Behavior Therapy for Obsessive-Compulsive Disorder Guided by a Computer or by a Clinician Compared With Relaxation as a Control

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Background: The demand for effective behavior therapy for obsessive-compulsive disorder (OCD) by exposure and ritual prevention exceeds its supply by trained therapists. A computer-guided behavior therapy self-help system (BT STEPS) was created that patients access by telephone from home via interactive voice response technology. This study compared the value of computer-guided behavior therapy value with that of clinician-guided behavior therapy and systematic relaxation as a control treatment.

Method: After screening by a clinician, 218 patients with DSM-IV OCD at 8 North American sites were randomly assigned to 10 weeks of behavior therapy treatment guided by (1) a computer accessed by telephone and a user workbook (N = 74) or (2) a behavior therapist (N = 69) or (3) systematic relaxation guided by an audiotape and manual (N = 75).

Results: By week 10, in an intent-to-treat analysis, mean change in score on the Yale-Brown Obsessive Compulsive Scale was significantly greater in clinician-guided behavior therapy (8.0) than in computer-guided (5.6), and changes in scores with both clinician-guided and computer-guided behavior therapy were significantly greater than with relaxation (1.7), which was ineffective. Similarly, the percentage of responders on the Clinical Global Impressions scale was significantly ($p < .05$) greater with clinician-guided (60%) than computer-guided behavior therapy (38%), and both were significantly greater than with relaxation (14%). Clinician-guided was superior to computer-guided behavior therapy overall, but not when patients completed at least 1 self-exposure session (N = 36 [65%]). At endpoint, patients were more satisfied with either behavior therapy group than with relaxation. Patients assigned to computer-guided behavior therapy improved more the longer they spent telephoning the computer (mostly outside usual office hours) and doing self-exposure. They improved slightly further by week 26 follow-up, unlike the other 2 groups.

Conclusion: For OCD, computer-guided behavior therapy was effective, although clinician-guided behavior therapy was even more effective. Systematic relaxation was ineffective. Computer-guided behavior therapy can be a helpful first step in treating patients with OCD when clinician-guided behavior therapy is unavailable.

(J Clin Psychiatry 2002;63:138–145)

Received Jan. 26, 2001; accepted Sept. 6, 2001. From Healthcare Technology Systems (HTS), (Drs. Greist and Kobak and Mr. Wenzel and Mss. Hirsch and Mantle) and the University of Wisconsin, Madison (Dr. Greist), Madison Wis.; the Institute of Psychiatry, Maudsley Hospital, London, England (Dr. Marks); the Department of Psychiatry, Massachusetts General Hospital, Boston (Dr. Baer); and Pfizer, Inc., New York, N.Y. (Dr. Clary).

Supported in part by a grant from Pfizer, Inc.

Drs. Greist and Kobak and Mr. Wenzel and Ms. Hirsch are employees of HTS, Madison, Wis. Ms. Mantle was employed at HTS during this study and is currently self-employed in Boise, Idaho. Mr. Wenzel and Ms. Hirsch own stock in HTS. Drs. Marks and Baer receive royalties from BT STEPS. BT STEPS is a trademark of Healthcare Technology Systems. Dr. Clary is an employee of Pfizer, Inc.

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Obsessive-compulsive disorder (OCD) is a common psychiatric disorder,[1] and chronic disability[2] from it incurs high costs for patients, their families, and communities.[3] Patients with OCD who received serotonin reuptake inhibitors (SRIs) improved in multicenter placebo-controlled trials.[4,5] Behavior therapy by exposure plus ritual prevention (henceforth called *exposure*) was also effective in the short and long term,[6] at least as much as SRIs in direct comparisons[7–9] and in meta-analyses.[10–13] During behavior therapy, patients with OCD expose themselves to whatever evokes obsessions and rituals, and then refrain from carrying out rituals to allow the ensuing discomfort to habituate over time.[14]

To make behavior therapy by self-exposure more widely available, we developed a computer-guided self-help behavior therapy system (BT STEPS) for patients with OCD and compared it with behavior therapy guided by clinicians and with systematic relaxation as a control.

