

# Web-based Therapist-Assisted Cognitive Behavioural Treatment of Mild to Moderate Depression: A Randomised Controlled Trial.

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**Background:** Depression is common but undertreated. Web-based self-help provides a widely accessible treatment alternative for mild to moderate depression. However, the lack of therapist guidance may limit its efficacy. **Objective:** To assess the efficacy of therapist-guided web-based Cognitive Behavioural Treatment (Web-CBT) of mild to moderate depression. **Design** A randomised waiting-list controlled trial, with an 18-month follow-up. **Participants:** The study included a community sample of 54 participants with chronic, moderate depression (immediate treatment:  $n = 36$ , waiting-list control:  $n = 18$ ). **Measures** Primary outcome measures were the Beck Depression Inventory (BDI-IA) and the Depression scale of the Symptom Check List - Revised (SCL 90-R DEP). Secondary outcome measures were the Depression Anxiety Stress Scales (DASS-42) and the Well-being Questionnaire (W-BQ12). **Results:** In the RCT, 5 participants (9%) dropped out. Intention-to-treat ANCOVAs revealed that participants in the treatment condition improved significantly more than the participants in the waiting-list control condition ( $.011 < p < .015$ ). With regard to the primary measures, between-group effects were  $d = 0.7$  (BDI-IA) and  $d = 1.1$  (SCL-90-R DEP). Post-test SCL90-R DEP scores indicated recovery of 49% of the participants in the treatment group, compared to 6% in the control group (Odds Ratio = 14.5;  $p < .004$ ). On average, the effects were stable up to 18 months ( $n = 39$ ), although medication was a strong predictor of relapse. **Conclusion:** The results demonstrate the efficacy of Web-CBT of mild to moderate depression, and the importance of therapist guidance in psychological interventions.

Although depression is common, costly, and a considerable source of personal suffering and diminished quality of life (Üstun, Ayuso-Mateos, Chatterji, Mathers, & Murray, 2004; Wang, Simon, & Kessler, 2003), it often goes untreated. While effective treatments are available, only a third of those affected gains access to these treatments (Collins, Westra, Dozois, & Burns, 2004). This suggests that evidence-based treatment for depression remains poorly accessible. It is therefore important to develop alternative avenues to disseminate such treatment.

Computerized and internet-based cognitive-behaviour therapy (CBT) provides a viable and cost-effective treatment alternative for a range of mental health conditions, including depression (Emmelkamp, 2005; Griffiths & Christensen, 2006; Kaltenthaler et al., 2006; Riper et al., 2007; Wantland, Portillo, Holzemer, Slaughter, & McGhee, 2004). Meta-reviews of internet-based programs targeting depression revealed small to moderate mean effect sizes, ranging from  $d = .3$  (Spek et al., 2007), and  $d = .6$  (Barak, Hen, Boniel-Nissim, & Shapira, 2008), to  $d = .7$  (Riper et al., 2007). However, these reviews also revealed significant heterogeneity in efficacy among studies. In a more qualitative review, Andersson (2006) concluded that differences between the studies preclude a single, pooled effect size.

Therapist support appears to be a significant moderator of the efficacy of internet-based therapy. Palmqvist, Carlbring, and Andersson (2007) found a strong correlation ( $\rho = .8$ ) between the amount of therapist guidance and treatment ef-

ficacy. In the meta-analysis of Spek et al. (2007), the mean effect size of programs with therapist input is large ( $d = 1.0$ ), while the mean effect size of programs without therapist support is small ( $d = .2$ ). However, there is a clear need for more research, because this review included only 12 trials. Of these, five trials included therapist support, and only one targeted depression (Andersson et al., 2005).

Based on principles of online therapy applied earlier for the treatment of posttraumatic stress Lange2003b and work-related stress (Ruwaard, Lange, Bouwman, Broeksteeg, & Schrieken, 2007), we developed a standardized, therapist-guided, web-based treatment of depression. Like most computer-aided psychological interventions of depression, the treatment is highly structured, and comprises a balanced sequence of cognitive-behavioural interventions. However, in contrast to most programmes, this intervention includes scheduled therapist guidance. The treatment protocol specifies the timing, nature, and frequency of therapist feedback. In this respect, the treatment is similar to the programme studied by (Andersson et al., 2005). But there are clear strategic differences. Andersson et al. (2005) aimed to provide guided self-help. In contrast, we aimed to transform manualized face-to-face CBT into an internet intervention. As such, the treatment includes more frequent therapist feedback. Further, our programme includes explicit techniques which serve to support the therapists in providing the treatment.

