al., 2008).

Although no prior psychometric studies have been conducted with the OCI-R with older adults, several investigators have administered the measure to study participants over age 65. Reports have largely been limited to score means and standard deviations. Teachman (2007) administered the OCI-R to a nonclinical community sample of older adults. Older adults' mean OCI-R subscale scores were similar to scores reported in prior evaluations of adult nonclinical samples. Scores on the OCI-R did not differ between Teachman's (2007) older adult group and her general adult sample with the exception of the hoarding subscale score. Older adults had higher scores. Magee and Teachman (2012) also administered the OCI-R to an older adult sample and an adult comparison group. OCI-R total score did not differ between age groups, although subscale comparisons were not reported. Reid et al. (2011) administered the OCI-R to a community sample of older adults (mean age 72.5) and found a mean total score of 14.7 ($SD = 12.8$), results comparable to Magee and Teachman's (2012), $M = 15.6$ (9.8).

In the present study, we conducted a comprehensive psychometric evaluation of the OCI-R with older adults. An older adult community sample completed the OCI-R and additional measures of anxiety, mood, and general functioning up to four times over approximately 18 months. The study is the first to evaluate the OCI-R longitudinally with older adults. We tested whether the identified latent structure of the OCI-R, well replicated in studies of general adult clinical and nonclinical samples, would emerge in our evaluation of older adults. In addition, we completed multiple reliability and validity analyses, including testing the stability of OCI-R scores over time. We hypothesized that if measurement error was low, OCI-R scores for our nonclinical sample should be strongly correlated across time points. We evaluated the convergent and discriminant validity of OCI-R scores, and our tests included evaluating whether OCI-R scores prospectively predicted obsessional symptoms later accessed via structured clinical interview.

Method

Participants

Participants were older adults recruited as part of a larger longitudinal study examining risk factors for anxiety disorders in late-life ($N = 204$; M age = 76.7, $SD = 6.9$; range 65–93). Recruitment sites included churches, senior centers, retirement communities, and social organizations for older adults located in the Chicago metropolitan and southeastern Wisconsin areas. As part of the larger longitudinal study, participants completed an extensive battery of cognitive functioning assessments, psychiatric disorder symptom

measures, and physical functioning and adaptive behavior evaluations ¹. Participants were evaluated up to four times at approximately six-month intervals.

Study inclusion criteria were an age of 65 years or older and an age and education adjusted scaled score on the Mattis Dementia Rating Scale – Second Edition (DRS-2; Jurica, Leitten, & Mattis, 2001) of 5 or higher, as scoring below 5 on the DRS-2 suggests moderate or more significant cognitive impairment. Of the 204 participants who completed time 1 assessment, three participants were excluded from analyses because of low scores on the DRS-2. OCI-R scores were available for 180 of the participants scoring above the DRS-2 cutoff at the time 1 assessment as the measure was added to the evaluation protocol shortly after the study was initiated. One-hundred and twenty-nine of the 180 time 1 participants were women.

Demographic information for the 180 older adults who completed the OCI-R at time 1 is shown in Table 1. Most participants reported their ethnicity as Caucasian, although almost 4% of the sample indicated their ethnicity was African American. Estimated mean income and education levels were higher for our sample in comparison to nationally representative older adult samples (e.g., Heeringa et al., 2007; Okura, Plassman, Steffens, Llewellyn, Potter, & Langa, 2010).

Study attrition—Attrition in the longitudinal study was significant but congruent with other longitudinal studies with older adults (Chatfield, Brayne, & Matthews, 2005). One hundred and fifty-three participants completed time 2 assessments, and 147 scored above the DRS-2 cutoff. OCI-R scores were available for 133 of the cognitively intact participants at time 2. At time 3, 114 participants completed assessment, and 111 scored above the DRS-2 cutoff and OCI-R scores available for 102. At time 4, 97 participants completed assessments, 96 scored above the DRS-2 cutoff, and OCI-R scores were available for 84 participants (participants who also had time 1 OCI-R scores).

Level of independent living—Independent living status was determined at the time participants entered the study (time 1 assessment). Living status was rated using a five-point ordinal scale: 1-continuous living support (i.e., received continuous support within a nursing home or other residential care facility); 2-assisted living (i.e., resided in settings that provided daily assistance with tasks of living such as bathing and dressing, but maintained an independent living space); 3-limited supported living within a retirement community (i.e., maintained an independent living space and performed most tasks of daily living independently); 4-independent living within a retirement community (i.e., maintained an independent living space, and functioned without assistance not regularly using community support services); and 5-independent living in the general community.

As shown in Table 1, approximately 68% of the participants were living without assistance in the community or in retirement community settings. An additional 27.8% of the sample maintained an independent living space in a retirement community or other supported setting and performed most tasks of daily living independently. Approximately 4.5% of the sample received extensive assistance with daily living activities.

¹A complete list of the assessment battery is available from the corresponding author upon request.