METHOD

Subjects

Two hundred eighteen subjects with a primary diagnosis of OCD for at least 2 years on the Structured Clinical Interview for DSM-IV (SCID)[15] were randomly assigned

Table 1. Types of Rituals in 218 Subjects With OCD by Treatment Group (patients could have more than 1 type of ritual)[a]

Treatment Method	Cleaning (%)	Checking (%)	Ordering (%)	Hoarding (%)
BT STEPS[b]	49	64	45	36
Clinician-guided behavior therapy	57	74	47	32
Relaxation	56	85	45	25

[a]Abbreviation: OCD = obsessive-compulsive disorder. Symptoms obtained by the Yale-Brown Obsessive Compulsive Scale (YBOCS) symptom checklist for clinician-guided behavior therapy and relaxation, and by interactive voice response question "Is this a major problem for you right now?" or case notes for BT STEPS. Thus, patients using BT STEPS were given fewer prompts to elicit rituals than were patients receiving clinician-guided behavior therapy and relaxation behavior therapy who completed the YBOCS checklist.
[b]BT STEPS is a computer-guided self-help behavior therapy system.

and enrolled. All SCID raters had prior experience and training on the instrument. Subjects were aged at least 14 years (mean ± SD = 39 ± 12 years; range, 15–80) and had a total score of at least 16 on the Yale-Brown Obsessive Compulsive Scale (YBOCS)[16] (mean ± SD = 25 ± 5; range, 16–39), which reflects substantial severity similar to that in clinical drug trials.[13] Subjects had to score over 7 on the YBOCS compulsions (rituals) subscale to be enrolled in this study. Table 1 shows their major types of rituals. Ninety-three percent of the subjects were white, and 58% were male; 57% had earned a college degree, 21% had some college education, 14% had earned a high school diploma, and 6% had less than a high school education. Mean OCD duration was 22 years (mean ± SD = 22 ± 12 years; range, 2–61). Twenty-four percent of the subjects had a secondary diagnosis of mental disorder: social phobia (9%), generalized anxiety disorder (8%), simple phobia (6%), major depression (2%), or dysthymia (2%). Mean Hamilton Rating Scale for Depression (HAM-D)[17] score (6-item,[18] converted to 17-item) was 10 (mean ± SD = 10 ± 8; range, 0–30). Patients gave written informed consent after receiving a description of the study.

Exclusion criteria were past Tourette's disorder, schizophrenia, bipolar disorder, psychosis, or psychosurgery; current comorbid primary major depression, serious suicidal thoughts, or unstable medical conditions; or, in the past 6 months, alcohol or substance abuse or electroconvulsive therapy.

Of the randomly assigned subjects, 51% had not taken an SRI for at least 2 weeks prior to prescreening (6 weeks prior if taking fluoxetine). The remainder were taking an SRI at or above an adequate minimum stable dose (e.g., 20 mg/day fluoxetine, 50 mg/day sertraline) and had been doing so for > 3 months prior to prescreening. The study did not allow dose adjustments or other prescription psychotropics. This was evaluated at each in-person assessment visit (see below).

Sites

Clinicians who had behavior therapy expertise were recruited from each of 8 sites in diverse geographic and practice settings. The 8 sites were Salt Lake City, Utah; Wheat Ridge, Colo.; Gainesville, Fla.; Houston, Tex; Toronto, Ontario, Canada; Raleigh, N.C.; Worcester, Mass., and Atlanta, Ga. None of the sites where this study was conducted were sites where the authors worked or held appointments. Subjects were recruited via radio, newspaper ads and articles, clinicians' current case loads, and referrals from colleagues.

Study Design

After screening, subjects were randomly assigned to 2 weeks of assessment followed by 10 weeks of behavior therapy (self-exposure) guided by computer (BT STEPS) (N = 74) or by a clinician (N = 69) or by self-relaxation (N = 75) (relaxation was ineffective for OCD in controlled comparisons with behavior therapy[7,19]). During assessment, subjects using BT STEPS completed steps 1–3 (see below), while subjects receiving clinician-guided behavior therapy and relaxation completed 2 OCD checklists and wrote an autobiography of their OCD (to equalize self-reflection during assessment). Subjects whose total YBOCS scores fell by 25% or more during assessment (placebo responders, N = 16) or who did not complete assessment tasks (N = 5), violated the protocol (N = 12), or withdrew (N = 2) were excluded. Patients were asked to return for follow-up 14 weeks after treatment ended (26 weeks after their first screening visit). Patients who responded to BT STEPS were offered continuing treatment, and nonresponders were crossed over to alternative treatment (see Follow-Up at Week 26 Post-baseline).

