**Supplemental Materials**

**Supplemental Methods**

Clinical and neuropsychological assessments

All assessments are detailed below. Screening assessments were conducted by the research associate at MHASF (GH). For those screened via telephone, physical copies of the Clutter Image Rating scale (CI-R) were mailed to the participant prior to participation or sent via email if preferred. Baseline assessments were conducted between 1 and 4 weeks prior to the start of group treatment. The clinical assessments were conducted by the postdoctoral psychologists (CYC and SU), and the neuropsychological assessments were conducted by the UCSF research associates (OV, KK, and LE), under the supervision of a neuropsychologist (RSM).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Assessment** | **Time** | **Frequency** | **Timing** | **Purpose** |
| Saving Inventory, Revised | 5 min | Three times | Pre-tx, post-tx, long | Screening, outcome |
| UCLA Hoarding Severity Scale | 2 min | Once | Pre-tx | Screening |
| Clutter Image Rating\* | 1 min | Twice | Pre- and post-tx | Screening, outcome |
| Saving Cognition Inventory | 5 min | Twice | Pre- and post-tx | Outcome |
| Activities of Daily Living for HD | 3 min | Three times | Pre-tx, post-tx, long | Outcome |
| Swanson, Nolan and Pelham ADHD Rating | 3 min | Once | Pre-tx | Predictor |
| Structured Interview for HD | 30 min | Once | Pre-tx | Inclusion |
| Mini International Neuropsych Interview  | 15 min | Once | Pre-tx | Inclusion, predictor |
| Montreal Cognitive Assessment | 5 min | Once | Pre-tx | Exclusion |
| Beck Depression Inventory | 2 min | Twice | Pre- and post-tx | Predictor |
| Beck Anxiety Inventory | 2 min | Twice | Pre- and post-tx | Predictor |
| Neuropsych battery | 60 min | Twice | Pre- and post-tx | Predictor, outcome |
| Treatment evaluation | 2 min | 16 times | Weekly during tx | Outcome |
| Beliefs assessment | 2 min | Twice | Pre- and post-tx | Predictor |
| Continuing support assessment | 2 min | Once | Longitudinal | Predictor of long-term outcome |

**Table S1:** Assessments at pre-treatment (including screening questionnaires), post-treatment, and longitudinal follow up. Tx=treatment. \*In the G-CBT condition, the Clutter Image Rating was also administered by the psychologists at two additional timepoints, once three weeks after the start of the group, and once after week 15, during the home visits.

Compensation for Participation

All participants were financially compensated for their time. Participants were compensated $30 at the completion of the pre-treatment assessments and neuropsychological testing, and $70 at the completion of the post-treatment assessments and neuropsychological testing. If participants completed either the post-treatment questionnaires or the neuropsychological testing, but not both, they were compensated $30. Participants who re-consented and completed the longitudinal assessments were compensated an additional $20.

**Assessments**

Saving Inventory-Revised (SI-R)(1): The SI-R was used both as the primary outcome measure and as one of three initial screening measures. The SI-R is a 23-item self-report questionnaire that measures problems with acquisition, clutter, and difficulty discarding, as well as associated distress and impairment/interference. Each question is scored on a four-point Likert scale ranging from 0 (none or no symptoms) to 4 (very much or extreme); the total possible score is 96, with higher scores indicating more severe hoarding symptoms. The SI-R has three subscales (difficulty discarding, acquisition, and clutter). Mean scores for help-seeking individuals with hoarding are generally in the 60s(2-4). The SI-R has good test-retest reliability (kappa=0.86), internal consistency (Cronbachs’ alpha between 0.91 and 0.94), and reliably discriminates between HD and community controls(5). A cutoff score of 41 has been suggested as optimal to identify HD based on receiver operating characteristic (ROC) graphs(2); our inclusion criteria required an SI-R score of >41. A change score (improvement) of 14 points or more was used as the criterion for clinically significant improvement based on previous studies using this measure as the outcome(6, 7). Remission was defined as a change score of 14 points or more plus a post-treatment SI-R score of 41 or less(8).

The Activities of Daily Living Scale for Hoarding Disorder (ADL-H) (9) assesses functional impairment due to hoarding symptoms. The ADL-H is a self-report measure containing 15 items that are scored on a 5 point scale (“can do it easily” to “unable to do”). Although the ADL-H items can be summed, resulting in a total possible score of 75, the mean score of the individual items is more typically used, to account for items that are not relevant to a particular individual (e.g., clutter on stairs). Mean scores for individuals with hoarding range between 1.95 and 2.2; community controls have mean scores around 1.15(9). The ADL-H has good internal reliability (alpha = 0.96), test-retest reliability (r = 0.79) and good inter-rater reliability (r=0.71)(9). Previous studies have found changes of ~0.5 points (approximately 25%) using the item mean scoring method following treatment for hoarding(6, 10).

UCLA Hoarding Severity Scale (UHSS)(11): The UHSS is a 10-item clinician-administered instrument that was designed to be used in conjunction with a clinician interview. The UHSS uses a Likert scale scoring system from 0 to 4 for each question and assesses clutter, acquisition, and difficulty discarding, as well as the individual’s level of shame associated with hoarding behaviors, his/her impairment in social relationships due to hoarding, procrastination, and difficulty making decisions. The authors have proposed a cutoff score of >20 to indicate clinically significant compulsive hoarding(11). The UHSS has good internal consistency (Cronbach’s alpha = 0.70) (12).