Measures

Demographic information—All participants were asked to report their date of birth, ethnicity, the highest level of education completed, and home address. Income level was estimated using average tax return data reported by the Internal Revenue Service for zip codes. Demographic characteristics of the sample are summarized in Table 1.

Clinical interview assessments of psychiatric disorder symptoms

Structured Clinical Interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 2002): Assessors completed the SCID mood, anxiety, and somatoform disorders sections (November 2002 revision) at initial (time 1) and final assessments (time 4) evaluating both current and lifetime symptoms. The evaluators were clinical psychology doctoral students trained to assess psychiatric disorder symptoms. All SCID raters underwent training that included viewing the interactive instructional videos created by the SCID developers. SCID raters also shadowed experienced raters during several SCID administrations before independently administering the SCID. SCID interviewers also rated the severity of Axis I disorder diagnoses using the Clinical Severity Rating Scale from the Anxiety Disorders Interview Schedule, a 9-point Likert scale (0–8) (Brown, DiNardo, & Barlow, 1994). Severity ratings were used to help determine primary diagnoses when multiple disorders were present. In prior studies, the inter-rater reliability of SCID has been moderate to excellent (e.g., Lobbetael, Leurgans, & Arntz, 2011; Zanarini et al., 2000). To estimate diagnostic reliability in the present study, 20 randomly selected SCID interviews were audio taped and evaluated by a second rater blind to the initial rater's diagnostic conclusions. Interrater agreement was 100% at the diagnosis level for specific disorders. Eighteen of the 20 participants evaluated by a second rater had no diagnoses as was expected for our nonclinical sample.

To test convergent validity in the present study, we created a SCID index score by summing all symptoms identified in the OCD section of the SCID. Because only four participants met diagnostic criteria for OCD at time 1 based on SCID evaluation, the OCD SCID symptom index score was intended to capture subclinical levels of OCD symptoms. Similar approaches for quantifying SCID-identified symptoms have been previously employed by several investigators (e.g., Bailey, Martin, Lynch, & Pollock, 2000; Simons et al., 2009). The potential range of the OCD SCID symptom index score was 10 (i.e., the 10 OCD SCID items scored 1, indicating the symptom was absent) to 30 (i.e., all symptoms present and scored 3). The scores for the present sample ranged from 10 to 30 at time 1 ($M = 10.41$, $SD = 2.30$) and time 4 ($M = 10.52$, $SD = 3.08$). The OCD SCID symptom index scores time 1 and time 4 were highly correlated, $r(81) = .81$, $p < .001$.

Hamilton Rating Scales (Hamilton Anxiety Rating Scale [HAMA], Hamilton, 1969; and Hamilton Depression Rating Scale [HAMD], Hamilton 1960): The HAMA and HAMD are widely used clinician-rated measures of anxiety and depression symptoms. Interviewers administered both structured interviews at each of the four assessment time points. The HAMA consists of 14 items designed to assess the somatic or psychological symptoms of anxiety, and the HAMD (24-item version) was used to rate depressive symptoms. Diefenbach and colleagues (2001) evaluated older adults and found that HAMA

and HAMD scores had good internal consistency ($\alpha = .85$ and $.84$, respectively). In the present study, HAMA and HAMD scores demonstrated good internal consistency, $\alpha = .83$ and $\alpha = .86$, respectively.

Self-report assessments of psychiatric disorder symptoms

Obsessive-Compulsive Inventory-Revised (OCI-R; Foa et al., 2002): The OCI-R is an 18-item measure of obsessive-compulsive symptoms. Individuals are asked to rate their symptoms over the past month on a five-point Likert-type scale from zero (“not at all”) to 4 (“extremely”). The reliability and validity of OCI-R scores have been very good in evaluations of adult clinical and nonclinical samples (e.g., Foa et al., 2002). The scale consists of six, three-item subscales: Washing, Checking, Ordering, Obsessing, Hoarding, and Neutralizing. Foa et al. (2002) found that OCI-R scores were strongly ($r = .53$) correlated with scores on the clinician-administered Yale-Brown Obsessive-Compulsive Scale (YBOCS; Goodman et al., 1989). The OCI-R has been translated into several different languages and is an effective OCD symptom measure across diverse cultures (e.g., Fullana, Tortella-Feliu, Caseras, Andin, Torrubia, & Mataix-Cols, 2005; Gnner, Leonhart, & Ecker, 2008).

Savings Inventory Revised (SIR; Frost, Steketee, & Grisham, 2004): The SIR is a 23-item questionnaire composed of three subscales, Excessive Clutter, Difficulty Discarding, and Compulsive Acquisition, and a scale total score. Items are scored on a Likert-type scale ranging from 0 (no problem) to 4 (very severe, extreme). Scores from the SIR have shown good internal consistency and construct validity (Frost et al., 2004). The measure has been used with older adults in multiple prior studies. The SIR was added later to the present study assessment protocol in response to the frequent identification of hoarding symptoms with our older adult sample. Internal consistency was evaluated using time 4 scores, which were associated with the largest sample size ($n = 83$). Internal consistency for the present sample for SIR total scores was high, $\alpha = .93$. Subscale scores demonstrated good to acceptable internal consistency: Excessive Clutter, $\alpha = .94$; Difficult Discarding, $.92$; and Compulsive Acquisition, $.77$.