Screening and Outcome Measures

All participants met with a clinician for 15 minutes at baseline and at the end of weeks 2, 6, and 10 after starting treatment to assess improvement, safety, and appropriateness of continued participation (patients receiving clinician-guided therapy also had weekly face-to-face visits with their behavior therapist). The primary outcome measure was the self-rated YBOCS. Secondary outcome measures included number of hours spent per day in obsessions and in rituals (YBOCS items 1 and 6), Patient and Clinical Global Impressions (PGI and CGI) scales,[20] and self-rated Work and Social Adjustment Scale (WSAS).[21] Comorbid depression was evaluated by a self-rated HAM-D. Patients also rated a brief treatment expectation questionnaire (TRT-X) at their first visit and a satisfaction questionnaire (PSQ) at endpoint (both instruments are available from J.H.G. upon request). Ratings were determined by an interviewing clinician (not the therapist) using paper-and-pencil scales (CGI) and by the patient using paper-and-pencil (TRT-X, PSQ) or telephone interac-

tive voice response (IVR) scales* (YBOCS, PGI, WSAS, HAM-D).[22–25] A subsample of 90 patients was also rated on the clinician-administered YBOCS at baseline and endpoint by a rater blind to treatment condition. Clinician- and self-reported change did not differ significantly,[22] ($t = 1.07$, $df = 69$, $p = .289$). All evaluation sessions with a study coordinator were audiotaped for auditing.

Treatments

Computer-guided behavior therapy. BT STEPS is a 9-step, computer-driven IVR system that allows patients with OCD to telephone from home and progress through a self-paced workbook. Steps 1–3 concern education and assessment. Steps 4–9 guide daily self-exposure to triggers of rituals, obsessions, and discomfort, followed by self-imposed ritual prevention for at least an hour until discomfort and the urge to perform rituals are reduced. These steps include the planning of self-exposure homework, carrying out and reporting of that homework, and relapse prevention (Marks et al.[26] give a detailed description). Patients advance through BT STEPS at their own pace.

Clinician-guided behavior therapy. Clinician-guided behavior therapy consisted of 11 weekly 1-hour (or longer) sessions to negotiate self-exposure homework to be done for at least an hour daily between sessions and recorded in daily diaries. Sessions were audiotaped and rated blindly by an expert behavior therapist for quality of instructions.

Relaxation therapy. Patients receiving relaxation therapy were asked to perform progressive relaxation exercises for at least an hour daily and to keep daily relaxation diaries for 10 weeks.[27] They were guided by a relaxation manual and an audiotape to standardize treatment across sites. No exposure or ritual prevention instructions were given.

Statistical Analysis

In an intent-to-treat analysis,[28] the last available postrandomization rating was input to endpoint for subjects who stopped prematurely. A secondary analysis concerned only compliers who, after starting treatment with BT STEPS and clinician-guided behavior therapy, did 2 or more exposure-homework sessions, and in relaxation showed a work sheet recording at least 2 relaxation practice occasions. All treatments began at week 0.

An analysis of covariance (for effects of baseline, site, treatment, and treatment-by-site interaction) examined the effects of site and baseline scores. One-way analyses of variance were used for all 3-way comparisons, with all post hoc tests done using planned comparisons at $p < .05$. The chi-square test was used to analyze dichotomous outcome measures, and parametric (Pearson) correlations were used between continuous measures. Sample size aimed for a power of 0.90, using estimates of means and standard deviations from a meta-analysis of multicenter OCD trials.[5]

RESULTS

Patient Flow

Altogether, 218 patients were randomly assigned and enrolled at first visit (74 to BT STEPS, 69 to clinician-guided behavior therapy, and 75 to systematic relaxation). One hundred eighty-three reached week 0 after 2 weeks' assessment (baseline visit: 57 in the BT STEPS group, 59 in the clinician-guided behavior therapy group, and 67 in the relaxation group). Of the 183 patients, 176 had at least 1 evaluable post–week 0 visit and were included in the endpoint intent-to-treat analyses: 55 (82%) BT STEPS, 55 (86%) clinician-guided behavior therapy, 66 (89%) relaxation ($\chi^2 = 1.460$, $df = 2$, $p = .22$). There was a significantly greater loss of evaluable patients in the BT STEPS group than in the relaxation group ($\chi^2 = 4.57$, $df = 2$, $p = .03$).

Primary Analysis: YBOCS

Total YBOCS. Improvement in total YBOCS score (Table 2 and Figure 1) was significant for treatment arm ($F = 12.45$, $df = 2$, $p < .001$) but not site ($F = 1.32$, $df = 7,152$; $p = .25$). Improvement from week 0 to endpoint was significantly greater in both the BT STEPS group (5.58) and the clinician-guided behavior therapy group (8.00) than in the relaxation group (1.67) ($t = 3.59$, $df = 173$, $p = .001$, and $t = 3.80$, $df = 173$, $p = .001$, respectively). Patients receiving clinician-guided behavior therapy also improved significantly more than patients in the BT STEPS group ($t = 2.12$, $df = 173$, $p = .035$). Computer-guided behavior therapy separated from relaxation at week 2 ($t = 2.51$, $df = 171$, $p = .013$), while clinician-guided behavior therapy separated from relaxation at week 6 ($t = 3.93$, $df = 159$, $p = .001$). The effect sizes for BT STEPS, clinician-guided behavior therapy, and relaxation were 0.84, 1.22, and 0.35, respectively (within-groups calculation).