The Clutter Image Rating Scale (CI-R)(13): The CI-R is a series of 9 photographs each of a kitchen, living room, and bedroom depicting varying levels of clutter, and was used as an adjunct to visually measure the severity of clutter. Participants select the photograph that most closely resembles each of the three rooms in his/her home. Each room is scored on a scale of 1-9, for a total possible score of 27. Scores of ≥4 on each of the three rooms are typically considered clinically significant(13). For houses with multiple bedrooms, the bedroom in primary use was scored. A score of ≥12 on the CI-R was used as the cutoff in the screening portion of the study, as we have done in previous studies(14, 15). Internal consistency (*α*=.84), test–retest reliability (*r*=.82), and inter-rater reliability (*r*=.94) for the CI-R are high (13). For individuals who lived in a single room, their CI-R score for the room that they rated was tripled for this purpose (there were no individuals who lived in only two rooms in this study).

The Structured Interview for Hoarding Disorder (SIHD)(16, 17) was used to confirm a diagnosis of HD. The SIHD is a semi-structured clinical interview instrument that is designed to assess for Hoarding Disorder (HD) according to the proposed DSM-5 criteria. The SIHD assesses hoarding behaviors and distress and interference associated with hoarding behaviors and/or with discarding items, as well as assessing for potential confounders or alternate diagnoses, such as autism or schizophrenia.

The Mini International Neuropsychiatric Interview (MINI) (18) was used to assess presence of lifetime and current history of psychiatric disorders prior to randomization. The MINI assesses for presence of all major psychiatric disorders (mood, anxiety, psychotic and substance use disorders, among others)(18). The MINI has good reliability and validity, and is widely used in neuropsychiatric research as a brief diagnostic screen.

Saving Cognitions Inventory (SCI): Hoarding beliefs were assessed using the Saving Cognition Inventory(19). The SCI is a 24-item scale assessing four types of beliefs and attitudes about possessions (emotional attachment, need to control, responsibility, memory). Responses range from 1 (not at all agree) to 7 (very much agree), with higher scores indicating stronger hoarding related beliefs. The total possible score is 168. The SCI has high internal consistency, and convergent and discriminant validity(19, 20). Average scores for individuals with HD are around 100(19); improvement in SCI scores has been shown to mediate improvement in hoarding symptom severity following treatment(21).

The Beck Depression Inventory (BDI-II), Second Edition and the Beck Anxiety Inventory (BAI) (22, 23) were used to assess current depression and anxiety symptoms both pre- and post-treatment. Both the BDI-II and the BAI are 21 item self-report questionnaires. The BDI was designed to measure severity of current depressive symptoms, and the BAI was designed to measure severity of current anxiety symptoms. Items are scored on a 0-3 scale. The total possible score on each measure is 63. Higher scores indicate more severe depressive or anxious symptoms. The total score on each of these measures was included in the analyses to control for the influence of concurrent depressive and/or anxiety symptoms on the outcomes.

The Swanson, Nolan and Pelham Questionnaire (SNAP-IV)(24) was used to assess symptoms of attention, concentration, hyperactivity and impulsiveness. The SNAP-IV consists of 10 inattentive and 10 hyperactive-impulsive symptoms, all rated on a 4-point scale from not at all to very much. Higher scores indicate more severe symptoms. The SNAP-IV total score has an area under the curve of 0.90, with an optimal cutoff score of 24.5 to identify ADHD(25). The SNAP-IV items were summed, and the total score was included in the analyses to assess the influence of ADHD symptoms on the outcomes.

The Montreal Cognitive Assessment (MoCA)(26, 27) was used to assess for symptoms of cognitive impairment and to exclude individuals with dementia. The MoCA was administered by the clinicians who conducted the clinical interviews. Individuals who scored ≥17 of a total possible 30 (considered moderate to severe dementia) were excluded(27).

Beliefs About Treatment Questionnaire (Figure S1): This questionnaire was designed by our partners at MHASF and was intended to assess participants’ preferences for treatment type and beliefs about how beneficial group therapy for hoarding would be (or was, post-treatment) in general, and in particular, how beneficial they would find (or found) PFT or CBT. Questions were asked on a scale of 1 to 5 (e.g., strong preference against to strong preference for each treatment. For this study, preferences were examined for their association with treatment outcome by correlating preference (measured as strong preference (strongly agree) for CBT or PFT or no preference (somewhat agree/disagree or neither agree nor disagree) with the outcome measure.

Homework Completion Questionnaire (Figure S2): This questionnaire assessed the amount of time spent organizing, sorting, discarding, active planning and strategizing for discarding, maintaining progress, and on the assigned homework. Whether or not participants met their own personal goals for the week was also assessed.

Bi-weekly Group Evaluation (Figure S3): This questionnaire assessed the participants’ perceived benefits from participation in the group treatment, the quality of the groups, and several aspects of group participation, including meeting with a clutter buddy, reducing clutter, etc.