Below, we present both the treatment and the results of a

randomised controlled trial in which we compared the effects of this treatment with those of a waiting-list. In addition, we report the results of an 18-month follow-up study. Also, in the light of previous research (Andersson, Bergstrom, Holandare, Ekselius, & Carlbring, 2004; Spek et al., 2007), we examined several predictors of treatment outcome, including baseline depression intensity, gender, educational level, number of depressive episodes, and medication. We hypothesized that, in comparison to the waiting-list, the treatment would reduce depressive symptoms more, and that the improvements would be sustained over time.

## Treatment

The treatment involves strategies from Cognitive Therapy (CT) and Behavioural Activation (Beck, Rush, Shaw, & Emery, 1979; Lewinsohn, Biglan, & Zeiss, 1976). In the cognitive interventions, clients learn to recognize maladaptive, negative thoughts, and to substitute these for more realistic, constructive thoughts. In the behavioural interventions, clients are encouraged to engage in behaviours that either elicit positive reinforcement, avoid negative reinforcement from the environment and generally enhance feelings of self-respect (Cuijpers, Van Straten, & Warmerdam, 2007; Hopko, Lejuez, Ruggiero, & Eifert, 2003).

Similar to manualised face-to-face CBT, the treatment

comprises a balanced set of homework assignments and scheduled therapeutic sessions in which assignments are explained and adapted to the needs of the client. In Web-based CBT, the homework assignments are based on web pages, which implement a personal interactive workbook. At regular intervals, therapists use the contents of this workbook to post feedback and further instructions. The therapist and the client do not communicate in real-time (e.g., chat, MSN). Similar to e-mail, communication between the therapist and the client is asynchronous. This provides the therapists with the opportunity to reflect on their feedback, or to discuss complex cases with colleagues or a supervisor.

Treatment integrity is enhanced by a computerized manual that specifies each step of treatment. This manual governs the order, the nature, and the contents of the assignments, and the timing of therapist feedback. Furthermore, the manual provides default feedback templates which the therapists personalize to their clients. The templates contain explicit instructions to the therapist (e.g., to start the feedback with a summary of the accomplishments of the client, followed by a compliment). In addition, the templates provide feedback snippets for various scenarios. Ideally, clients may complete an assignment as intended and with satisfying results. However, when this is not the case, the templates provide the therapist with suggestions on how to deal with these situations.

A full treatment requires approximately 11 weeks to complete, although the schedule allows clients to adjust the pace to their own situation. The manual defines 8 treatment phases, with 86 client assignments and 21 feedback/instruction texts. Clients need about 2 to 4 hours per week to complete the assignments, and therapists need about 20 to 40 minutes to formulate their feedback. Hence, the treatment takes between 22 to 44 hours of client time, and about 7 to 14 hours of therapist time.

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**Phase 1 - Inducing awareness: writing.** The first phase consists of two writing assignments (Lepore & Smyth, 2002). Clients make an inventory of how and when they experience depressive moods, and try to determine the immediate causes of these moods. In the first essay, they are asked to describe in detail an event that elicits their depressive symptoms. In the second essay, they are asked to reflect on the first essay, by relating possible past and present events to their negative feelings and thoughts. After each essay, therapists provide advice, support, and specific commentary.

**Phase - Inducing awareness: monitoring.** Following phase 1, mood monitoring is applied to enhance awareness. On five days, at three fixed time points, participants rate their mood on a 1-10 scale, and provide a short description of the situation. These records provide clients and therapists with insight into the mood fluctuations during the day, and into high-impact events, thoughts, and emotions. In the feedback, provided after the second and fifth day, therapists emphasize the positive experiences reported by the clients (e.g., "you are not always feeling bad"). In addition, the therapists explain that there are ways to counter the negative experiences (e.g.,

”this may change”).

**Phase 3 - Timemanagement.** Building on the previous phase, clients are encouraged to structure their activities. For one week, they schedule their daily activities and evaluate their success in following this schedule. They are taught how to use their insight in possible daily mood fluctuations by scheduling positive activities at difficult moments. To this end, clients compile a list of pleasant activities. In addition, the therapists suggest several health-promoting activities. Clients receive detailed psycho-education and instruction concerning relaxation and breathing exercises (Öst, 1987), physical activities (Bosscher, 1991), and sleep hygiene strategies (Morin, 1993).

**Phase 4 - Cognitive restructuring: challenging negative thoughts.** Phase 4 targets maladaptive, negative thinking. First, clients simply record negative thinking and its triggering events. Next, they learn to identify automatic, dysfunctional thinking in their notes (e.g., black-and-white thinking, overgeneralization, catastrophic thinking, self-blaming, and neglect of positive aspects). Finally, clients adopt a critical approach towards the maladaptive thoughts, by formulating alternative interpretations of the triggering events.