Mean number of hours per day spent in rituals and in obsessions (YBOCS). The mean number of hours spent in rituals and in obsessions fell significantly more in both the BT STEPS (3.4 hours) and the clinician-guided behavior therapy (3.4 hours) groups than in the relaxation group (0.6 hours) ($t = 3.15$, $df = 173$, $p = .002$ and $t = 3.24$, $df = 173$,

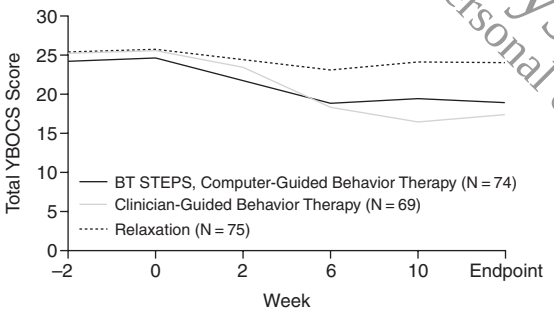
*Interactive voice response (IVR) uses a computer to send recorded voice files via standard phone lines, which patients hear on their telephone. Patients answer questions by pressing touch-tone keys. They record their initial behavior therapy treatment goals, repeatedly refine and personalize these as treatment continues, and before each behavior therapy session hear these customized goals in their own voice. Patients may also record a personal message to a behavior therapist and receive the therapist's recorded answer within 72 hours. Progress is monitored by IVR assessments at baseline and at intervals during treatment. Patients get feedback on their progress via the calls and reports mailed to them weekly. The system asks patients to make 12 separate calls, some of which are used repeatedly. Patients also get a programmed workbook that complements the IVR system.

Table 2. Mean (SD) Baseline, Endpoint, and Change Score for YBOCS, HAM-D, and WSAS, and Percent Responders at Endpoint on PGI and CGI[a]

	YBOCS[b]			HAM-D[c]			WSAS Total				
Treatment Method	Baseline	Endpoint	Change[d]	Baseline	Endpoint	Change[e]	Baseline	Endpoint	Change[f]	PGI[g]	CGI[h]
BT STEPS	24.6 (4.3)	19.0 (7.2)	5.6 (6.6)	9.6 (7.9)	9.6 (7.9)	0.0 (6.8)	20.7 (7.9)	15.7 (8.5)	5.0 (7.2)	38%	38%
Clinician-guided behavior therapy	25.2 (4.6)	17.6 (6.2)	8.0 (6.6)	9.8 (8.4)	7.8 (7.6)	2.0 (9.4)	20.4 (7.7)	13.6 (8.5)	6.8 (8.3)	58%	60%
Relaxation	25.8 (5.1)	24.1 (6.7)	1.7 (4.8)	9.7 (7.5)	10.0 (8.2)	–0.3 (7.0)	21.8 (7.6)	19.8 (8.1)	2.0 (7.7)	15%	14%
	p Value			p Value			p Value			p Value	p Value
Planned comparisons on change scores											
Clinician-guided behavior therapy vs BT STEPS		.035			.886			.247		.036	.022
BT STEPS vs relaxation		< .001			.160			.032		.004	.002
Clinician-guided behavior therapy vs relaxation		< .001			.108			.001		.001	< .001

[a]Abbreviations: CGI = Clinical Global Impressions scale, HAM-D = Hamilton Rating Scale for Depression, PGI = Patient's Global Impressions scale, WSAS = Work and Social Adjustment Scale, YBOCS = Yale-Brown Obsessive Compulsive Scale.
[b]Range, 0–40.
[c]Range, 0–50.
[d]$F = 17.41$, $p = .001$; omnibus test on change scores.
[e]$F = 1.53$, $p = .220$; omnibus test on change scores.
[f]$F = 5.94$, $p = .003$; omnibus test on change scores.
[g]$\chi^2 = 24.36$, $p < .001$.
[h]$\chi^2 = 28.26$, $p < .001$.

Figure 1. Total Yale-Brown Obsessive Compulsive Scale (YBOCS) Score by Study Week: Intent-to-Treat Analysis



p = .001, respectively). Computer-guided and clinician-guided behavior therapy did not differ significantly from each other on this measure (t = 0.80, df = 173, p = .99). Half the reduction in time spent per day concerned rituals and half concerned obsessions.