Continuing Support Questionnaire (Figure S4): This questionnaire was designed by the MHASF research team for the longitudinal assessment component, and asks about types of ongoing support or treatment that may have been continued by the participants after the formal end of the treatment study.

Neuropsychological assessments were conducted at baseline and post-treatment and administered by research staff trained in the administration of neuropsychological assessments, overseen by a licensed neuropsychologist (RSM). The assessments are listed briefly below. Further details are provided in Uhm et al.(28).

The neuropsychological assessment battery took approximately one hour to complete and included the Brief Visuospatial Memory Test–Revised (BVMT- R; visual learning and memory)(29), Hopkins Verbal Learning Test–Revised (HVLT-R; verbal learning and memory)(30), Delis–Kaplan Executive Function System - Sorting Test (categorization)(31), Symbol Digit Modalities Test (SDMT)(32), and Stroop Color-Word Test (information processing speed)(33), Wechsler Adult Intelligence Scale-IV Block Design (visual spatial perception)(34), Wechsler Adult Intelligence Scale- IV Matrix (abstract reasoning abilities)(34), and Connors Continuous Performance Test II (CPT; attention)(35), Wechsler Adult Intelligence Scale-IV Digit Span (memory)(34), and Iowa Gambling Task (IGT; decision making)(36). The National Adult Reading Test (NART)(37) was administered as a proxy for intelligence at baseline.

**Power calculations and attrition:** We chose the sample size for this study (N=300 total, N=150 per arm) using power calculations conducted prior to the initiation of the study, and based on data showing a mean improvement in the SI-R of ~10 points in our pilot work(3), and increased the sample size screened and assessed to account for 15% attrition, and to ensure that we were able to randomize at least 150 individuals in each treatment arm. Power calculations were based on the assumption that a three-to five-point difference between the two groups on a scale where the mean score for participants entering the study was approximately 65, and improvement was anticipated to be between 10 and 14 points, was unlikely to be clinically meaningful, and therefore, any difference between the groups that was smaller than 3-5 points would signify that the two treatment types were equally effective. Our power calculations suggested that with a sample size of 150 participants per arm, we had 80% power to demonstrate non-inferiority if the PFT mean was no more than 2.9 points below (i.e., worse) than the CBT mean.

Our efforts to reduce attrition of participants included the following: If someone began a group, but attended fewer than three sessions before dropping out, they were eligible to participate in another group of the same type (e.g., CBT or PFT) at a later date. We contacted individuals as soon as possible after completing treatment to conduct post-treatment assessments, and the bulk of the compensation for participation was given after the post-treatment assessment was completed. To maximize follow-up, at least three attempts to contact participants were made. Reasons for becoming lost-to-follow-up or withdrawing from the study were ascertained by group leaders or coordinators asking the participants why they stopped or withdrew.

# Interventions: The interventions in this study included group CBT (G-CBT) using a HD-specific CBT treatment manual and facilitators’ guide (38, 39) and group PFT (G-PFT) using the Buried in Treasures (BiT) self-help workbook and associated peer facilitators’ guide(40, 41). In order to make the study procedures consistent with application in the real-world, such as might take place in a treatment setting at MHASF or similar organization, some changes and accommodations were made to the previously published protocols, both for CBT and for PFT(38-41). Group treatment was chosen over individual to allow for the provision of treatment to the largest number of participants possible. The target number of participants in each group was 8-12, the standard size of the groups run by MHASF. Although this number is larger than seen in other studies, it was considered to be feasible by the MHASF treatment providers with experience, and allowed for possible attrition of group members. Other changes to the protocol are detailed below.

Treatment groups: G-CBT and G-PFT groups were run concurrently at four locations, two in San Francisco, one in the East Bay (Berkeley), and one in the South Bay (San Mateo). All locations were easily accessible by public transportation. Both evening and daytime groups were offered. At any given time during the study treatment period, six to eight groups (3-4 CBT and 3-4 PFT) were conducted per week. Group size was optimized at 8-12 members, but for logistical reasons some groups began with fewer in order to minimize delays in starting treatment. Two postdoctoral psychologists (SU and CYC) led the CBT groups and two peer facilitators (SS and LDB) led the PFT groups. To balance logistical considerations regarding the provision of treatment and the need to establish reliability between facilitators, the first two rounds of groups for the G-CBT arm and the first five rounds of groups for the G-PFT arm were led by two facilitators. To maximize the number of groups that could be offered, subsequent groups were generally led by one facilitator each, beginning when the facilitators expressed comfort in leading groups alone. Participants were asked to commit to a minimum of 12/15 PFT or 13/16 CBT groups at the start of treatment.

