

Cognitive Behavioral Therapy For Hoarding Disorder: A Meta-Analysis

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Background: Hoarding disorder (HD) is a new diagnosis in DSM-5 (American Psychiatric Association, 2013). Cognitive-behavioral therapy (CBT) appears promising for the treatment of HD, and has been tested in both individual and group settings.

Methods: The present study used meta-analytic techniques to examine the overall strength of effect of CBT on HD, as well as on its component symptoms (clutter, difficulty discarding, and acquiring) and associated functional impairment. Potential demographic and treatment-related moderators of CBT response, as well as the presence of clinically significant change were also examined. From 114 published articles, 10 articles comprising 12 distinct HD samples ($N = 232$) met inclusion criteria and were retained for analysis.

Results: HD symptom severity decreased significantly across studies with a large effect size. The strongest effects were seen for difficulty discarding, followed by clutter and acquiring. Functional impairment showed the

smallest effect in the moderate range. Female gender, younger age, a greater number of CBT sessions, and a greater number of home visits were associated with better clinical outcomes. Reliable change was found in the majority of samples for each outcome domain. Rates of clinically significant change, however, were lower (percentage ranged from 24 to 43). Thus, in most cases, study patients' post-treatment scores remained closer to the HD range than to the normal range.

Conclusions: CBT is a promising treatment for HD, although there is significant room for improvement. Results are discussed in terms of treatment refinement for HD, and additional moderator variables are suggested for further study. *Depression and Anxiety* 32:158-166, 2015.

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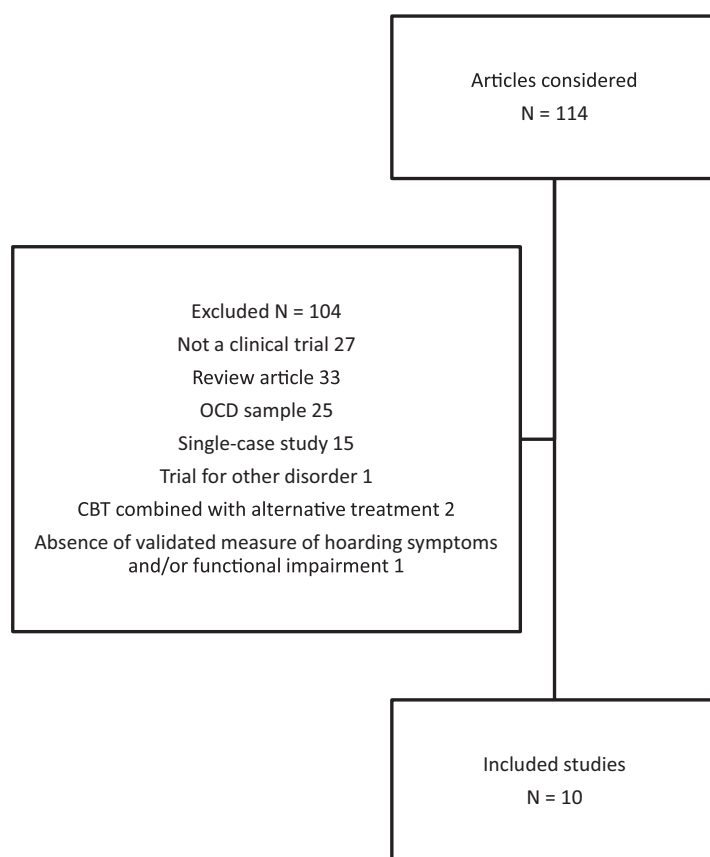
INTRODUCTION

Over the past decade, a specialized cognitive-behavioral therapy (CBT) for hoarding disorder (HD) has been developed, based on scientifically grounded models of HD, which includes motivational interviewing (efforts to increase motivation to change and adherence to treatment), graded exposure to nonacquiring (gradually building ability to resist the urge to buy or otherwise acquire items), training in sorting and discarding (practicing effective decision making using challenging questions), cognitive restructuring (identifying and correcting maladaptive patterns of thinking), and organizational training (practicing appropriate handling and placement of items to be saved in order to reduce clutter in the home). For more details about the specific CBT procedures, the reader is directed to published treatment manuals.^[1-3] Hoarding-specific CBT has now been tested in both individual^[4,5] and group^[6-8] formats; concurrently, specialized assessment instruments have made it possible to assess not only the presence of HD, but also outcomes for the specific symptoms of difficulty discarding, acquiring, and clutter,