Secondary Analyses: Other Measures

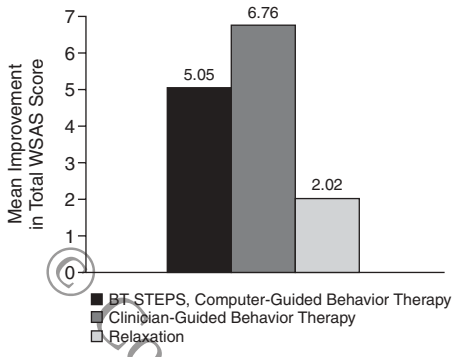
Improvement by type of ritual (BT STEPS group only). Forty-eight percent of the 112 computer-guided exposure sessions were for cleaning rituals, 32% for checking, 9% for hoarding, 5% for sexual or violent obsessions, 4% for ordering, and 2% for obsessions without related overt rituals (data on goals of clinician-guided behavior therapy exposure sessions are unavailable). The percentage of goals considered completed (i.e., a score of "0" [no discomfort] or "1" [less than slight discomfort] for 3 consecutive exposure sessions) was achieved 39% of the time with cleaning rituals, 19% with checking, 8% with ordering, and 0% with hoarding ($\chi^2 = 8.59$, df = 3, p = .036) (these data were not available from the clinician-guided behavior therapy and relaxation groups).

Percent responders on patient- and clinician-rated global improvement (PGI and CGI). *PGI:* At endpoint, significantly more responders were "much" or "very much" improved in both the BT STEPS (38%) and clinician-guided behavior therapy (58%) groups than in the relaxation group (15%) ($\chi^2 = 8.35$, df = 1, p = .004 and $\chi^2 = 24.51$, df = 1, p = .001, respectively), and in clinician-guided behavior therapy than in the BT STEPS group ($\chi^2 = 4.41$, df = 1, p = .036) (see Table 2). The BT STEPS group had significantly more responders than relaxation from week 2 onwards ($\chi^2 = 6.63$, df = 1, p = .01), while clinician-guided behavior therapy separated from relaxation at week 6 ($\chi^2 = 22.48$, df = 1, p = .001).

CGI: At endpoint, there were significantly more responders in both the BT STEPS (38%) and the clinician-guided behavior therapy (60%) groups than in the relaxation group (14%) ($\chi^2 = 9.69$, df = 1, p < .02 and $\chi^2 = 28.45$, df = 1, p < .001, respectively), and in the clinician-guided behavior therapy group than in the BT STEPS group ($\chi^2 = 5.24$, df = 1, p = .022) (see Table 2). BT STEPS had significantly more responders than relaxation at week 10 ($\chi^2 = 10.04$, df = 1, p = .002), while clinician-guided behavior therapy had significantly more responders than relaxation from week 6 ($\chi^2 = 10.52$, df = 1, p = .001).

Work and Social Adjustment Scale. Patients assigned to either BT STEPS or clinician-guided behavior therapy improved significantly more from baseline to endpoint on total WSAS than did patients assigned to relaxation

Figure 2. Mean Improvement in Work and Social Adjustment Scale (WSAS) Total Score From Baseline to Endpoint: Intent-to-Treat Analysis



(Figure 2; BT STEPS vs. relaxation [t = 2.16, df = 173, p = .032]; clinician-guided behavior therapy vs. relaxation [t = 3.37, df = 173, p = .001]). BT STEPS and clinician-guided behavior therapy did not differ significantly (t = 1.16, df = 173, p = .247). The BT STEPS group improved significantly more than the relaxation group on 4 WSAS items **(**home, social leisure, private leisure, and relationships) but not on its fifth item, work impairment (Table 3). The clinician-guided behavior therapy group improved significantly more than the relaxation group on all 5 WSAS items. Effect sizes on total WSAS in BT STEPS, clinician-guided behavior therapy, and relaxation were 0.71, 0.82, and 0.26, respectively.

HAM-D. HAM-D scores for the 3 groups (BT STEPS, clinician-guided behavior therapy, and relaxation) did not differ significantly at any point from randomization onward; mean baseline scores were 10 for each group and endpoint scores were, respectively, 10, 8, and 10.

SRI medication status. Among BT STEPS, clinician-guided behavior therapy, and relaxation, week 0–to-endpoint improvement in total YBOCS score did not differ significantly between patients treated and not treated with an SRI.