**Phase 5 - Cognitive restructuring through behavioural experiments.** In phase 5, clients reformulate their negative thoughts into so-called ‘If... Then...’ hypotheses (e.g., “If I express my feeling, then they will make fun of me”). Next, the therapists help to create behavioural experiments in which these hypotheses are tested. Two such experiments are designed, executed and evaluated. The therapists ensure that the experiments are practicable and realistic.

**Phase 6 - Positive self-verbalization.** Phase 6 targets the self-esteem of the clients. For one week, they focus on their positive qualities by using the technique of positive self-verbalization (Lange, Richard, Gest, De Vries, & Lodder, 1998). First, they write an essay on their positive qualities. Next, they summarize on a small card their most powerful statements. The clients are encouraged to read aloud the contents of this card several times a day.

**Phase 7 - Social skills: Interacting with others.** A depressive mood and a negative self-image result in diminished contact with others, which may in turn initiate a negative spiral through the lack of positive interaction. In phase 7, clients break this spiral with two behavioural exercises. In the first exercise, they compile a list of positive characteristics of an influential person (e.g., a wife or husband, a good friend), communicate this list to this person in a scheduled, face-to-face meeting, after which they report the outcome of this meeting to the therapist. In the second experiment, clients compile a list of ways in which they can convey positive messages toward people in their surroundings, including family,

friends, and colleagues. Again, these strategies are put into practice, and the therapist is informed of the results.

**Phase 8 - Relapse prevention: the ‘toolkit’.** In this last phase, clients reflect on symptoms that might signal relapse in the future. They compose a personal ‘relapse prevention toolkit’: a personal account of the techniques that helped them most during therapy. They are encouraged to print the toolkit, and keep it for future reference.

## Method

### *Design*

The efficacy study comprised a randomised waiting-list controlled pre-post trial. Participants were randomly assigned to two groups. One group started the 11-week treatment immediately (experimental group), while the other started after 11 weeks (waiting-list control group). Eighteen months after the start of the trial, a follow-up study was conducted among participants who completed therapy to assess treatment effects in the long term.

### *Participants*

**Enrollment.** The recruitment procedure, which targeted people from the general population with mild to moderate depression, started with the publication of an article in a national Dutch newspaper announcing the study. The article referred readers to a website, which provided psycho-education regarding depression and its treatment, explained the purpose and design of the study, and contained an application form.

**Screening.** Respondents were screened by means of web-administered self-report questionnaires. The following exclusion criteria were applied: a score less than 10 (no depression) or more than 29 (severe depression) on the Beck Depression Inventory (BDI-IA: Beck, Ward, Mendelson, Mock, & Erbaugh, 1961; Beck et al., 1979, age under 18 years, heightened risk of dissociation or psychosis, suicidal ideation, drug and alcohol abuse, use of neuroleptic medication, unstable dosages of other psychiatric medication, concurrent psychotherapy, high anxiety levels, or a prevailing posttraumatic stress disorder or panic disorder. Finally, eligible respondents were required to download, print, and return a signed Informed Consent form. Respondents with severe depression (BDI-IA>29) were referred to a concurrent clinical trial of a face-to-face treatment for severe depression (Dekker et al., 2007). Other excluded respondents were referred to their GPs or received information concerning mental health centres in their vicinity.

*Risk of dissociation* was assessed using the 5-item Somatoform Dissociation Questionnaire (SDQ-5; Nijenhuis 1997), using a cut-off of 8. Respondents who scored above this cut-off also completed the longer, more specific Dissociation-Questionnaire (DIS-Q; Nijenhuis, Spinhoven, Van Dyck, Van der Hart, & Vanderlinden, 1998).

*Risk of psychosis* was attributed to respondents who scored above the cut-off value of 5 on the Hallucination scale of the Screening Device for Psychotic Disorder (SDPD; Lange, Schrieken, Blankers, Van de Ven, & Slot, 2000).

*Suicidal ideation* was measured using an inventory similar to that of Joiner et al. (2003). Respondents with suicidal plans or a history of recent suicide attempts (within the past 3 years) were excluded.

*High anxiety levels* were detected using the Anxiety and Stress subscales of the Depression Anxiety Stress Scales (described below in the Outcome Measures section).

*Prevailing posttraumatic stress or panic disorder* was inferred in respondents, who either scored above 36 on the revised Impact of Events Scale (IES-R; Weiss & Marmar, 1996; cut-off 36: Neal et al., 1994), or scored above 8 on the self-rate version of the Panic Disorder Severity Scale (PDSS-SR; Houck, Spiegel, Shear, & Rucci, 2002).