Other Self-report symptom measures: Participants also completed the Penn State Worry Questionnaire (PSWQ; Meyer, Miller, Metzger, & Borkovec, 1990) an extensively evaluated measure of trait worry. In a sample of older adults, Stanley et al. (2001) reported strong convergent validity with other measures of worry and general anxiety and good discriminant validity from measures of depression. The internal consistency of PSWQ scores was high with the present older adult sample, $\alpha = .89$. Participants also completed Spielberger State-Trait Anxiety Inventory – Trait Scale (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983), a 20-item measure of individual differences in anxiety proneness. The STAI-T is a well-established general anxiety measure that has demonstrated good reliability and validity (Spielberger et al., 1983). Internal consistency with the present sample was high, $\alpha = .92$.

Participants completed the Geriatric Depression Scale (GDS; Yesavage et al., 1983), a 30-item scale structured to measure depression with older adults. Several studies found GDS

scores to be reliable and valid with older adults (e.g., Dunn & Sacco, 1989; Koenig, Meador, Cohen, & Blazer, 1988; Norris, Gallagher, Wilson, & Winograd, 1987). The internal consistency of GDS scores for the current sample was high, $\alpha = .89$.

Assessment of physical health

SF-36 Health Survey, Version 2 (SF-36; Ware, 2000): The SF-36 is a widely used measure of health status and health related quality of life. The measure assesses both physical functioning and mental health (Ware, 2000). Higher scores indicate better health. The SF-36 has well-established reliability and validity (Ware, Kosinski, & Gandek, 1998) and the measure has been used effectively with older adults (e.g., Schofield, & Mishra, 2004; Syddall, Martin, Harwood, Cooper, & Sayer, 2009). In the present study, we asked participants to complete the SF-36 at each assessment time point. Further, participants were provided with an additional copy of the measure and asked to have a friend or family member familiar with their health (e.g., spouse, adult child) complete the SF-36 based on their observation of the participant's functioning.

Because the scale was used to evaluate discriminant validity in the present study, we focused our analyses on the Physical Functioning subscale. The Physical Functioning subscale score is considered the best measure of physical health (Ware, 2000), and subscale questions focus on behavioral markers of physical functioning (e.g., able to climb several flights of stairs). The internal consistency of the Physical Functioning subscale score was high in prior evaluations of older women and men ($\alpha = .90$ and $.89$, respectively) and scores correlated with performance on a range of physical performance evaluation (Syddall et al., 2009). Internal consistency for the present sample for the Physical Functioning subscale score at time 1 for participants' self-report and for the participant's collateral report were high, $\alpha = .91$, and $.93$, respectively.

Cognitive functioning evaluation

Mattis Dementia Rating Scale-2 (DRS-2; Mattis, 1988; Jurica et al., 2001): Cognitive functioning was assessed with the DRS-2. Alternate forms of the DRS-2 (Schmidt, 2004) were administered across the four evaluation time points. The DRS-2 is a cognitive screening instrument that evaluates multiple aspects of cognitive functioning including attention, initiation and perseveration, construction, conceptualization, and memory. Subscale scores and a total cognitive functioning score are computed. The measure has well established reliability and validity (e.g., Green, Woodward, & Green, 1995; Schmidt, Mattis, Adams, & Nestor, 2005).

Procedures

Before initiation of data collection, the investigation was reviewed and approved by the Institutional Review Boards at the authors' university and at the data collection sites. Participants provided written informed consent prior to investigators acceptance of their self-report measures and initiation of clinical interview evaluations. Individuals indicating their willingness to participate in the study were first sent self-report measures to complete prior to a first meeting with an investigator. The order of the self-report symptom measures was counterbalanced such that each assessment appeared at the beginning, middle, and end

of the packet an equal number of times. Participants were provided a phone number to call if they had questions about the completion of self-report measures. All assessors were advanced doctoral students in clinical psychology who had completed extensive psychological assessment training. Two senior clinical psychologists (the first and second authors), experts in the diagnosis of anxiety and mood disorders and the evaluation of older adults, supervised the evaluation of study participants by the doctoral student assessors. All assessment results were reviewed with the senior clinicians in a case evaluation conference for verification of results.