Complier and completer analyses. Because in previous work[29] compliant patients who took part in 2 or more postbaseline self-exposure homework sessions did better than those who had not, compliance was analyzed here. With this definition of compliance in an analysis of drop in total YBOCS scores, compliant patients in both the BT STEPS group (N = 19) (mean drop = 9.3) and in the clinician-guided behavior therapy group (N = 54) (mean drop = 8.1) improved significantly more than patients receiving relaxation therapy (N = 52) (mean drop = 1.8) on YBOCS (t = 4.88, df = 122, p = .001; t = 5.63, df = 122, p = .001, respectively), while BT STEPS and clinician-guided behavior therapy compliant patients improved similarly (t = 0.80, df = 122, p = .421). Patients receiving computer-guided or clinician-guided behavior

Table 3. Mean (SD) Scores on Work and Social Adjustment Scale: Individual Items

	Work			Home			Social Leisure			Private Leisure			Relationships		
Treatment Method	Baseline	Endpoint	Change	Baseline	Endpoint	Change	Baseline	Endpoint	Change	Baseline	Endpoint	Change	Baseline	Endpoint	Change
BT STEPS	4.02 (1.8)	3.07 (2.3)	0.95 (1.9)	4.84 (2.0)	3.75 (2.4)	1.09 (1.9)	4.53 (2.3)	3.26 (2.1)	1.27 (1.8)	4.46 (2.3)	3.04 (2.03)	1.41 (2.0)	4.29 (2.4)	3.27 (2.2)	1.02 (2.0)
Clinician-guided behavior therapy	3.89 (2.1)	2.42 (1.9)	1.48 (1.8)	4.76 (2.2)	2.91 (2.2)	1.91 (2.2)	4.73 (2.3)	3.20 (2.3)	1.56 (2.2)	4.16 (2.2)	2.66 (2.0)	1.56 (2.4)	4.35 (2.2)	2.75 (2.3)	1.65 (1.9)
Relaxation	4.41 (2.0)	3.86 (2.1)	0.55 (1.7)	4.65 (2.1)	4.47 (2.2)	0.18 (1.9)	4.56 (2.1)	4.12 (2.0)	0.44 (2.0)	4.53 (2.0)	4.14 (2.3)	0.39 (1.7)	4.09 (2.1)	4.00 (2.1)	0.09 (2.0)
		p Value			p Value			p Value			p Value			p Value	
Planned comparisons on change scores															
Clinician-guided behavior therapy vs BT STEPS		.121			.033			.461			.721			.098	
BT STEPS vs relaxation		.224			.013			.024			.006			.011	
Clinician-guided behavior therapy vs relaxation		.005			< .001			.003			.002			< .001	

therapy also improved similarly among patients who did at least 1 self-exposure homework session (N = 36 and N = 54, respectively) (mean drops = 7.8 and 8.1, t = 0.23, df = 139, p = .818), and both improved significantly more than those undergoing relaxation (N = 52) (mean drop = 1.8), t = 4.65, df = 139, p = .001 and t = 5.44, df = 130, p = .001, respectively).

The number of self-exposure homework sessions completed by patients in the BT STEPS group (mean ± SD = 7.9 ± 35.2) correlated significantly with mean YBOCS improvement (r = 0.27, p = .049) (the standard deviation reflected 1 outlier with 259 self-exposure homework sessions). Subjects in the BT STEPS group who completed > 20 self-exposure homework sessions (N = 3), 2–20 such sessions (N = 15), or 1 such session (N = 18) had significantly greater YBOCS improvement than those completing no such sessions (N = 19), (12.7, 8.7, and 6.2 vs. 1.4, p = .003, .001, and .017, respectively).

Site Differences

On an analysis of covariance using week 0 scores as a covariate, site-by-treatment interaction was significant (F = 1.93, df = 14, p = .027). Sites varied widely in degree of improvement, with the BT STEPS group improving significantly more than relaxation in 3 sites, clinician-guided behavior therapy more than relaxation in 5 sites, and clinician-guided behavior therapy more than BT STEPS in 1 site.

Follow-Up at Week 26 Postbaseline

Responders had rated themselves as "much" or "very much" improved on the PGI after 10 weeks' treatment. BT STEPS responders at week 10 (who had continuing access to BT STEPS) had a mean further drop in YBOCS score at week 26 (mean ± SD = 1.9 ± 4.40; t = 1.71, df = 15, p = .109), while clinician-guided behavior therapy and relaxation responders (followed up without further treatment) had mean increases in the total YBOCS score of 0.69 and 0.60, respectively (t = 0.52, df = 12, p = .610 and t = 0.65, df = 4, p = .553, respectively).