*Medication usage* was assessed through open-ended questions concerning the use, including dosage, of prescription and non-prescription medicine.

**Randomisation.** One month after the publication of the newspaper article, participants were randomly assigned to the experimental groups by means of a random number generator. Participants were assigned to the treatment group and the control group in a 2:1 ratio. Unbalanced randomisation was considered a defensible ethical compromise between the interests of the participants and that of the study: the treatment under study was built upon evidence-based principles, but not readily available to the public and the alternative for treatment was the waiting list (Avins, 1998; Edwards & Braunholtz, 2000).

### Procedure

**Setting.** The trial included no face to face contact between the participants and any mental health professional. Participants and therapist were given an account to a private password-protected Website. They used a common Web-browser (e.g., Microsoft Internet Explorer or Firefox) to follow the complete therapeutic procedure, including the completion of the questionnaires and the therapeutic assignments.

**Privacy.** Several procedures were in place to secure the privacy of the participants. First, only the therapist and the participant were given access to individual treatments. Also, the website included a web-mail system, which allowed participants to contact their therapist outside the treatment regime. Thus, participants, who shared an e-mail account with others (e.g., family members), did not have to use this shared account during treatment. Furthermore, the webserver was located at a professional Internet host, protected by a firewall, and remotely administered through an encrypted communication channel. All communication with the website was encrypted with the Hypertext Transfer Protocol over Secure Socket Layer (HTTPS).

**Therapists.** Eighteen therapists participated: 12 (72%) graduate-level clinical psychologists, and 6 (28%) therapists of the JellinekMentrum Mental Health Care Organization Amsterdam. The therapists were supervised by a licensed clinical psychologist specialized in Web-CBT. E-contact among the therapists and the supervisor was encouraged. In addition, weekly face-to-face supervision group sessions were held.

All therapists were trained in administering Web-CBT. The therapists learned how to personalize the feedback, how to avoid pitfalls of electronic, text-based communication (Brennan & Ohaeri, 1999), and how to make use of the asynchronous communication to enhance the quality of the feedback.

**Posttest and Follow-up.** Immediately after treatment, participants completed the post-test measurements on the website. These included the outcome questionnaires and an evaluation questionnaire. Eighteen months after treatment, those who completed treatment were invited by e-mail to complete the follow-up measures on the website. This group included members of the control group, who followed treatment after the 11-week waiting period.

### Measures

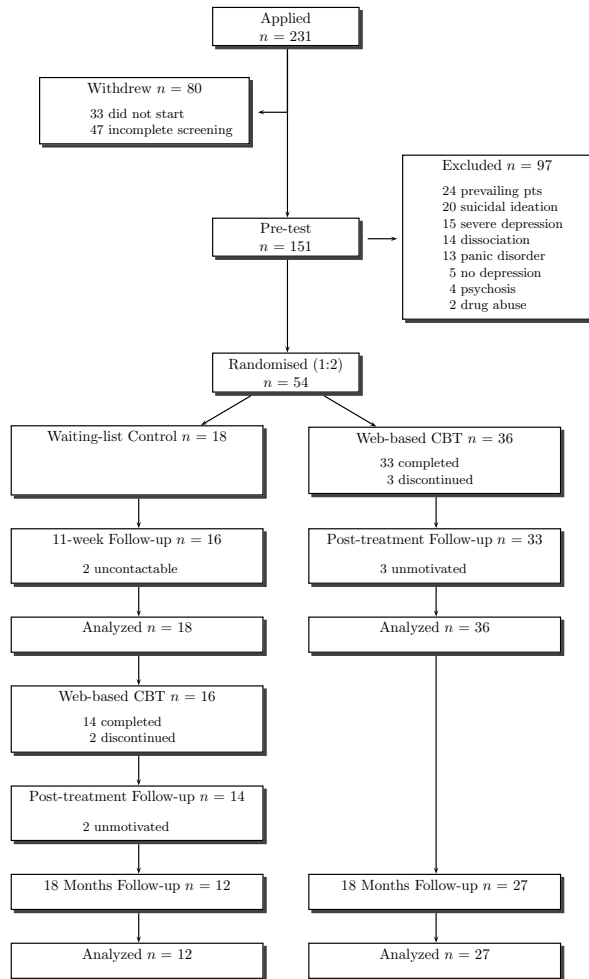
The primary outcome measures were the Beck Depression Inventory (BDI-IA, Beck et al., 1979 and the Depression subscale of the Symptom Check List Revised (SCL-90-R; Derogatis, 1977). Secondary measures were the Depression Anxiety Stress Scales (DASS-42: Lovibond & Lovibond, 1995 and the short-form Well-being Questionnaire (W-BQ12: Bradley, 2000). For each measure bar the W-BQ, higher scores indicate less favourable conditions. For the W-BQ12, higher scores indicate better levels of functioning.