Statistical Analyses

Latent structure: To determine if the latent structure of the OCI-R was similar to the well-replicated structure identified in prior studies with adult samples, we used confirmatory factor analysis (CFA) with robust maximum likelihood estimation (Satorra & Bentler, 1988). Robust estimation was used in light of significant multivariate skewness and kurtosis (e.g., Mardia's coefficient normalized, 50.12). We evaluated the fit of our data to the previously identified latent structure model of the OCI-R consisting of six correlated factors composed of three items each (e.g., Foa et al., 2002). We compared the fit of this model only to a unifactoral structure for comparison, as alternative latent structures have not been proposed for the OCI-R. To allow for direct comparison of our results to prior CFAs of the OCI-R, we first treated the OCI-R item scores as continuous. The goodness-of-fit of the model was estimated via four robust and commonly used indices: (1) chi-square, (2) non-normed fit index (NNFI), (3) comparative fit index (CFI), and (4) root mean-square error of approximation (RMSEA). We used EQS 6.1 (Bentler, 2006) to conduct analyses. Although OCI-R item scores have been treated as continuous in prior CFAs of the OCI-R (e.g., Hajcak et al., 2004; Roberts & Wilson, 2008), evaluation of item score distributions for our nonclinical sample suggested that the normality assumption was violated and scores might best be treated as ordered categorical data with an underlying continuous distribution (cf. Bentler, 2005). When ordered categorical data are treated as continuous, factor loadings are typically underestimated (Dolan, 1994) and the chi-square estimate of the model tends to be excessively large (Dolan, 1994; Green, Akey, Fleming, Hershberger, & Marquis, 1997). Therefore, we also conducted a second CFA with the OCI-R item scores treated as ordered categories using Byrne's (2006) procedure with EQS. Byrne's analyses uses estimations based on the polychoric correlation matrices that are posited to be robust. We evaluated fit using the same goodness-of-fit indicators after conducting this analysis.

Symptom differences: We tested for gender differences on OCI-R total score and subscale scores using independent group t-tests, and these analyses were conducted using SPSS 18. One-way repeated measures ANOVA was conducted using participants' OCI-R subscale scores to determine if our older adult sample experienced greater levels of specific types of OCD symptoms (e.g., reported more checking than contamination symptoms). To test if our older adults' report of obsessional symptoms with the OCI-R differed from the symptom level reports of younger adults, we computed the 95% confidence intervals around our sample's mean scores (total and subscale scores) and compared these scores to the scores reported in prior published studies of younger adults. Results were compared to the prior evaluations of six, English speaking, adult nonclinical samples described in four previous

studies (Foa et al., 2002; Hajcak et al., 2004; Hayes, Storch, & Berlanga, 2009; Teachman, 2007; Table 2).

Reliability and validity: To evaluate OCI-R total score and subscale score internal consistency, Cronbach's alpha was computed. Score stability across assessment time points was tested using Pearson correlation coefficients. Simple correlations and multiple regression analyses were conducted to test convergent and discriminant validity.

Results

Sample Psychiatric Disorder Symptoms

Our community sample's psychiatric disorder symptom levels were congruent with levels of anxiety and depression reported for other older adult nonclinical samples (e.g., Grenier et al., 2011; Gum, King-Kallimanis, & Kohn, 2009; Mackenzie, Reynolds, Chou, Pagura & Sareen, 2011; Mojtabai & Olfson, 2004)². SCID evaluations revealed that four participants met DSM-IV diagnostic criteria for OCD at time 1 evaluation, approximately 2% of the sample. Symptom severity ratings for these four people varied from mild to moderate. Two of the four participants with OCD had predominant hoarding symptoms. Furthermore, at time 1, 14 additional participants without OCD met diagnostic criteria for anxiety disorders, most often with mild symptoms. An additional five participants without OCD or anxiety disorders met criteria for mood disorders at time 1 (major depression, $n = 4$; bipolar I disorder, $n = 1$). No participants met diagnostic criteria for a somatoform disorder.

Factor Structure of the OCI-R

Factors were allowed to covary while errors were specified as uncorrelated in the CFA with robust maximum likelihood estimation. Treating the OCI-R item scores first as continuous in analyses, the six factor model had a significant Chi-square, $\chi^2(120) = 163.31$, $p = .005$; a NNFI of .92; a CFI of .94; and an RMSEA of .045, 90% CI [.025 – .061]. These values suggested a generally adequate fit for the model (Hu & Bentler, 1999; Tabachnick & Fidell, 2007) and values were comparable to those reported in prior studies (Foa et al., 2002; Hajcak, et al., 2004; Roberts & Wilson, 2008). For comparison, a single factor model was tested and fit indices suggested poor fit, $\chi^2(135) = 360.11$, $p < .001$, NNFI = .671, CFI = .662, and RMSEA = .097. Conducting CFA with the OCI-R item scores treated as ordered categories using Byrne's (2006) procedure with EQS revealed a significant chi-square, $\chi^2(120) = 161.21$, $p < .05$; a NNFI of .983; a CFI of .986; and a RMSEA of .044, 90% CI [.024 – .060]. Based on recommended criteria, these values suggested an excellent fit of our older adult sample's data to the model.³

Internal Consistency and Score Stability

Cronbach's alpha for OCI-R total score at time 1 was high, $\alpha = .87$. Subscale score internal consistency at time 1 was acceptable for all subscale scores (Washing, .73, Checking, .73,

²A detailed breakout of all participants' primary and secondary disorder diagnoses is available from the corresponding author.

³We tested an alternative five-factor model eliminating the Neutralizing subscale items because of reliability problems (reported below). Again treating scores as ordered categories, we found a significant chi-square, $\chi^2(80) = 108.04$, $p < .05$; a NNFI of .984; a CFI of .988; and a RMSEA of .044, 90% CI [.018 – .064].