At week 10, 22 BT STEPS nonresponders (PGI > 2) were switched to clinician-guided behavior therapy and improved significantly in total YBOCS score by week 26 (mean drop = 5.1; t = 4.07, df = 21, p = .001), while 11 nonresponders to clinician-guided behavior therapy switched to BT STEPS and did not improve significantly in total YBOCS score by week 26 (mean drop = 0.5; t = 0.31; df = 10, p = .76). At week 10, 40 subjects who did not respond to relaxation were switched to BT STEPS and improved significantly in total YBOCS score by week 26 (mean drop = 3.8; t = 4.01, df = 39, p < .0001).

Treatment Expectations

At week –2, subjects rated 5 questions from 0 (none) to 8 (extremely) except question 4 asking for a percentage. Better initial treatment expectations correlated significantly with more YBOCS improvement from weeks 0 to 10 (p < .05) regarding each of the 5 questions in BT STEPS (r = 0.31 to r = 0.42) and with none of the questions in clinician-guided behavior therapy (r = –0.03 to r = 0.12) and relaxation (r = 0.09 to r = 0.22).

Treatment Satisfaction

At endpoint, on almost every item, patients were most satisfied with clinician-guided behavior therapy, next most satisfied with BT STEPS, and least satisfied with systematic relaxation. Patients who received clinician-guided behavior therapy or BT STEPS were significantly more satisfied than patients who received relaxation, and patients treated with clinician-guided behavior therapy tended to be more satisfied than patients who used BT STEPS. Satisfaction correlated significantly with improvement in each treatment condition (BT STEPS, clinician-guided behavior therapy, and relaxation, respectively) on the YBOCS (r = 0.49, 0.48, 0.37), total WSAS (r = 0.42, 0.52, 0.48), and at endpoint CGI (r = 0.65, 0.51, 0.52) and PGI (r = 0.60, 0.73, 0.54) (p < .001 for all r values).

Time and Length of BT STEPS Telephone Calls

The mean length of telephone calls to BT STEPS was 8.6 minutes (mean ± SD = 8.6 ± 5.5); 61% of calls were made outside business hours (9 a.m.–5 p.m., Monday–Friday). YBOCS improvement correlated significantly with more calls (mean ± SD = 22.5 ± 71.6; r = 0.28, p = .04), longer duration of all BT STEPS calls added together (mean ± SD = 140.5 ± 222.4 minutes; r = 0.31, p = .019), and more days from first to last call (mean ± SD = 71.6 ± 76.3 days; r = 0.30, p = .025), but not with mean call length, mean numbers of days from calls 4 to 5 (end of assessment to first self-exposure session) (mean ± SD = 4.0 ± 8.5), or calls 5 to 7 (first to second self-exposure session) (mean ± SD = 19.1 ± 30.7).

DISCUSSION

This study's pattern of results was similar on significance and percent of improvement and effect size. Clinician-guided behavior therapy was significantly more effective than BT STEPS, and both clinician-guided behavior therapy and BT STEPS were significantly more effective than systematic relaxation, which was ineffective. Both computer-guided and clinician-guided behavior therapy reduced total time per day spent in rituals plus obsessions by 3.4 hours, compared with 0.6 hours for relaxation. Clinician-guided behavior therapy was significantly superior to computer-guided overall on 3 measures and had a larger overall effect size, but was no more effective than computer-guided behavior therapy for patients who completed at least 1 self-exposure homework session

(N = 36, 65%). Behavior therapists may thus have motivated more patients than did computer-guided behavior therapy to start self-exposure homework, but once patients began to do such exposure, they improved as much when guided by computer as by a clinician. A similar pattern appeared in another computer-guided study[30] and in another randomized controlled trial (RCT) in which clinician-guided but self-administered exposure was as effective as clinician-accompanied exposure.[8] Perhaps non–behavior-therapist clinicians could motivate patients to do self-exposure guided by computer or by a workbook alone, even without knowing exactly how exposure is done, just as we advocate treatments from other specialists. Computer-guided and clinician-guided behavior therapy effect sizes (a between-subjects calculation of 0.69 and 1.10, respectively) resemble those found in other trials of behavior therapy[12,13,31] and were in the range of effect sizes found for the SRIs with U.S. Food and Drug Administration approvals for OCD[13] (i.e., clomipramine = 1.09, fluoxetine = 0.87, fluvoxamine = 0.73, paroxetine = 0.41, and sertraline = 0.37).

Patients who did not respond to computer-guided behavior therapy improved after switching to clinician-guided behavior therapy, but patients that did not respond to clinician-guided behavior therapy did not improve after switching to computer-guided behavior therapy. Thus, resistant patients with OCD improved more when a clinician guided their self-exposure rather than a computer. It is unclear why better initial expectations of treatment by patients correlated with more effective outcome in computer-guided but not in clinician-guided behavior therapy or systematic relaxation.