**BDI-IA.** This self-rate instrument assesses (changes in) the intensity of depression. It comprises 21 items, scored by means of a 4-point Likert scale ranging from 0 to 3, yielding a total score between 0 and 63. It has good psychometrical properties, which have been confirmed in the Dutch population (Bouman, Luteijn, Albersnagel, & Van der Ploeg, 1985; Bouman, 1994). It has an internal consistency coefficient of  $\alpha = .86$ , a 1-month test-retest reliability of  $r = .82$ , and it correlates  $r = .72$  with clinical ratings of depression (Beck, Steer, & Garbin, 1988). In this study, we used the commonly applied clinical cut-off of  $c = 10$  (Beck et al., 1961; NICE, 2004; Oliver & Simmons, 1984).

**SCL-90-R Depression Scale.** This scale comprises 16 items, which are scored on a five-point Likert scale (0-4), indicating the rate of occurrence of depressive symptoms over the past week. The scale has good internal consistency ( $\alpha = .90$ ), and good convergent and discriminant validity (Arrindell & Ettema, 2003; Schmitz, Kruse, Heckrath, Alberti, & Tress, 1999). For this study, a cut-off score of 25 was used (Aben, Verhey, Lousberg, Lodder, & Honig, 2002;

sensitivity: 88%, specificity: 61%). Of relevance to the present study is that computerized versions of the SCL-90-R are comparable to the paper-and-pencil version (Schmitz, Hartkamp, Brinschwitz, Michalek, & Tress, 2000; Vallejo, Jordan, Diaz, Comeche, & Ortega, 2007).

Figure 1. Participant Flow.



**DASS-42.** The DASS measures negative affect by assessing the severity of symptoms of depression (DASS DEP), anxiety (DASS ANX), and mental stress (DASS STR). It comprises 42 items, 14 per subscale, that relate to the experience of symptoms in the past week. The items are rated on a 4-point Likert scale ranging between 0 (did not apply to me) to 3 (applied to me very much, or most of the time). All subscales of the Dutch adaptation are characterized by good internal consistencies (Cronbach’s  $\alpha$  between .94 and .97), and satisfactory 1-month test-retest reliabilities (Depression:  $r = .75$ , Anxiety:  $r = .89$ ; Stress:  $r = .79$ ; De Beurs, Van Dyck, Marquenie, Lange, & Blonk, 2001; Nieuwenhuijsen, De Boer, Verbeek, Blonk, & Van Dijk, 2003).

**W-BQ12.** The 12-item W-BQ (Dutch version: Pouwer, Snoek, Ploeg, Ader, & Heine, 2000) is a measure of psychological well-being. It comprises three subscales, measuring negative well-being, positive well-being and energy. Each subscale contains four items that are scored on a 4-point Likert scale, ranging from 0 (never) to 3 (always). The total score, used in this study, is derived by summing the subscale-scores, after inverting the Negative Well-being subscale score. This yields scores between 0 and 36. The W-BQ12 was administered at baseline and posttest, but not at follow-up, to reduce the response burden.

*Analysis*

**Intention-to-treat** The analyses were conducted on an intention-to-treat. Drop-outs, who did not complete the posttest measurements, were assumed to have gained nothing. Their pretest scores served as posttest scores.

**Statistical significance.** Two-tailed ANCOVA’s (using pretest scores as a covariate) were conducted to test the difference in means of the two groups at posttest. The assumptions of ANCOVA were tested and found to be satisfied. The homogeneity of the regression coefficients in the two groups was confirmed by non-significant interactions between the covariates (pretest scores) and experimental condition. Further, the distributions of the outcome variables were approximately normal (in the case of the DASS anxiety scores, normality was achieved by means of a square root transformation), and the variance across the groups was homogeneous.

To balance Type-I and Type-II errors, we controlled for multiple testing by controlling the False Discovery Rate (FDR; Benjamini & Yekutieli, 2001). In this procedure,  $p$ -values are ordered ascendingly and then evaluated sequentially against ascending critical alpha levels, according to the formula  $\alpha_i = \alpha/m * i$  ( $i$  denotes the rank of the ordered  $p$ -values, and  $m$  denotes the number of tests).

**Effect size.** To express the magnitude of the effects, mean gain scores on the outcome measures were standardized to Cohen’s  $d$  (Cohen, 1988), representing the number of standard deviations separating the two means. Point estimates and 95% confidence intervals of  $d$  were determined following a procedure described in detail by Robey (2004). In this procedure, effect sizes are calculated using the pooled standard deviation (of the pretest and posttest scores) and confidence intervals are approximated from the central  $t$ -distribution.