as well as associated functional impairment.^[9] Outcomes of clinical trials of CBT for HD have generally yielded positive results, although it has been noted that many, if not most, patients continue to experience some degree of hoarding symptoms and associated impairment at posttreatment.^[10] To date, no studies have examined treatment outcome across studies in HD samples, as has been done for hoarding symptoms within obsessive-compulsive disorder (OCD) samples.^[11] The primary aim of the present meta-analysis is to examine the within-group effect size of CBT for HD, with attention to overall HD severity as well as to the individual symptoms of clutter, difficulty discarding, acquiring, and associated impairment.

The fact that the treatment of HD is still very much a "work in progress" makes this an ideal time to examine factors that predict CBT outcome. Understanding predictors of treatment success would likely help efforts to refine treatment protocols. One trial of CBT in older adults yielded poor outcomes,^[12] although another seemed more promising.^[13] Despite a roughly equal

FIGURE 1. Study selection process.



prevalence of HD in men and women,^[14] most trials have included relatively few men, making it difficult to understand the relationship between gender and HD treatment outcomes. Depression, the most common comorbid condition in HD,^[15] may also be a complicating factor in CBT; some studies have suggested that severe depression is associated with attenuated treatment outcome in OCD.^[16,17] Furthermore, medication status may also be predictive; in OCD, patients receiving antidepressant medications along with CBT show somewhat better outcomes across studies than do patients receiving CBT without medications.^[18] Understanding the relationship between the number of sessions (both in the home and in the office) and outcome would help identify a dose-response relationship of CBT and examine the necessity of home visits; one trial suggested only modest benefits from increasing the number of sessions in the home.^[19] Investigating the impact of treatment parameters, such as individual versus group sessions and the presence of a professional clinician, may help improve the efficiency of treatment, which can be somewhat labor-intensive in its original form,^[4,5] but has shown promise in group settings^[6–8] and with trained lay counselors.^[20,21] Thus, the second aim is to examine whether demographic and treatment-related variables are associated with differential CBT response.

The third and final aim is to examine, for each outcome domain, the proportion of patients achieving reliable and clinically significant change. As has been noted qualitatively,^[22] many patients remain significantly symptomatic after the completion of CBT. By examining the proportion of patients meeting criteria for reliable change (change in the outcome measure is significantly greater than that expected by chance, given the test-retest reliability of the measure) and clinically significant change (posttreatment scores that better match the distribution of scores in the general population than in a hoarding population), we will be able to make stronger conclusions about the efficacy of CBT for HD than would be possible with estimates of statistical significance alone.^[23,24]

METHOD

Data Sources

Journal articles were identified by searching the Medline and PsycINFO electronic databases in May 2014 using the search terms listed in Fig. 1. This literature search identified 114 journal articles, books, book chapters, and dissertations that were examined for inclusion.

Study Selection and Data Extraction

To be included, studies were required to meet the following criteria:

1. Open trial or randomized controlled trial (RCT) of a behavioral or cognitive-behavioral intervention for hoarding in adults.
2. Sample was selected based on the presence of clinically significant hoarding symptoms, defined according to standardized measures.
3. Study used outcome measures with adequate psychometric properties for the assessment of hoarding.
4. Hoarding was the primary condition being studied, as opposed to hoarding measured in the context of another psychiatric disorder (e.g., OCD).
5. CBT was not combined prospectively with another treatment (although concomitant medications were allowed).

As shown in Fig. 1, 10 articles, comprising 12 distinct HD samples (N = 232), were retained for analysis. Study data were extracted by the first author, with additional queries to study authors as needed.

Data Synthesis

Measures of HD symptoms included the *Saving Inventory-Revised* (SI-R),^[25] *Hoarding Rating Scale-Interview* (HRS-

I)^[26] and *Hoarding Rating Scale-Self-Report* (HRS-SR),^[27] *UCLA Hoarding Severity Scale* (UHSS),^[28] and *ClutterImage Rating* (CIR)^[29]. Measures of functional impairment included the *Sheehan Disability Scale* (SDS)^[30] and the *Activities of Daily Living-Hoarding Scale* (ADL-H).^[31]²

Outcomes were categorized according to the following constructs: (1) total HD symptom severity, (2) difficulty discarding, (3) clutter, (4) acquiring, and (5) impairment. When multiple measures of the same construct were used, an aggregate effect size^[32] was calculated.