CBT groups: Based on the experience of MHASF in running CBT groups with community-based clinicians as leaders, and to make the CBT groups more comparable to the PFT groups in terms of number of sessions (e.g., treatment dose), the manual–based treatment was adapted to be 16 rather than 20 sessions, conducted over 20 weeks (detailed in Uhm et al., 2016)(28). Clutter buddies were assigned from within the group rather than recommending that participants find their own clutter buddies. Clutter buddies were typically assigned based on geographic location or other logistical considerations, although individual requests for a specific clutter buddy assignment were honored. Two home visits were conducted, as outlined in the manual, although these visits were 30 minutes rather than an hour in length. The first visit occurred after the third session rather than prior to treatment to decrease fears of stigma and judgment, based on MHASF’s experience that participants were reluctant to let providers into their homes prior to developing a relationship with them. The second visit occurred after the 15th session. The aim of the visits was to objectively assess the degree of clutter in the participants’ homes. Weekly homework assignments included reading and practicing skills learned in sessions.

PFT groups: The PFT groups consisted of 15 sessions over 20 weeks led by one to two trained peers with personal lived experience of hoarding using the treatment manual “Buried in Treasures: Help for Compulsive Acquiring, Saving, and Hoarding”(40). Although clutter buddies were recommended in G-PFT, the peer facilitators chose not to assign clutter buddies but rather to encourage the group participants to identify a clutter buddy from friends, family, or other group members as they wished. The topics of psychoeducation in the PFT group were similar to CBT(28). As with CBT, each PFT group was two hours in length with homework assignment weekly. Additionally, peer facilitators called each member of the group weekly prior to the group meeting to check in and field questions, if any. The PFT treatment did not include home visits.

Supervision and adherence to treatment manuals: Group facilitators for both CBT and PFT received initial training in delivering the treatment in a two day training workshop. They then received an hour of supervision each week. Although adherence to the treatment manual was not formally assessed (e.g., through videotaping and reviewing treatment sessions), adherence was informally assessed during the supervision sessions. The PFT training workshop focused on guiding participants through the Buried in Treasures (BiT) workbook (40) and provided rudimentary training on facilitating groups. The CBT training focused on working with the therapists’ guide and familiarizing the postdoctoral fellows with the accompanying workbook.

**Follow-Up:** The scheduled assessments included eligibility screening, pre-and post-treatment (within a month after treatment) assessment on clinical and neuropsychological function, homework compliance and treatment satisfaction assessed during treatment period. While longitudinal follow-up assessments were not a part of the original protocol, in the final year of the study, we obtained additional funding allowing us to re-contact participants at least 3 months (range 3-25 months) after they had completed treatment and conduct longitudinal assessments to assess any maintenance (or loss) of treatment gains. All participants who were randomized for treatment and had given us permission to re-contact them for possible participation in future studies were contacted for this component; 6 participants did not give permission for re-contact and thus were not included. Participants who agreed to this additional assessment signed a new consent form, and were paid an additional $20 for their time. As the decision to conduct this long-term follow-up was made after the study was started, the elapsed time from end of treatment to longitudinal assessment varied. Participants who had not yet completed treatment were consented prospectively for this component of the research, and re-assessed at 3 months’ post-treatment. The longitudinal assessment, which was conducted by a member of the research team who was blind to treatment arm and post-treatment outcome, consisted of the two primary outcome measures of interest, the SI-R and the ADL-H, as well as questions asking about what type of ongoing involvement in hoarding related supports or treatments (if any) the participants had (Figure S4).

**Missing data:** Collected data was constantly monitored to check for missing values. When found, every attempt was made to recover the data by checking for hard copies, contacting participants if available, resending surveys, to participants or requesting relevant information (e.g., regarding group participation, etc). Baseline and post-treatment missingness rates were compared between participants who provided post-treatment data and those who did not using the appropriate test (t-test or Pearson’s chi-square) to test for evidence that the missing data was not missing at random. There were very little missing data at the level of the individual variable; the mean number of missing items were 0.08 and 0.03 for the for the SI-R and ADL-H, respectively. There were no differences between completion rates or missingness by treatment arm (X2=0.14, df=1, p= 0.71 for SI-R, X2=0.82, df=1, p= 0.36 for ADL-H), questionnaire, or timepoint (pre-treatment vs. post-treatment vs. longitudinal).

In this pre-post design, the likelihood for the outcome given treatment condition is empty when the outcome is missing. As the missing outcomes cannot be meaningfully imputed, only participants with complete outcome data for any given measure were included in the analyses. Thus, the numbers of participants varied in the secondary analyses based on whether the outcome of interest was available.

**Supplemental Results**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Screened,****Not Randomized (N=149)** | **Randomized (N=323)** | **t-statistic (df=1)** | **p-value** |
| SI-R total score | 54.9 (18.3) | 65.5 (11.7) | -7.59 | <0.0001 |
| UHSS total score | 23.2 (8.6) | 29.1 (5.5) | -8.88 | <0.0001 |
| CI-R total score | 10.6 (5.0) | 13.5 (5.0) | -5.71 | <0.0001 |
| ADL-H total score | 29.5 (11.0) | 31.0 (10.5) | -0.55 | 0.58 |
| Poor insight  | 3/11 (27.3%) | 39/323 (12.1%) | Fisher’s exact | 0.009 |
| Age\* | 57.6 (13.3) | 59.1 (10.6) | -1.37 | 0.17 |
| Female\* | 138 (61.9%) | 241 (74.6%) | 10.07 (df=2) | 0.007 |