**Clinical relevance.** We tested the higher probability of statistically reliable individual recovery after treatment compared to the control group with two-sided Fishers exact tests ( $\alpha = .05$ ), and expressed this difference as odds ratios (OR; Hillis & Woolson, 2002). First, we used the Reliable Change Index (RCI) to test the significance of individual change (Jacobson & Truax, 1991; ‘no change’ and ‘deterioration’ were pooled into a single ‘unimproved’ category). Next, recovery was defined as reliable change from a pretest score

Table 1  
*Characteristics of Participants and Excluded Respondents.*

	Control <i>n</i> = 18		Treatment <i>n</i> = 36		Excluded <i>N</i> = 97	
<b>Demographic</b>						
Gender : female	56%	10	75%	27	78%	76
Age ( <i>M SD</i> )	42	9	42	10	35	12
Education : tertiary	67%	12	69%	23	45%	44
Marital status : married	22%	4	28%	10	31%	30
unmarried	61%	11	53%	19	56%	54
divorced/widow(er)	17%	3	19%	7	13%	13
<b>Symptoms</b>						
Duration of symptoms ( <i>years; Median IQR</i> †)	15	16	10	12	11	16
Multiple depressive episodes	72%	13	69%	25	78%	76
Number of depressive episodes ( <i>Median IQR</i> )	4	7	5	6	3	3
Longest episode ( <i>weeks; Median IQR</i> )	16	33	22	44	24	39
<b>Treatment</b>						
Received treatment before	67%	12	56%	20	61%	60
Pharmacotherapy	44%	8	30%	11	48%	47
Psychotherapy	56%	10	44%	76	43%	42
Antidepressant <sup>b</sup> at pretest	17%	3	20%	7		

<sup>†</sup>IQR: Interquartile range.

<sup>b</sup>All excluded respondents were excluded before baseline medication usage was recorded. Therefore, the cells in the columns of the excluded group are empty. Further, baseline medication of one participant of the treatment group was unknown at the time of analysis.

above the (published) clinical cut-off to a posttest score below the cut-off. Therefore, participants scoring below cut-off at pretest were excluded from the recovery analysis.

**Follow-up.** Pretreatment to follow-up data of those who participated in the follow-up were analyzed using repeated measures ANOVAs with time of measurement as a 3-level within-subject factor (pretest/posttest/follow-up). Differences between the means at the times of measurement were tested for significance using simple contrasts and *p*-value adjustments to control the false discovery rate within each measure.

**Mediating variables.** To assess the strength of outcome predictors, we examined the correlation of several predictor variables with the change scores of the BDI-IA (pretest-posttest; pretest-follow-up). Additionally, the predictors were examined through multiple regression analyses.

## Results

### RCT

**Enrollment** In response to the newspaper article, 231 respondents applied for treatment, of whom 80 (34%) subsequently withdrew. Of the 151 participants who completed the screening, 97 (64%) were excluded, and 54 (36%) were included (cf. Figure 1). In accordance with the exclusion protocol, excluded respondents scored less favourably on the BDI-IA [ $t(148) = 5.8, p < .001$ ] and the other outcome

measures. In addition, excluded respondents were younger [ $t(149) = 3.3, p = .001$ ] and less educated [ $\chi^2(1, n = 143) = 4.9, p = .03$ ] (c.f. Table 1)

**Sample.** The included sample ( $N = 54$ ) comprised 37 females (69%) and 17 males (31%). On average, they were middle-aged ( $M = 42, SD = 10$ , range: 18 - 71), unmarried (54%) and highly educated (69% completed tertiary education). They reported a median of 4 depressive episodes (interquartile range = 7.5, range: 0 - 50) over a median of 12 years (interquartile range = 14, range: 2 - 36 years). The median duration of the longest episode was 16 weeks (interquartile range = 45). Sixty percent had received previous treatment for depression, and 19% ( $n=10$ ) applied for treatment while taking a stable dosage of an antidepressant.

The participants were randomly assigned to immediate treatment ( $n = 36$  participants; 67%) or to the waiting-list control condition ( $n = 18$ ; 33%). With these groups sizes, the power of the study to detect a large ( $d = .8$ ) between-group effect was approximately 75% for the strongest effect (evaluated at  $\alpha = .05/6 = .008$ ). To check the randomisation, *t*-tests and  $\chi^2$  tests were conducted with respect to the outcome measures, gender, age, marital status, education, duration of symptoms, and medication status. No significant differences were found (cf. Table 1).

**Dropout.** Five participants (9%) dropped out of the study, 3 in the treatment group (8%) and 2 in the control group (11%; see Figure 1). Given the small number of drop-outs, predictors of drop-out were not subject to analysis.