Ordering, .87, Obsessing, .72, Hoarding, .73) with the exception of Neutralizing (.59). The correlations between OCI-R total score and subscale scores at time 1 were high, .66 (Obsessing) to .81 (Checking). This suggested that the subscales all measured a common construct, OCD symptoms. The correlation between OCI-R subscale score at time 1 ranged from small ($r = .20, p = .006$; Washing-Hoarding) to medium ($r = .53, p < .001$; Checking-Neutralizing) suggesting that the symptom subscales were related but not redundant.

To evaluate the temporal stability of OCI-R scores, we examined score correlations across the four assessment times. Time 1 OCI-R total score was highly correlated with time 2 total score, $r(133) = .73, p < .001$. The relationship between time 1 and 2 OCI-R subscale scores was similar: Washing, $r(132) = .72, p < .001$; Checking, $r(133) = .63, p < .001$; Ordering, $r(133) = .67, p < .001$; Obsessing, $r(133) = .65, p < .001$; Hoarding, $r(133) = .71, p < .001$; and Neutralizing, $r(133) = .73, p < .001$. Time 1 and time 3 OCI-R total scores were also highly correlated, $r(100) = .79, p < .001$; and subscale score correlations ranged between .61 (Washing) to .81 (Neutralizing). The time 1 to time 4 OCI-R total score correlation was also large, $r(85) = .80, p < .001$; subscales, .47 (Obsessing) to .80 (Neutralizing). Limiting analyses to only participants with OCI-R scores available at all four time points resulted in a similar pattern of correlations between OCI-R total scores at time 1 and later OCI-R total scores, .79, .84, .82, $p < .001$; time 2 through time 4, respectively.

Older Adults' OCI-R Scores

Outlier analyses with time 1 data revealed no univariate outliers ($z > 3.29, p < .001$) for OCI-R total score. More variability was found among OCI-R subscale scores, which could range from 0 to 12 (Table 2). Univariate outliers were identified on all subscales except Hoarding and Ordering: Washing ($n = 3$), Checking ($n = 1$), Obsessing ($n = 2$), and Neutralizing ($n = 5$). Because there were relatively few outlier scores, we chose not to exclude participants with outlier subscale scores from analyses, although we evaluated the influence of these scores on statistical test results.

There were no gender differences on OCI-R total score at time 1 or on the Washing, Checking, Ordering, and Obsessing subscale scores. On the Hoarding subscale, women ($M = 4.2, SD = 3.0$) scored higher than men ($M = 2.9, SD = 2.3$), $t(120.91) = 3.12, p = .002$, while on the Neutralizing subscale, men reported higher scores ($M = 1.6, SD = 2.2$) than women ($M = 0.9, SD = 1.6$), $t(73.58) = 2.02, p = .047$.

Next, we conducted repeated measures ANOVA with time 1 subscale scores to test whether our older adult sample experienced some types of OCD symptoms more often (e.g., reported more contamination than checking symptoms). Because of violations of sphericity, we interpreted multivariate results. Analyses revealed significant differences between symptom subscale scores, Pillai's Trace = 0.61, $F(5, 175) = 53.795, p < .001, \eta^2 = .61$. Pairwise comparisons between subscale means (Bonferroni corrected) revealed multiple differences (see Table 2). Specifically, Washing and Neutralizing subscale scores were lower than other subscale scores. Hoarding subscale scores were higher than scores reported on any other subscale.

To compare our older adults sample's reporting of obsessional symptoms with the OCI-R to other age groups' scores on this measure, we tested total score and subscale score differences in comparison to score reported in studies with nonclinical adult samples (Table 2). The OCI-R scores reported in prior nonclinical sample studies were moderately variable (mean OCI-R total score range, 11.6 to 18.9; Table 2). The present older adult sample's OCI-R total score was significantly lower than the scores reported in two prior studies with student samples (Foa et al., 2002; Hajcak et al., 2004). The present older adult sample's Hoarding subscale scores were higher than scores reported by Hayes et al.'s (2009) nonclinical sample, although no other reliable differences were found. Our sample's OCI-R total and subscale scores did not differ from Teachman's (2007) older adult group with the exception of the Obsessing subscale score, which was higher (Table 2).

Convergent and Discriminant Validity

Cross-sectional relationships—Analyses using time 1 data ($n = 180$) revealed that OCI-R total score correlated with the time 1 SCID OCD symptom index score, $r(178) = .29$, $p < .001$, as did most of the OCI-R subscale scores, $r(178) = .29$ (Washing), $r(178) = .18$ (Checking), $r(178) = .22$ (Ordering), $r(178) = .21$ (Obsessing), $r(178) = .20$ (Hoarding), all $ps < .05$. The Neutralizing subscale was not included in validity analyses because of poor internal consistency reliability. OCI-R total score was also related to self-report and clinical interview measures of anxiety and depression, PSWQ, $r(178) = .39$, $p < .001$; STAI-T, $r(177) = .45$, $p < .001$; GDS, $r(175) = .36$, $p < .001$; HAMA, $r(178) = .29$, $p < .001$; and HAMD, $r(178) = .26$, $p < .001$, but was unrelated to physical functioning measured on the Physical Functioning subscale of the SF-36 (SF-36 PF) whether self-reported or collateral reported, $r(177) = -.14$, $p = .06$; $r(78) = -.18$, $p = .11$, respectively.