**Table S2:** Characteristics of individuals completing the pre-treatment screening. SI-R = Saving Inventory, Revised. UHSS = UCLA Hoarding Severity Scale. CI-R = Clutter Image Rating Scale. ADL-H = Activities of Daily Living Scale, Hoarding. Poor insight was assessed by clinical interview in 334 participants (323 who were randomized to treatment and 11 who were excluded or chose not to participate). \*data available for 223 of the non-randomized participants.

|  |  |  |
| --- | --- | --- |
|  | SI-R | ADL-H |
| Directionof effect/correlation | Test statistic | P value | Direction of effect/correlation | Test statistic | P value |
| Female sex | 0 | 0.003 | 0.95 | 0 | 0.37 | 0.54 |
| Age | -0.11 |  | 0.22 | -0.02 |  | 0.79 |
| Years of education | -0.04 |  | 0.69 | 0.12 |  | 0.21 |
| Insured vs. uninsured | + | 0.64 | 0.42 | 0 | 0.30 | 0.58 |
| Age at HD symptom onset  | 0 | 1.57, 6 df | 0.95 | + | 9.1, 6 df | 0.17 |
| Excessive acquisition | - | 0.91 | 0.34 | + | 0.78 | 0.38 |
| Any psychiatric diagnosis | 0 | 0.15 | 0.70 | + | 3.13 | 0.08 |
| Mean # psych diagnoses | 0.05 |  | 0.64 | 0.18 |  | 0.07 |
| Moderate or high suicide risk | 0 | 1.01, 2 df | 0.60 | 0 | 1.06, 2 df | 0.59 |
| **SCI pre-treatment score** | 0.08 |  | 0.38 | 0.29 |  | 0.002 |
| **UHSS pre-treatment score** | 0.24 |  | 0.32 | 0.21 |  | 0.03 |
| **BAI pre-treatment score** | -0.01 |  | 0.90 | 0.20 |  | 0.03 |
| **BDI pre-treatment score** | -0.06 |  | 0.49 | 0.15 |  | 0.11 |
| **SNAP-IV pre-treatment score** | 0.04 |  | 0.67 | 0.25 |  | 0.007 |
| MoCA score | 0.18 |  | 0.17 | 0.15 |  | 0.26 |
| BVMT pre-treatment SS | 0.03 |  | 0.74 | 0.12 |  | 0.20 |
| NART pre-treatment SS | -0.05 |  | 0.61 | 0.10 |  | 0.29 |
| WAIS Matrix SS | 0.06 |  | 0.56 | 0.10 |  | 0.32 |
| CPT Detectability SS | 0.09 |  | 0.32 | 0.06 |  | 0.50 |
| Preferred mental health (MH) provider | 0.03 |  | 0.77 | 0.03 |  | 0.75 |
| Had a clutter buddy | 0 | 0.003 | 0.96 | 0 | 0.23 | 0.64 |
| **Found clutter buddy helpful** | + | 6.16 | 0.01 | 0 | 0.12 | 0.72 |
| **Mean % groups attended** | 0.23 |  | 0.01 | 0.17 |  | 0.07 |
| **Mean % HW completed** | 0.25 |  | 0.006 | 0.19 |  | 0.04 |

**Table S3:** Relationship between baseline characteristics and treatment outcome in the G-PFT sample. For categorical variables (chi square analyses), direction of effect is reported. + = positive direction of effect, - = negative direction of effect, 0 = neutral or no clear direction of effect. Correlation for quantitative variables are Pearson correlation coefficients.

|  |  |  |
| --- | --- | --- |
|  | SI-R | ADL-H |
| Directionof effect/correlation | Test statistic | P value | Direction of effect/correlation | Test statistic | P value |
| Female sex | 0 | 0.15 | 0.70 | - | 0.87 | 0.35 |
| Age | 0.01 |  | 0.93 | 0.02 |  | 0.83 |
| Years of education | -0.05 |  | 0.57 | 0.07 |  | 0.45 |
| Insured vs. uninsured | + | 1.65 | 0.20 | + | 0.65 | 0.42 |
| Age at HD symptom onset  | + | 6.88, 6 df | 0.33 | 0 | 3.78, 6 df | 0.71 |
| Excessive acquisition | 0 | 0.001 | 0.97 | 0 | 0.34 | 0.56 |
| Any psychiatric diagnosis | 0 | 0.02 | 0.89 | 0 | 0.03 | 0.86 |
| Mean # psych diagnoses | 0.05 |  | 0.64 | -0.04 |  | 0.62 |
| Moderate or high suicide risk | 0 | 1.02, 2 df | 0.60 | 0 | 0.82 | 0.67 |
| **SCI pre-treatment score** | 0.15 |  | 0.09 | 0.15 |  | 0.08 |
| **UHSS pre-treatment score** | 0.28 |  | 0.001 | 0.12 |  | 0.19 |
| **BAI pre-treatment score** | 0.15 |  | 0.09 | 0.11 |  | 0.22 |
| BDI pre-treatment score | 0.13 |  | 0.15 | 0.09 |  | 0.34 |
| SNAP-IV pre-treatment score | 0.07 |  | 0.45 | 0.05 |  | 0.55 |
| **MoCA score** | 0.03 |  | 0.82 | 0.25 |  | 0.10 |
| BVMT pre-treatment SS | -0.03 |  | 0.73 | 0.02 |  | 0.80 |
| NART pre-treatment SS | -0.10 |  | 0.28 | -0.06 |  | 0.51 |
| WAIS Matrix SS | -0.03 |  | 0.76 | -0.03 |  | 0.18 |
| CPT Detectability SS | 0.06 |  | 0.50 | -0.12 |  | 0.18 |
| **Preferred mental health (MH) provider** | 0.18 |  | 0.04 | 0.09 |  | 0.33 |
| Had a clutter buddy | 0 | 0.27 | 0.61 | + | 0.91 | 0.34 |
| Found clutter buddy helpful | + | 1.99 | 0.16 | + | 2.11 | 0.15 |
| Mean % groups attended | 0.10 |  | 0.27 | 0.11 |  | 0.22 |
| Mean % HW completed | 0.16 |  | 0.08 | 0.02 |  | 0.77 |