Table 2  
*Web-CBT vs. Waiting-List Control (intention-to-treat analysis)*

Measure <sup>a</sup> Group <sup>b</sup>	Pre		Post <sup>c</sup>		Effect Size		ANCOVA <sup>c</sup>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>d</i>	<i>CI</i> <sub>.95</sub>	<i>F</i> <sub>1,51</sub>	<i>p</i> <sup>d</sup>
<b>BDI-IA</b>								
Web CBT	19.7	5.5	9.8	6.5	.7	±.6	7.6	.012
Control	21.3	5.3	15.6	7.6				
<b>SCL-90-R DEP</b>								
Web CBT	39.9	8.6	26.7	8.1	1.1	±.7	10.9	.011
Control	38.1	7.5	34.4	10.5				
<b>DASS DEP</b>								
Web CBT	20.6	8.4	7.6	6.9	.7	±.6	7.9	.070
Control	20.8	8.1	11.8	9.8				
<b>DASS ANX</b>								
Web CBT	6.9	4.7	2.8	2.8	1.0	±.6	8.0	.013
Control	6.1	4.2	6.3	6.6				
<b>DASS STR</b>								
Treatment	18.8	8.6	9.2	7.1	.8	±.7	4.1	.057
Control	15.5	7.9	13.3	8.8				
<b>W-BQ12</b>								
Web CBT	14.6	2.6	19.9	4.4	1.0	±.6	8.6	.015
Control	15.3	3.0	16.8	4.7				

<sup>a</sup>BDI-IA: Beck Depression Inventory; SCL-90-R DEP: Symptom Check List-Revised Depression scale; DASS: Depression Anxiety Stress Scales; W-BQ12: Well-Being Questionnaire. Higher scores indicate less favourable conditions, except for W-BQ12, where higher scores indicate higher levels of functioning.

<sup>b</sup>Web-CBT:  $n = 36$ ; Waiting-list control:  $n = 18$ .

<sup>c</sup>Pretest scores of drop-outs ( $n = 5$ ) were carried forward to the posttest.

<sup>d</sup>ANCOVA: Analysis of Covariance.

<sup>d</sup>Listed  $p$ -values are adjusted for multiple testing.

**Treatment duration.** The treatment group took longer than the planned 11-weeks to complete treatment (a median of 16 weeks), and completed the posttest later than the control group (13 weeks). This resulted in interpretative difficulties, because the control group did not fully control for spontaneous improvement. There were no indications that longer treatments were more effective: correcting for pre-treatment scores, treatment duration did not correlate with post-test scores,  $-.10 < r_{part} < .13$ .

Nevertheless, to account for the discrepancy, the scores of the control group were extrapolated to 16 weeks. Because there were just two measurements, the only option for post-hoc statistical correction was to assume linear change. Given improvements in the control group, this correction deflated the treatment efficacy estimate, and therefore resulted in a conservative evaluation.

**Statistical significance.** Table 2 shows the results in the intention-to-treat sample. Despite improvements in the control group, the improvement in the treatment group was significantly greater, both with regard to the primary outcome measures (adjusted  $p < .012$ ; Figure 2a), DASS anxiety and

W-BQ12 ( $p < .015$ ). With regard to DASS Stress and DASS Depression, the differential improvements between the two groups were not significant, although marginally so ( $p < 0.07$ ).

**Effect size.** Table 2 also shows the magnitude of the effects. Compared to no treatment, the primary depression measures revealed a large pooled effect size of treatment of  $d = .9$ . Large between-group effects were also found with respect to the secondary measures. With regard to DASS, the pooled effect was  $d = .8$ ; with regard to W-BQ it was  $d = 1.0$  (c.f. Table 2).

**Clinical relevance.** Table 3 shows the recovery rates in the two experimental groups. The odds ratios indicated more reliable individual recovery in the treatment group compared to the waiting-list (OR  $> 2.1$ ). However, this difference was only significant with regard to SCL-90 DEP (OR = 14.5; adjusted  $p < .01$ ).

Table 3  
Clinical Relevance: Reliable Recovery (Intention-to-treat Analysis)

Measure <sup>a</sup>	Pretest		Posttest <sup>b</sup>		OR <sup>c</sup>	p <sup>d</sup>
	n	%	n	%		
<b>BDI-IA</b>						
Treatment	36	100%	16	44%	2.1	.375
Control	18	100%	5	28%		
<b>SCL-90-R DEP</b>						
Treatment	35	97%	17	49%	14.5	.004
Control	17	94%	1	6%		

<sup>a</sup>BDI-IA: Beck Depression Inventory; SCL-90-R Dep: Symptom Check List Revised Depression Scale; Cut-off: BDI ≤ 10; SCL-90-R DEP ≤ 25.