Longitudinal relationships—To more stringently test OCI-R score convergent and divergent validity, we examined longitudinal relationships (Table 3). Because the cross-sectional relationships between time 1 measures did not reliably differ when analyses were conducted with all time 1 participants ($n = 180$) in comparison with analyses conducted only with participants completing time 1 and time 4 assessments ($n = 84$), all the correlation reported in Table 3 (both cross sectional and longitudinal relationships) included only the latter group for consistency. The correlations shown in Table 3 are for participants who scored above the DRS-2 cutoff at time 1 and time 4, and who had OCI-R scores available at both times.

As shown in Table 3, time 1 OCI-R total score was significantly correlated with the OCD SCID symptom index score at time 4. The only time 1 measure scores correlated with time 4 OCD symptoms assessed with the SCID were OCI-R and HAMA scores, $rs = .38$ and $.23$ respectively (Table 3). Additionally, time 1 OCI-R total score and time 1 OCI-R Hoarding subscale score correlated with the time 4 Savings Inventory Revised (SI-R) total score, which was available for a sufficient number of participants only at time 4 ($n = 83$). All other time 1 OCI-R subscale scores (not shown in Table 3) were correlated with time 4 SIR total score, although the association was not as strong except for the Checking subscale, $r(81) = .50$, $p < .001$; other subscales, $.44$ (Checking) to $.30$ (Obsessing). In regression analyses with

all time 1 OCI-R subscale scores entered as predictors of time 4 SIR total score, only the Hoarding subscale score was a significant predictor, $\beta = .56$, $t = 5.75$, $p < .001$, $sr^2 = .20$.

Next, we conducted additional analyses with the two time 1 measures that predicted the time 4 OCD SCID symptom index score, the clinical interview HAMA score and OCI-R total score. We conducted a regression analysis to test incremental validity. In the model, time 1 OCI-R total score and time 1 HAMA score were entered as predictors of time 4 OCD SCID symptom index score. Both predictor variables' scores were square root transformed, which substantially reduced deviation from normality. The regression model including both variables predicted time 4 OCD SCID symptom index score, $F(1,80) = 4.65$, $p = .012$, adjusted $R^2 = .082$. In the model, OCI-R time 1 total score remained associated with time 4 OCD symptom index score, $\beta = .23$, $t = 2.21$, $p = .03$, $sr^2 = .055$, although time 1 HAMA score did not, $\beta = .10$, $t = 0.87$, $p = .39$, $sr^2 = .008$. Regression casewise diagnostics revealed that two cases had large (> 3.00) standardized residuals. Evaluation of the two cases revealed that both participants met diagnostic criteria for OCD time 1 and time 4. Removal of the cases from analyses reduced the relationship between OCI-R time 1 total score and time 4 OCD symptom index score to a trend, $\beta = .21$, $t = 1.74$, $p = .086$, $sr^2 = .037$, while time 1 HAMA score continued to be unrelated to time 4 OCD symptom index score.

Discussion

We found that the OCI-R had strong reliability and validity in our evaluation of older adults, results congruent with evaluations of the measure with other adult groups. Our analyses of OCI-R latent structure supported the six-factor model well replicated with other age groups. The symptom dimensions corresponded to the most frequently identified symptom subtypes of OCD (cf. McKay et al., 2004). Further, each symptom subscale had acceptable internal consistency reliability with the exception of the Neutralizing subscale, a finding also reported in prior studies with adult samples (e.g., Foa et al., 2002; Hajcak et al., 2004). Additionally, our nonclinical older adult sample reported total OCD symptom levels and specific symptom subtype scores that were equivalent to the symptom reporting of other nonclinical adult samples suggesting that the OCI-R was an adequately sensitive measure of OCD symptoms, and that older adults' experience of obsessions and compulsions might be similar to other age groups. Caution regarding the latter conclusion in particular is warranted because as Stanley et al. (1996) pointed out, an equivalent mean score on a symptom measure does not indicate that older adults experience the same pattern of symptoms as other age groups. Nonetheless, our findings that older adults report similar symptom levels on the OCI-R is important because of suggestions that this age group might experience some anxiety or related disorder symptoms very differently (e.g., Cully & Stanley, 2008) or might be broadly less inclined to perceive or report mental health symptoms (e.g., Davies, Sieber, & Hunt, 1994).

We found that nonclinical older adults' total and subscale OCI-R scores were stable across assessment times, which suggested that measurement error was low. Our finding that subscale scores were stable over time is congruent with reports in the OCD symptom heterogeneity literature. Although some variability is seen in obsessional symptoms over

time (e.g., changes in the contaminant feared), the concerns of most OCD patients remain focused within a specific symptom dimension (e.g., contamination; Mataix-Cols et al, 2002).