Data were analyzed using Comprehensive Meta-Analysis v.2.2 and SPSS v.19. For the two studies that included more than one treatment condition, we used subgroup as the unit of analysis, given the fact that the groups were entirely independent, and the moderator aims required comparisons among subgroups.^[33] For each comparison, Hedges' *g* was calculated, weighted by sample size. Analyses were corrected for dependence among means by accounting for the correlation between pre and posttreatment scores.^[34] To examine differences between effect size estimates, the mixed-effects between-group heterogeneity was calculated. Random-effects models were used. To test the file drawer effect (the probability that unpublished null results would eliminate the obtained results), for each significant result, the fail-safe *N*(FSN) was computed.^[35] Metaregression was used to test the impact of moderator variables, using the *Z*-test of the significance of the slope of the regression line.^[33]

One moderator variable, depression, was calculated using four different measures across studies.^[36–38] Mean depression scores were therefore converted to *z* scores, using the normative means and *SD*s from published research.^[37,39,40] *z* Scores were calculated as $z = \frac{M - \mu}{\sigma}$, where *M* is the pre- or posttreatment mean for the HD sample, and μ and σ are the normative mean and *SD*.

We also tested for the presence of reliable change and clinically significant change^[24,41] on an individual-patient basis by reanalyzing the source data from each study. The reliable change index (RCI) determines whether change in an outcome measure is significantly greater than that expected by chance, given the test-retest reliability of the measure. Test-retest reliability statistics were obtained from published studies.^[25,26,29,42]³ We defined clinically significant change as posttreatment scores that better matched the distribution of scores in the general population than in a clinical (hoarding) population. To facilitate interpretation across

outcomes, at pre and posttreatment, we transformed each outcome measure to *z* scores using normative data.

The RCI was calculated as $RCI = \frac{M_{pre} - M_{post}}{S_{diff}}$, where M_{pre} and M_{post} are the group's pre- and posttreatment scores. S_{diff} is the standard error of the difference between two means, calculated as $s_{diff} = \sqrt{2(S_E)^2}$. S_E is the standard error of measurement, calculated as $S_E = SD_{pre} \sqrt{1 - r_{xx}}$, where SD_{pre} is the sample's pretreatment *SD* and r_{xx} is the test-retest reliability of the measure.

Clinically significant change was determined by calculating the statistic *C*, representing the cutoff between clinical and normative groups. *C* is calculated as $C = \frac{(M_{HD})(\sigma)(SD_{HD})}{SD_{HD} + \sigma}$, where M_{HD} and SD_{HD} are the established mean and *SD* for HD patients, and μ and σ are the normative mean and *SD*.

Normative and HD scores for the outcome measures were obtained from previous studies.^[5,26,31,43,44] For each study, the proportion of patients meeting criteria on each outcome measure for reliable change, clinically significant change, and both reliable and clinically significant change was entered. When a single study used two different measures of the same construct (e.g., both the SI-R clutter subscale and the CIR as measures of clutter), we calculated the mean proportion across outcome measures so that no study contributed more than one outcome in each domain. For different outcome measures, we then compared mean proportions of patients per study meeting each criterion using a univariate analysis of variance (ANOVA) with Tukey's HSD follow-up tests.

RESULTS

Study Information

As shown in Table 1, sample sizes ranged from 6 to 41 for 12 samples. In four of these, patients were not required to meet HD criteria,^[45,46] but other documented signs of clinically significant hoarding behavior were available. The proportion of women ranged from 33 to 100% ($M = 76.3\%$). Mean age ranged from 49 to 74 years ($M = 58.7$ years). The proportion of patients taking psychiatric medications ranged from 0 to 74% ($M = 44.6\%$ for the nine samples in which medication information was reported). Mean depression *z* score ranged from 0.6 to 2.8 ($M = 1.4$ *SD* above the normal mean for the 11 samples in which depression was assessed). Three samples employed a peer-directed, bibliotherapy-based program of CBT with no professional therapist present. The number of CBT sessions ranged from 13 to 35 ($M = 20.2$ sessions), and the number of visits conducted in patients' homes ranged from 0 to 33 ($M = 5.6$ sessions). Four samples used individual CBT, whereas the remaining eight used a group format.