The effective self-exposure element of behavior therapy is little used to treat OCD[32] or other anxiety disorders even in academic settings.[33] In a survey of behavior therapists, a course of behavior therapy for OCD cost a mean of $4370,[34] so many may be using inefficient behavioral techniques as the mean outpatient cost in centers of excellence is estimated at $2000. A stepped-care approach could widen treatment availability if patients with OCD first had access to self-exposure guidance delivered by computer and then, if that failed, they had self-exposure guided (but not necessarily accompanied) by a behavior therapist. In 2 meta-analytic reviews, 1 concluded that "The treatment effect of self-controlled exposure in vivo is not enhanced by therapist or spouse involvement,"[12(p373)] while the other found larger effect sizes for therapist-accompanied exposure.[35]

Patients' reactions to BT STEPS were largely positive. Many mentioned the convenience of telephoning at times that they, rather than the clinician, preferred, and 61% of calls were made between 5:00 p.m. and 9:00 a.m. or on weekends.

Certain clinical procedures, such as outcome assessments, are so costly when performed by clinicians that they are often not included as part of the patient's treatment plan.[36] Patient-computer interaction, as with BT STEPS, can facilitate self-ratings of progress with feedback to patients and clinicians, with aggregation in a database to speed analyses. Other benefits of computer-guided care are that it is easier to disseminate as a new treatment than it is to train clinicians, and treatment elements can be added or removed to study the effect of such changes.

Our design could not address 4 important issues. First, is there a potential effect from our patients having been screened face-to-face by a clinician before enrollment? Second, after screening at week –2 and enrollment at week 0, patients had to see a clinician for ratings at weeks 2, 6, 10, and 22. This may have motivated them to do more self-exposure than if they had not been asked to report back, although it did not make relaxation effective. Third, we did not compare the merits of self-exposure guided by the BT STEPS workbook alone vs. the workbook plus its IVR system. A workbook is less interactive, does not allow patients to give and get electronic feedback of progress, and is more difficult to update and disseminate widely. However, bibliotherapy without computer interaction improved phobias in an RCT in which patients were screened by and had to report progress regularly to a clinician.[37] Finally, our sample included only patients with extensive rituals (mainly cleaning and checking), so the results may apply less to patients who have obsessions with no overt rituals, even though our patients improved similarly in rituals and in obsessions.

Given these 4 caveats, present results suggest how even clinicians without behavioral training might widen access to effective help for patients with OCD by encouraging them to use an appropriate computer-guided system. A system like BT STEPS can also save 85% of scarce behavior therapist time, the 15% still needed being spent mainly on initial screening.[30] This, too, might in time be delegated to an IVR interview.

Some fear that using computers to guide therapy may make the work of clinicians redundant. In fact, computer-guided treatments can extend clinicians' powers. Systems like BT STEPS may complement and reinforce treatment elements that clinicians want their patients to have but cannot give due to lack of training, time, or resources. Such systems may widen access to guidance for effective self-treatment. They may be enough for many OCD patients who have so far been unable to obtain self-exposure guidance. Patients who do not benefit enough from computer-guided self-help could go on to have clinician-guided self-exposure that might be speeded by having available the results of preceding automated self-assessment. The cost-efficiency of computer- versus clinician-guided care now deserves careful study.

Drug names: fluoxetine (Prozac and others), fluvoxamine (Luvox and others), paroxetine (Paxil), sertraline (Zoloft).

Acknowledgment

The authors gratefully acknowledge the contributions of the following investigator sites: Daniel Christensen, M.D., private practice, Salt Lake City, Utah; Alan Feiger, M.D., Feiger Health Research Center, Wheat Ridge, Colo.; Wayne K. Goodman, M.D., University of Florida, Gainesville, Fla.; Philip T. Ninan, M.D., Emory University, Atlanta, Ga.; Rachid Och, M.D., CAPSTAN/ Boston Road Clinic, Worcester, Mass.; Teresa A. Pigott, M.D., Comprehensive Neuroscience, Inc., Chevy Chase, Md.; Richard P. Swinson, M.D., McMaster University, Hamilton, Ontario, Canada; Martin Antony, Ph.D., St. Joseph's Hospital, Hamilton, Ontario, Canada; Richard Weisler, M.D., private practice, Raleigh, N.C. We also thank Deborah Osgood-Hynes, Psy.D., who prepared the relaxation tapes used in the relaxation treatment arm.

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