**Table S4:** Relationship between baseline characteristics and treatment outcome in the G-CBT sample. + = positive direction of effect, - = negative direction of effect, 0 = neutral or no clear direction of effect for chi-square analyses.

**Beliefs About Group Treatment for Hoarding and Cluttering**

This questionnaire asks about your thoughts on what aspects of group therapy for hoarding and cluttering you think will be the most helpful to you. There are no right or wrong answers, just answer as honestly as you can. All answers will be kept private and confidential.

**For the following statements, circle the number that best corresponds with how you feel.**

Strongly Somewhat Neither agree Somewhat Strongly

agree agree or disagree disagree disagree

 5----------------- 4-------------------3---------------------2 ------------------------ 1

1. Participating in a group treatment will work as well as individual treatment for me.

 5----------------- 4-------------------3---------------------2 ------------------- 1

1. I work best with a licensed mental health provider.

5----------------- 4-------------------3---------------------2 ------------------- 1

1. I work best with others who have personal experience with hoarding and cluttering challenges.

5----------------- 4-------------------3---------------------2 -------------------- 1

1. I believe that cognitive-behavioral therapy, which follows a structured plan and asks me to complete homework assignments, will best fit my style.

5----------------- 4-------------------3---------------------2 -------------------- 1

1. I believe that a peer-lead support group that follows the readings and assignments from a book will best fit my style.

5----------------- 4-------------------3---------------------2 -------------------- 1

1. If given the choice, I would prefer participating in a cognitive-behavioral treatment group provided by a mental health professional for treatment of my hoarding and cluttering challenges.

5----------------- 4-------------------3---------------------2 ---------------------- 1

1. If given the choice, I would prefer participating in a peer-facilitated support group treatment of hoarding and cluttering challenges.

5----------------- 4-------------------3---------------------2 ---------------------- 1

**Figure S1:** Beliefs About Treatment Questionnaire

**Homework Completion**

Date\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Session #\_\_\_\_\_\_\_\_\_\_\_\_\_

How much time did you spend on sorting/organizing/discarding?

\_\_\_\_\_\_\_\_\_\_\_minutes/hours (circle one)

How much time did you spend on active planning, visualizing, and strategizing?

\_\_\_\_\_\_\_\_\_\_\_\_\_minutes/hours (circle one)

How much time did you spend on maintenance of progress?

\_\_\_\_\_\_\_minutes/hours (circle one)

How much time did you spend on the assigned homework?

 \_\_\_\_\_\_\_\_\_\_\_minutes/hours (circle one)

If you set a decluttering goal that was not part of the assigned homework, what was it?

Did you complete your personal goal? totally partially not at all (circle one)

**Figure S2:** Homework Completion Questionnaire

**Bi-Weekly Group Evaluation Form**

1. How would you evaluate the quality of the treatment group?

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ( ) | Excellent | ( ) | Good | ( ) | Fair | ( ) | Poor  | ( ) Prefer not to answer |

2. Was the group beneficial to you?

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ( ) | Yes | ( ) | No | ( ) | Not Sure |  | ( ) Prefer not to answer |  |

3. How would you rate the severity of your hoarding/cluttering problems now?

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ( ) | Mild | ( ) | Neither Severe nor Mild | ( ) | Severe | ( ) | Very Severe | ( ) Prefer not to answer |  |

4. How does this compare to when you first started the group?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ( ) | Better | ( ) | The same | ( ) | Worse  | ( ) | Not sure |

5. Thinking back to the last time you attended the group, have you done anything to reduce your hoarding/cluttering?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ( ) | Yes | ( ) | No | ( ) | Not Sure | ( ) | First Time |

6. Thinking back to when you first began to attend the group, have you reduced the amount of clutter in your house?

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ( ) | Yes, Very Much | ( ) | Yes, Somewhat | ( ) | No | ( ) | Not Sure | ( ) | First Time |

7. Have you met with or spoken to your clutter buddy this week**?**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ( ) | Yes | ( ) | No | ( ) | Does not apply |

8. How helpful was your clutter buddy in assisting or motivating you to complete your group assignment or reduce your clutter?

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ( ) | Very Helpful | ( ) | Somewhat Helpful | ( ) | Not Very Helpful | ( ) | Unhelpful | ( ) | Does Not Apply |

9. How do you feel today about your overall prospects for recovery from your hoarding and cluttering challenges compared to before you started the group?