Continuous Outcomes

Table 2 shows that overall HD symptom severity decreased significantly across studies with a large effect size. Parsing this overall HD score, significant effects were evident on all

¹One study used only the first three HRS-I items; these three items were totaled to create the overall severity index. Normative statistics for this three-item version were calculated from the original HRS-I source data.

²One study also used the supplemental Safety Issues subscale of the ADL-H and this was included in the present analyses. Another study published results of only the first 12 items; the full 15-item ADL-H was calculated from the original database for the present analyses.

³Because test-retest reliability has not been established for the UHSS and therefore the RCI could not be calculated, we used the SI-R to represent total HD severity for the one study using that measure

TABLE 1. Studies included in the meta-analysis

Study name	Subgroup	N	Diagnosis required?	Therapist involved?	CBT format	Percentage of women	Mean age	Mean depression score (z)	Mean number of sessions	Mean number of sessions in the home	Percentage on medications
Ayers et al. ^[12]	Study 1	12	Yes	Yes	Individual	58.3	73.7	1.35	26	6.5	58.3
Frost et al. ^[20]		17	No	No	Group	88.2	53.7	1.62	13	0	70.6
Frost et al. ^[20]		11	No	No	Group	81.8	61.3	0.74	13	0	54.5
Frost et al. ^[21]		37	No	No	Group	94.4	56.4	1.17	13	0	60.5
Gilliam et al. ^[6]	GCBT	35	Yes	Yes	Group	85.7	55.1	0.95	17.6	0	74.0
Muroff et al. ^[7]		32	Yes	Yes	Group	65.6	53.0	1.57	16.6	2	N/A
Muroff et al. ^[8]		14	Yes	Yes	Group	64.3	54.7	1.58	20	4	N/A
Muroff et al. ^[8]		11	Yes	Yes	Group	90.9	55.0	2.76	20	8	N/A
Steketee et al. ^[5]	GCBT + HA	41	Yes	Yes	Individual	82.6	54.5	0.58	26	6.5	0
Tolin et al. ^[4]		10	Yes	Yes	Individual	100.0	49.2	1.37	26	6.5	0
Tolin et al. ^[47]		6	Yes	Yes	Group	33.3	52.8	1.15	16	0	16.7
Turner et al. ^[13]		6	No	Yes	Individual	83.3	72.3	N/A	35.3	33.3	66.7

GCBT, group cognitive-behavioral therapy; GCBT + HA, group cognitive-behavioral therapy plus additional home assistance; N/A, not assessed.

outcome domains. The strongest effects were seen for difficulty discarding, the core behavioral feature of HD. Clutter, an environmental outcome of HD behaviors, and acquiring, which is a specifier for the HD diagnosis, showed effects in the moderate range. Functional impairment (which was not used in the calculation of overall HD symptom severity) showed the smallest effect, in the moderate range. In all cases, the effects were robust against the file drawer effect as evidenced by FSN.

Moderators of CBT Outcome

Significant heterogeneity was detected for total HD severity, clutter, and difficulty discarding outcomes, supporting the value of moderator analyses. Moderator analyses were conducted for each of the hoarding-related outcomes (total, clutter, difficulty discarding, acquiring, and impairment). As shown in Table 3, the requirement of a diagnosis of HD for study entry, involvement of a professional therapist versus a peer leader, individual versus group format, and severity of depression were not significantly associated with any outcomes.

Samples with a greater proportion of women showed significantly better outcomes in total HD severity, clutter, acquiring, and particularly difficulty discarding. Samples with a younger mean age were associated with significantly better outcomes in total HD severity and acquiring. A greater number of CBT sessions was associated with better outcomes in clutter and impairment. A greater

number of home visits was associated with better outcomes in clutter, difficulty discarding, and impairment. Samples with a higher proportion of patients on psychiatric medications showed better outcomes in difficulty discarding.

Reliable Change and Clinically Significant Change

As shown in Fig. 2, all domains showed a significant decrease in severity from pre- to posttreatment. Total HD severity and clutter were remarkably high at pretreatment, with scores over 4 SD above the normative mean. Difficulty discarding, impairment, and acquiring were also high but less so, with scores over 2 SD above the normative mean. At posttreatment, total HD severity and clutter remained strongly elevated, with scores around 3 SD above the normative mean. Difficulty discarding, acquiring, and impairment were 1-2 SD above the normative mean at posttreatment.