We found strong support for OCI-R validity. Although OCD symptom measures had limited variability because of our nonclinical sample, significant correlations were found. In longitudinal analyses, only time 1 OCI-R and HAMA scores were related to time 4 OCD SCID index score, and further analysis indicated that the relationship was more robust for the OCI-R measure.

Although compulsive hoarding appears to have an onset early in life, there is increasing evidence that hoarding is a significant public health problem for older adults (e.g., Turner, Steketee, & Nauth, 2010). Hoarding symptom severity appears to increase each decade of life (Ayers et al., 2010) resulting in affected older adults having severe and debilitating symptoms. Because of the detrimental effect of compulsive hoarding on late-life functioning and the relatively high levels of hoarding symptoms reported by our older adult nonclinical sample, we added additional hoarding symptom measures to our study protocol over time, and conducted focused analyses on hoarding symptoms. Initial OCI-R Hoarding subscale scores correlated with scores on the SIR, a well-validated hoarding symptom measure, 18-months later. Because simple correlations were found between other time 1 OCI-R symptom subscale scores and later SIR scores, we tested incremental validity and found that only the Hoarding subscale predicted significant variance in later SIR score after controlling for the OCD symptoms measured by the other OCI-R subscales. These findings suggest that the Hoarding subscale of the OCI-R could function as a brief but useful screening measure for older adults hoarding difficulties.

Although our findings support the use of the OCI-R as an OCD symptom measure with older adults, several methodological limitations of our study must be noted. First, as a self-report instrument, responses on the OCI-R may have been subject to social desirability or other types of response biases. Additionally, the information obtained from the OCI-R is not sufficient to diagnose OCD, although the short time required for the measures' administration (i.e., an average of five minutes in our older adult sample) suggests the OCI-R could be an efficient screening instrument.

Additional study limitations include our relatively small sample size at initial assessment, and the significant study attrition that occurred over the investigation. In preliminary evaluations of reasons for attrition in our study, Socha, Calamari, and Woodard (2013) found that initial OCI-R total score was one of few measures related to study drop out, although the Odds Ratio was small (1.05). Noting that the Hoarding subscale contributed substantially to OCI-R total score, we are conducting further analyses to determine how specific types of symptoms are related to attrition. Nonetheless, the relationship between OCD symptoms and study drop out complicates understandings of the symptom measure evaluated in this study.

Although we made significant efforts to recruit a diverse older adult sample, we had limited success. Study participants were predominantly Caucasian, and our sample was better educated and more affluent than nationally representative samples of the current cohort of

older adults. It is unclear if results would have been different with a more representative older adult sample, and attempts to replicate findings with more representative and ethnically diverse older adult are needed.

Additional research is needed with older adults to evaluate a broad range of OCD symptom measures, including clinical interview assessments of the disorder. There is also a need for additional evaluations of measures of OCD and anxiety related condition symptoms (e.g., hoarding; hypochondriasis). Although little is known about late-life OCD, less is known about OCD-related conditions and how they affect older adults (Carmin et al., 2012). The rapid aging of the population and the increased mental health needs of the next older adult cohort should make focused attention on assessment and treatment of this age group a public health priority.

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Highlights

- Obsessive-compulsive (OC) symptom measures have not been validated with older adults curtailing research and treatment.
- We evaluated the Obsessive Compulsive Inventory-Revised (OCI-R) with participants aged 65 and older.
- OCI-R total score was robustly associated with OC symptoms assessed 18 months later.
- Results indicate the OCI-R is an effective OC symptom measure for older adults.

Table 1

Participant Characteristics

		<i>M</i>	<i>SD</i>
Age		76.9	(7.1)
		<i>N</i>	%
Gender	Male	51	28.3%
	Female	129	71.7%
Ethnicity	Caucasian	166	92.2%
	African American	7	3.9%
	Hispanic	1	0.6%
	Other	6	3.3%
Education	High school not completed	16	8.9%
	High school degree	40	22.2%
	One to three years of college	42	23.3%
	Bachelor's degree	40	22.2%
	Some graduate study	6	3.3%
	Master's degree or higher	36	20.1%
Income Level	\$0 – \$50,000	58	31.7%
	\$50,000 – \$100,000	39	21.7%
	\$100,001 – \$150,000	54	30.0%
	\$150,001 – \$200,000	5	2.8%
	\$200,000+	24	13.3%
Living Situation Classifications	5- Independent-Community	110	61.1%
	4-Independent-Retirement	12	6.7%
	3-Support-Retirement	50	27.8%
	2-Assisted Living-Retirement-	7	3.9%
	1-Continuous Support	1	< 1%

Note. Demographic information is provided for the 180 participants who completed the *Obsessive Compulsive Inventory-Revised* during the first evaluation session of an 18-month longitudinal study.