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ( ) | Very Hopeful | ( ) | Somewhat Hopeful | ( ) | No Change | ( ) | Somewhat Less Hopeful | ( ) | Much Less Hopeful |

10. How would you rate the hoarding and cluttering treatment group overall?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ( ) | Excellent | ( ) | Good | ( ) | Fair | ( ) | Poor |

**Figure S3:** Bi-Weekly Group Evaluation Questionnaire

**Continuing Support Questionnaire**

**Since you have finished the group, have you:**

Stayed in contact with your clutter buddy (if you had one)? Y/N

Are you still in contact with your clutter buddy? Y/N

Stayed in contact with group members and/or continued to meet with your group? Y/N

Are you still in contact with group members and/or continuing to meet with your group? Y/N

Attended drop in groups or any other support groups for hoarding? Y/N

 What drop in group or other support groups have you attended? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Are you still attending the drop in or other support groups for hoarding? Y/N

Received any additional formal treatment for hoarding? For example, received treatment from a psychiatrist or psychologist? Y/N

 If so, what kind of treatment was it?\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Are you still receiving that treatment? Y/N

Worked with a professional organizer? Y/N

 Are you still working with a professional organizer? Y/N

Had friends or family members (not your clutter buddy) help you to declutter? Y/N

Note: questions are asked in a branching fashion, such that if the first question is answered “yes”, the following questions (indented) appear.

**Figure S4. Continuing Support Questionnaire, completed at longitudinal follow-up, ≥3 months’ post-treatment.**

**References Cited**

1. Frost RO, Steketee G, Grisham J. Measurement of compulsive hoarding: saving inventory-revised. Behav Res Ther. 2004;42:1163-1182.

2. Frost RO, Hristova V. Assessment of hoarding. J Clin Psychol. 2011;67:456-466.

3. Mathews CA, Uhm S, Chan J, Gause M, Franklin J, Plumadore J, Stark SJ, Yu W, Vigil O, Salazar M, Delucchi KL, Vega E. Treating Hoarding Disorder in a real-world setting: Results from the Mental Health Association of San Francisco. Psychiatry Res. 2016;237:331-338.

4. Tolin DF, Frost RO, Steketee G, Muroff J. Cognitive behavioral therapy for hoarding disorder: a meta-analysis. Depress Anxiety. 2015;32:158-166.

5. Ayers CR, Dozier ME, Mayes TL. Psychometric Evaluation of the Saving Inventory-Revised in Older Adults. Clin Gerontol. 2017;40:191-196.

6. Frost RO, Ruby D, Shuer LJ. The buried in treasures workshop: waitlist control trial of facilitated support groups for hoarding. Behav Res Ther. 2012;50:661-667.

7. Muroff J, Steketee G, Rasmussen J, Gibson A, Bratiotis C, Sorrentino C. Group cognitive and behavioral treatment for compulsive hoarding: a preliminary trial. Depress Anxiety. 2009;26:634-640.

8. Gilliam CM, Norberg MM, Villavicencio A, Morrison S, Hannan SE, Tolin DF. Group cognitive-behavioral therapy for hoarding disorder: an open trial. Behav Res Ther. 2011;49:802-807.

9. Frost RO, Hristova V, Steketee G, Tolin DF. Activities of Daily Living Scale in Hoarding Disorder. J Obsessive Compuls Relat Disord. 2013;2:85-90.

10. Frost RO, Pekareva-Kochergina A, Maxner S. The effectiveness of a biblio-based support group for hoarding disorder. Behav Res Ther. 2011;49:628-634.

11. Saxena S, Brody AL, Maidment KM, Baxter LR, Jr. Paroxetine treatment of compulsive hoarding. J Psychiatr Res. 2007;41:481-487.

12. Saxena S, Ayers CR, Dozier ME, Maidment KM. The UCLA Hoarding Severity Scale: development and validation. J Affect Disord. 2015;175:488-493.

13. Frost RO, Steketee, G., Tolin, D.F., Renaud, S. Development and validatoin of the Clutter Image Rating. J Psychopathol Behav Assess. 2008;30:193-203.

14. Mackin RS, Vigil O, Insel P, Kivowitz A, Kupferman E, Hough C, Fekri S, Crothers R, Bickford D, Delucchi KL, Mathews CA. Patterns of Clinically Significant Cognitive Impairment in Hoarding Disorder. Depress Anxiety. 2015.

15. Mathews CA, Perez VB, Roach BJ, Fekri S, Vigil O, Kupferman E, Mathalon DH. Error-related brain activity dissociates hoarding disorder from obsessive-compulsive disorder. Psychol Med. 2015:1-13.

16. Mataix-Cols D, Billotti D, Fernandez de la Cruz L, Nordsletten AE. The London field trial for hoarding disorder. Psychol Med. 2012:1-11.

17. Nordsletten A, E. FdlC, L., Pertusa, A., Reichenberg, A., Hotopf, M., Hatch, S. L., & Mataix-Cols, D. The Structured Interview for Hoarding Disorder (SIHD): Development, further validation, and pragmatic usage. Journal of Obsessive-Compulsive and Related Disorders. 2013;2:346-350.