As shown in Table 4, pretreatment z scores for acquiring and difficulty discarding showed a significant correlation with proportion of women. In each case, a higher proportion of women in the sample was associated with a greater mean severity of hoarding symptoms. In addition, pretreatment impairment severity was significantly correlated with the proportion of patients taking medications, with greater medication use associated with greater impairment. Other correlations were not significant.

Table 5 shows the proportion of samples whose pre- to posttreatment scores reflected reliable change, the proportion of samples whose posttreatment scores reflected clinically significant change, and the proportion of samples meeting criteria for both reliable change and clinically significant change. Reliable change (i.e., change from pre- to posttreatment that is significantly greater than that expected by chance, given the test-retest reliability of the measure) was detected in the majority of samples for each outcome domain (percentage ranged from 90 to 99). Thus, across studies, the improvement seen likely reflects real change that was not due to chance factors.

TABLE 2. Pre- to posttreatment effect sizes of CBT for HD

Outcome	k	g	95% CI	P	Q _{within}	FSN
Total HD severity	12	0.82	0.64–1.00	<.001	19.73*	435
Clutter	12	0.70	0.52–0.89	<.001	31.91*	463
Difficulty discarding	11	0.89	0.63–1.16	<.001	33.64**	372
Acquiring	11	0.72	0.56–0.87	<.001	15.10	351
Impairment	10	0.52	0.38–0.67	<.001	13.73	181

K, number of outcomes; g, Hedges' g; CI, confidence interval; Q_{within}, within-group heterogeneity; FSN, fail-safe N. *P < .05; **P < .001.

TABLE 3. Moderators of CBT outcome (Q)

Outcome	Diagnosis required	Therapist involved	Individual versus group	Lower depression	Greater percentage of women	Younger mean age	Greater mean number of sessions	Greater mean number of sessions in the home	Greater percentage on medications
Total HD severity	0.68	0.87	0.52	0.75	7.43*	6.28*	2.69	1.49	0.10
Clutter	0.48	1.29	1.19	0.72	5.59*	0.92	6.55*	3.94*	0.00
Difficulty Discarding	0.66	0.66	0.29	0.13	30.88**	1.26	2.37	7.83*	11.29**
Acquiring	0.32	0.32	0.06	1.21	11.03**	8.94*	0.01	0.14	1.16
Impairment	1.21	0.01	2.23	0.24	1.27	3.72	4.19*	5.31*	0.02

Q, heterogeneity explained by the moderator variable.

* $P < .05$; ** $P < .01$; *** $P < .001$.

Examining clinically significant change (i.e., posttreatment scores are more likely to come from the distribution of scores in the general population than from a hoarding population), a minority of individuals met this criterion (percentages ranged from 25 to 43). Thus, in most cases, study patients' posttreatment scores remained closer to the HD range than to the normal range. The rates of clinically significant change were significantly higher for acquiring and impairment than for clutter.

The proportion of patients meeting the strictest criteria of both reliable and clinically significant change yielded results that were very similar to those for clinically significant change only. A minority of individuals met both criteria, with acquiring showing a higher rate of reliable and clinically significant change than clutter.

DISCUSSION

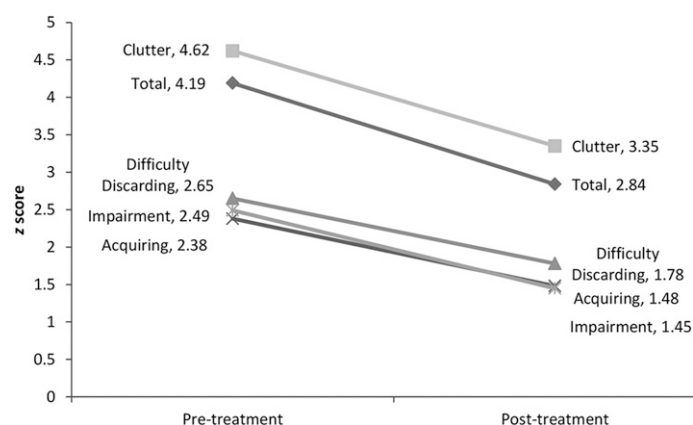
The present results demonstrate that CBT has a large effect from pre- to posttreatment, with a particularly strong effect for the core behavioral feature of HD, difficulty discarding. This is perhaps not surprising, given the focus of most of the CBT protocols on that symptom.^[1] Interestingly, a greater number of sessions in the home was associated with greater improvement in difficulty discarding. This likely reflects the fact that in-home sessions provide an opportunity to practice discarding in the most challenging context.