Table 2

Older Adults' Scores on the Obsessive Compulsive Inventory-Revised Compared to Scores Reported in Studies with Adult Nonclinical Samples

Study	Population	N	Age	Total score	Washing	Checking	Ordering	Obsessing	Hoarding	Neutralizing
Current Older Adult Sample		180	76.9	12.31 (9.32)	0.97 ¹ (1.76)	1.86 ² (2.07)	2.80 ³ (3.00)	1.77 ² (2.07)	3.85 ⁴ (2.90)	1.07 ¹ (1.81)
Foa et al. (2002)	Students	477	----	18.82a (11.10)	2.41a (2.50)	2.91a (2.56)	4.4a (3.03)	2.86a (2.72)	4.41 (2.67)	1.82a (2.20)
Teachman (2007) *	Adult community sample	222	----	11.58 (14.95)	0.83 (1.62)	1.78 (2.10)	3.28 (2.76)	1.28 (1.62)	3.35 (2.78)	1.06 (1.78)
	Older adult community sample	112	----	11.85 (13.86)	0.64 (1.13)	2.07 (2.10)	2.91 (2.52)	1.08b (1.27)	4.24 (3.44)	0.91 (1.26)
Hayes, Storch, & Berlanga (2009)	Community sample	354	32.3	11.25 (11.19)	1.23 (2.10)	1.76 (2.28)	2.76 (3.02)	1.79 (2.59)	2.51b (2.70)	1.21 (2.12)
Hajcak, Huppert, Simons, & Foa (2004)	Students, mostly women	395	----	18.91a (11.38)	2.41a (2.55)	2.95a (2.64)	4.48a (3.16)	2.92a (2.82)	4.44 (2.82)	1.78a (2.20)
	Students, mostly women	221	----	11.95 (9.31)	1.58a (2.06)	1.32a (2.11)	3.01 (2.71)	1.73 (2.31)	3.31 (2.33)	1.00 (1.60)

Note. Significant differences between subscale scores for the current older adult sample are indicated by different numeric superscripts. Statistically significant differences between the current older adult sample's *Obsessive Compulsive Inventory-Revised* (OCI-R) total scores and subscale scores and score reported in prior studies are indicated by letter subscripts (a = higher score; b = lower score).

* Indicates the total score mean and standard deviation or study sample size was estimated based on limited information provided in the published report. Mean age was not reported for several samples. Teachman's (2007) younger group's age ranged between Age 18–64 and the older group's age was 65 years-old or older.

Table 3

Cross-sectional and Longitudinal Relationships between Obsessive Compulsive Inventory-Revised Scores and Measures of Obsessive-Compulsive Symptoms, Anxiety, Depression, and Physical Health

Time		Time 1										Time 4					
Time 1	Construct	Measure	Convergent Validity										Divergent Validity				
			1.	2.	3.	4.	5.	.6	7.	.8	9.	10.	OCD SCID	SIR total	PSWQ	HAMA	SF-36 PF-self
OCD		1. OCI-R total	—										.38*	.64*	.45*	.30*	-.20
		2. OCD SCID	.31*	—								.81*	.12	.02	.32*	-.26*	
		3. OCI-R hoarding	.73*	.10	—							.22	.67*	.26*	.16	-.04	
Divergent Validity																	
Anxiety		4. PSWQ	.46*	.07	.22*	—						.05	.33*	.75*	.35*	-.20	
		5. STAI-T	.54*	.22*	.33*	.56*	—					.17	.44*	.52*	.57*	-.33*	
		6. HAMA	.38*	.27*	.24*	.41*	.60*	—				.23*	.22	.28*		-.33*	
Depression		7. GDS	.41*	.20	.28*	.48*	.54*	.63*	—			.11	.30*	.41*	.50*	-.27*	
		8. HAMD	.31*	.18	.19	.28*	.60*	.85*	.61*	—		.18	.23*	.23*	.56*	-.19	
Physical Functioning		9. SF-36 PF-self	-.18	-.20	-.09	-.16	-.43*	-.47*	-.42*	-.37*	—	-.05	-.13	-.15	-.41*	.75*	
		10. SF-36 PF-C	-.12	-.01	-.13	-.21	-.38*	-.39*	-.47*	-.41*	.49*	-.01	-.18	.26	-.28	.41*	

Note. OCD = obsessive-compulsive disorder; OCI-R = Obsessive-Compulsive Inventory Revised, total score, and Hoarding subscale score (OCI-R hoarding); OCD SCID = OCD symptom index score which was computed by summing items endorsed on the OCD section of the Structured Clinical Interview for DSM-IV; PSWQ = Penn State Worry Questionnaire; Spielberger State-Trait Anxiety Inventory – Trait Scale; HAMA = Hamilton Anxiety Rating Scale; HAMD = Hamilton Depression Rating Scale; GDS = Geriatric Depression Scale; SF-36 PF-self = the Physical Functioning subscale of the SF-36 Health Survey, Version 2, self-reported by the participant (self), or completed by the participants collateral (C); SIR total = Savings Inventory Revised total score.

*
p < .05