18. Sheehan DV, Lecrubier Y, Sheehan KH, Amorim P, Janavs J, Weiller E, Hergueta T, Baker R, Dunbar GC. The Mini-International Neuropsychiatric Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. J Clin Psychiatry. 1998;59 Suppl 20:22-33;quiz 34-57.

19. Steketee G, Frost, R.O., Kyrios, M. Cognitive aspects of compulsive hoarding. Cogn Therapy Research. 2003;27:463-479.

20. Coles ME, Frost RO, Heimberg RG, Steketee G. Hoarding behaviors in a large college sample. Behav Res Ther. 2003;41:179-194.

21. Levy HC, Worden, B.L., Gilliam, C.M., D'Urso, C. Steketee, G., Frost, R.O., Tolin, D.F. Changes in saving cognitions mediate hoarding symptom change in cognitive-behavioral therapy for hoarding disorder. Journal of Obsessive-Compulsive and Related Disorders. 2017;14:112-118.

22. Beck AT, Ward, C.H., Mendelson, M., Mock, J., Erbaugh, J. An inventory for measuring depression. Arch Gen Psychiatry. 1961;4.

23. Beck AT, Steer, R.A.: Beck Anxiety Inventory. San Antonio, Harcourt Assessment, Inc; 1993.

24. Swanson J: School Based Assessments and Interventions for ADD Students., Irvine, CA; 1992.

25. Darrow SM, Illmann C, Gauvin C, Osiecki L, Egan CA, Greenberg E, Eckfield M, Hirschtritt ME, Pauls DL, Batterson JR, Berlin CM, Malaty IA, Woods DW, Scharf JM, Mathews CA. Web-based phenotyping for Tourette Syndrome: Reliability of common co-morbid diagnoses. Psychiatry Res. 2015;228:816-825.

26. Nasreddine ZS, Phillips NA, Bedirian V, Charbonneau S, Whitehead V, Collin I, Cummings JL, Chertkow H. The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. J Am Geriatr Soc. 2005;53:695-699.

27. Waldron-Perrine B, Axelrod BN. Determining an appropriate cutting score for indication of impairment on the Montreal Cognitive Assessment. Int J Geriatr Psychiatry. 2012;27:1189-1194.

28. Uhm SY, Tsoh JY, Mackin RS, Gause M, Chan J, Franklin J, Eckfield M, Salazar M, Vigil O, Bain D, Stark S, Vega E, Delucchi KL, Mathews CA. Comparison of a peer facilitated support group to cognitive behavior therapy: Study protocol for a randomized controlled trial for hoarding disorder. Contemp Clin Trials. 2016;50:98-105.

29. Benedict RH: Brief Visuospatial Memory Test-Revised. Lutz, Fl, Psychological Assessment Resources, Inc; 1997.

30. Brandt J, Benedict, R.H.B: Hopkins Verbal Learning Test-Revised. Lutz, Fl, Psychological Assessment Resources, Inc; 2001.

31. Parmenter BA, Zivadinov R, Kerenyi L, Gavett R, Weinstock-Guttman B, Dwyer MG, Garg N, Munschauer F, Benedict RH. Validity of the Wisconsin Card Sorting and Delis-Kaplan Executive Function System (DKEFS) Sorting Tests in multiple sclerosis. J Clin Exp Neuropsychol. 2007;29:215-223.

32. Smith A: Symbol Digit Modalities Test. Los Angeles, Western Psychological Services; 2002.

33. Stroop Color and Word Test. Wood Dale, IL, Stoelting; 2002.

34. Wechsler D: Wechsler Adult Intelligence Scale-Fourth Edition (WAIS-IV), Pearson Education, Inc; 2008.

35. Conners CK: Conners' Continuous Performance Test II: Computer Program for Windows Technical Guide and Software Manual. Conners CKaMS, editor. North Tonawanda, NY, Multi-Health Systems; 2000.

36. Bechara A, Damasio, A.R., Damasio, H., Anderson, S.W. Insensitivity to future consequences following damage to human prefrontal cortex. Cognition. 1994;50:7-15.

37. Nelson HE: The National Adult Reading Test (NART): Test Manual. Edited by NFER-Nelson1982.

38. Steketee G, Frost, R.O.: Compulsive Hoarding and Acquiring: Therapist Guide. Oxford, Oxford University Press; 2006.

39. Steketee G, Frost, R.O.: Compulsive Hoarding and Acquiring: Workbook. New York, Oxford University Press; 2007.

40. Tolin DF, Steketee,G., Frost, R.O.: Buried in Treasures: Help for Compulsive Acquiring, Saving, and Hoarding. Oxford, Oxford University Press; 2007.

41. Shuer LJ, Frost, R.O.: Leading the Buried in Treasures Workshop. in [http://wwwocfoundationorg/uploadedfiles/Hoarding/Help\_for\_Hoarding/Facilitator's Manual Finalpdf](http://wwwocfoundationorg/uploadedfiles/Hoarding/Help_for_Hoarding/Facilitator%27s%20Manual%20Finalpdf). Edited by College S2011.