Effect sizes for clutter and acquiring were somewhat lower. As clutter is an environmental outcome of HD, one might expect that clutter would respond less strongly to behavioral intervention than would hoarding-specific behaviors. Indeed, the association between clutter reduction and more sessions (both in the office and in the home) would suggest that clutter reduction is a timeconsuming and laborious process. Follow-up data do not indicate that clutter continues to decrease after treatment discontinuation,^[48] although it could be argued that additional improvement would have occurred with ongoing external support. Additional research is needed to determine whether longer-term practical supports, such as help with sorting and organizing, or physical help with cleaning, would improve the efficacy of treatment on reducing clutter in patients who have received CBT.

The lower response of acquiring is somewhat surprising. The somewhat attenuated effect for acquiring may be due in part to the lower pretreatment severity in this domain, compared to clutter and total HD severity. The lower pretreatment score might also help explain why a higher percentage of patients met criteria for clinically significant change on acquiring symptoms compared to clutter. It is also possible, however, that the CBT protocols used in previous clinical trials^[1] placed a greater emphasis on discarding than on acquiring; recent manuals^[2] increase attention to reducing acquiring.

Functional impairment showed an effect that, while significant, lagged behind the effects observed for the core features of HD. As was the case with acquiring, this could be due in part to somewhat lower pretreatment severity on impairment measures. The attenuated effect on impairment may also relate to the ongoing impact of clutter, as the ADL-H is a hoarding-specific measure of impairment that explicitly links functional impairment to clutter in the home. As was the case with clutter, impairment appears to respond to a higher number of sessions in and out of the home. It is also quite possible that the level of impairment in HD patients is not exclusively due to the symptoms of HD themselves. Although impairment did not correlate significantly with depression across studies, other symptoms could be involved. Psychiatric comorbidity in HD is very high, with a majority of individuals meeting criteria for comorbid depressive and anxiety disorders.^[15] Furthermore, substantial evidence suggests the presence of diminished cognitive functions, such as attention, memory, or executive functions;^[49] impaired behavioral self-control;^[50] and significant medical illness.^[27,51] The SDS, which is a broader measure of impairment, does not specify a cause of impairment, and it may be that these other factors contribute to residual functional impairment even after successful treatment of HD symptoms.

The clinically significant change findings suggest that although treatment gains may be substantial in HD patients, the majority continue to score in the clinical range at posttreatment. The best results were seen for acquiring and impairment, which, as described previously, may relate to somewhat lower pretreatment severity on these measures. Clinically significant change was lowest

FIGURE 2. z Scores for hoarding outcomes from pre- to posttreatment.

in the domain of clutter, which also showed the highest severity at pretreatment. This finding, along with the somewhat weaker within-group effect size, underscores the idea that successful decluttering may require, for many, more time and intervention beyond that represented in most CBT trials.

The relationship between gender and CBT outcome was not expected, as gender has not been consistently associated with outcome in treatment for related disorders, such as OCD.^[52] Previous research investigating gender differences in HD has not produced likely explanations for the poorer CBT response in men: compared to women with HD, men with HD have somewhat higher rates of OCD, but lower rates of anxiety and mood disorders, and the rate of personality disorders is similar for both genders.^[15,53] Gender does not appear to be associated with the severity of HD symptoms or associated functional impairment,^[27] nor are men with HD described as less insightful than women with HD.^[53,54] Men with HD report a somewhat earlier age of onset than do

women,^[53] although their HD is not more severe.^[55] In the present analysis, men treated for HD showed lower symptoms of difficulty discarding and acquiring symptoms (the behavioral aspects of HD), compared to women. Further research is needed in order to understand why men with HD may fare more poorly in CBT than do women, and how CBT might be modified in order to improve response rates in men.

Younger age was predictive of better CBT response, and it appears that this finding is largely the result of differential acquiring outcomes. Compulsive buying behaviors are more common among younger adults than among older adults,^[56] and the present data show that pretreatment acquiring was more severe among younger study patients. It may also be the case, however, that increased age presents a different set of challenges in CBT for HD. Older adults with HD may be at particular risk for chronic medical illness^[51] and executive dysfunction.^[57] Research in middle-to-later adult-

hood HD patients suggests that older age is not significantly associated with greater hoarding severity, depression, or functional impairment, although therapists rated older HD patients as more severely psychiatrically ill in general than younger patients.^[58] Further research on the impact of age on CBT response in HD, including potential remediation for cognitive dysfunction,^[59] is needed.

The finding that psychiatric medication use was associated with better outcomes in difficulty discarding is intriguing. Without knowledge of the specific medications used, it would be premature to speculate about a possible augmenting effect of medications on CBT for HD. In one open trial of paroxetine, hoarding and nonhoarding OCD patients fared equally well,^[28] although neither group showed a particularly strong response. In a recent open trial of venlafaxine, patients' hoarding symptoms improved significantly with a high response rate.^[60] However, among OCD patients, those with hoarding symptoms show poorer response to pharmacotherapy.^[11] In the present analysis, samples with

TABLE 4. Correlations between sample characteristics and pre- and posttreatment hoarding symptoms

Outcome		Depression	Percentage of women	Mean age	Mean number of sessions	Mean number sessions in the home	Percentage on medications
Total HD severity	Pre	-0.06	-0.19	0.04	-0.09	-0.42	-0.15
	Post	0.05	-0.31	0.01	-0.24	-0.55	-0.14
Clutter	Pre	0.01	0.36	-0.18	0.38	0.33	-0.36
	Post	0.00	0.28	-0.09	0.34	0.31	-0.29
Difficulty discarding	Pre	0.20	0.70**	-0.07	0.38	0.43	0.02
	Post	0.46	0.35	-0.17	0.19	0.25	-0.16
Acquiring	Pre	0.19	0.75**	-0.24	0.05	0.07	0.37
	Post	0.52	0.13	0.35	-0.13	-0.02	0.62
Impairment	Pre	0.42	0.07	-0.20	-0.35	-0.06	0.64*
	Post	0.55	0.27	-0.56	-0.51	-0.36	0.31

* $P < .05$; ** $P < .001$.

TABLE 5. Mean (SD) percentage of reliable change and clinically significant change in studies of CBT for HD

Outcome	Reliable change	Clinically significant change	Reliable and clinically significant change
Total HD severity	98.85% (2.49)	35.38% (10.22)	35.28% (10.14)
Clutter	98.25% (2.74)	25.44% (9.62) ^a	25.44% (9.62) ^a
Difficulty discarding	96.65% (4.47)	34.04% (12.07)	34.04% (12.07)
Acquiring	96.35% (5.37)	40.95% (12.41) ^b	39.81% (12.49) ^b
Impairment	89.62% (28.36) ^b	43.30% (11.59) ^b	40.12% (15.10)
$F_{4,50}$	0.94	4.02**	2.68*

* $P < .05$; ** $P < .01$.

Within each column, values with different superscripts are significantly different ($P < .05$).

a higher rate of medication use were associated with higher levels of pretreatment impairment, potentially creating greater room for clinical improvement. Additional research is needed to compare the efficacy of CBT and medications for HD, alone and in combination.

The absence of demonstrated relationships between treatment outcome and the requirement of an HD diagnosis, therapist involvement, or individual versus group treatments merit further study. At this time the significance of these null findings is not clear, given the relatively small number of studies and the fact that categorical analyses such as these may have been underpowered.

Although the present study examined several potential moderators of treatment outcome, there are several other variables that have not been consistently assessed (and therefore could not be included in the present meta-analysis), but might nevertheless prove important as moderators or mediators of treatment response in HD. Factors such as poor insight,^[53,61,62] impaired cognitive function,^[15] [63–67] and maladaptive personality features^[68–72] may all adversely impact the process and outcome of CBT.

A major limitation of the present meta-analysis is the use of within-group, rather than between-group, analyses. Without direct comparison to placebo conditions, treatment effects cannot be reliably distinguished from the passage of time, regression to the mean, and nonspecific treatment effects. To date, three randomized controlled trials of CBT have been published;^[5,8,21] in each of these, CBT proved superior to control conditions in which patients showed minimal improvement. The present analyses are confined to posttreatment outcomes, as there have been few follow-up studies of CBT for HD. The existing research, however, suggests that treatment gains are largely maintained after treatment discontinuation.^[48] We also did not include studies in which CBT was combined with alternative treatments. Two studies suggest that various forms of cognitive remediation, when added to CBT, might have a beneficial impact on cognitive function^[73] or on HD severity.^[59]

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