<sup>b</sup>pretest scores of drop-outs were carried forward to the posttest.

<sup>c</sup>Odds Ratio (OR): the ratio of the odds of recovery in the treatment group compared to the odds in the control group.

<sup>d</sup>Listed p-values are adjusted for multiple testing.

### Pooled Outcome and Long-term Follow-up

**Participants.** After the 11-week waiting period, 16 out of 18 participants of the control group embarked on the web-based treatment. To enhance the precision of the assessment of participant satisfaction and predictors of outcome, data from both groups were pooled ( $N = 52$ ), using the second (pre-treatment) assessment of the control group as the pretest.

**Dropout.** In total, 47 participants (90%) completed treatment, and 5 participants (10%) dropped out. Visual inspection of the mean outcome scores suggested that drop-out was unrelated to baseline symptom severity. However, given the small number of drop-outs, predictors of drop-out were not analysed.

**Follow-up attrition.** Eighteen months after the start of the trial, the participants who had completed the treatment were invited for the long term follow-up. Thirty-nine participants (83%) responded. Baseline depression severity was unrelated to follow-up participation [ $t(45) = 0.08 - 1.5, p = .93 - .13$ ].

**Outcome.** Table 4 shows the results among the trial completers ( $n = 39$ ). The growth curves of the depression scores (illustrated by Figure 2b) indicated significant linear and quadratic time effects ( $F[1,38] = 21.7-47.6, p < .001$ ). On average, participants improved significantly from pretest to posttest ( $p < .001$ ; pooled  $d = 1.4$ ) and maintained their improvements up to the 18-months follow-up with marginal changes from posttreatment (pretest to follow-up:  $p < .001$ ; posttest to follow-up:  $p < .13$ ). The same pattern emerged

Table 5  
Predictors of Reduction of Depressive Symptoms After Web-based CBT.

Measure	$r_{post}$		$r_{fu}$	
Pretest depression severity	.68	***	.42	**
Gender	-.07		.11	
Age	.12		-.02	
Education	-.01		-.04	
Treatment duration	.06		.07	
Previous number of episodes	-.14		-.02	
Antidepressant (at pretest)	-.17		-.35	*
Additional treatment	.00		-.29	
Antidepressant	-.12		-.49	**
Psychotherapy	-.03		-.24	

<sup>a</sup>Outcome is defined as the difference score (Pretest-Posttest,  $n = 47$ ; Pretest-Follow-up,  $n = 39$ ) on the Beck Depression Inventory (BDI-IA).

<sup>b</sup> $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

with respect to DASS Stress (posttest to follow-up:  $p < .12$ ) and DASS Anxiety (posttest to follow-up:  $p < .13$ ).

As indicated by posttest BDI-IA scores of 36 trial completers scoring above cut-off at pretest, 17 (47%) reliably recovered from depression. At follow-up, again 17 (47%) of the participants had recovered. Of the 17, who recovered at posttest, 13 (76%) maintained this improvement up to 18 months.

**Participant satisfaction.** Immediately after treatment, participants evaluated the overall value of the treatment on a 1- to-10 scale with an average of 7.7 ( $SD = 1.2$ ). They rated their relationship with their therapist as pleasant (88%) and personal (75%), and stated that the relationship had grown during treatment (57%). Most participants (89%) indicated that they had not missed face-to-face contact.

**Predictors of outcome.** As shown by Table 5, baseline BDI-IA scores correlated positively with post-treatment improvements. Further, the use of an antidepressant (either during or after treatment) correlated negatively with long-term improvements (see Figure 2. None of the other variables significantly predicted the improvements. Examination through multiple regression produced similar results.

Baseline medication status correlated negatively with long-term improvements. Although the effect was absent at posttest, taking an antidepressant during treatment ( $n = 6$ ), was associated with a less favourable outcome at 18 months. At follow-up, the severity of depression in the antidepressant group was equal to baseline severity of depression.

Between the posttest and the 18-month follow-up, 16 (41%) of the 39 participants received additional treatment (psychotherapy only:  $n = 7$ ; medication only:  $n = 1$ ; both:  $n = 8$ ). Although the overall association was not significant, participants receiving additional treatment showed a consid-

Figure 2. Effects of Web-CBT as measured by the Beck Depression Inventory (BDI-IA) in comparison to a waiting-list control group (A), from pretest to the 18-month follow-up (B), and as moderated by medication (C). The error bars represent  $\pm 1$  standard error. The dashed horizontal line represents the clinical cut-off (10).

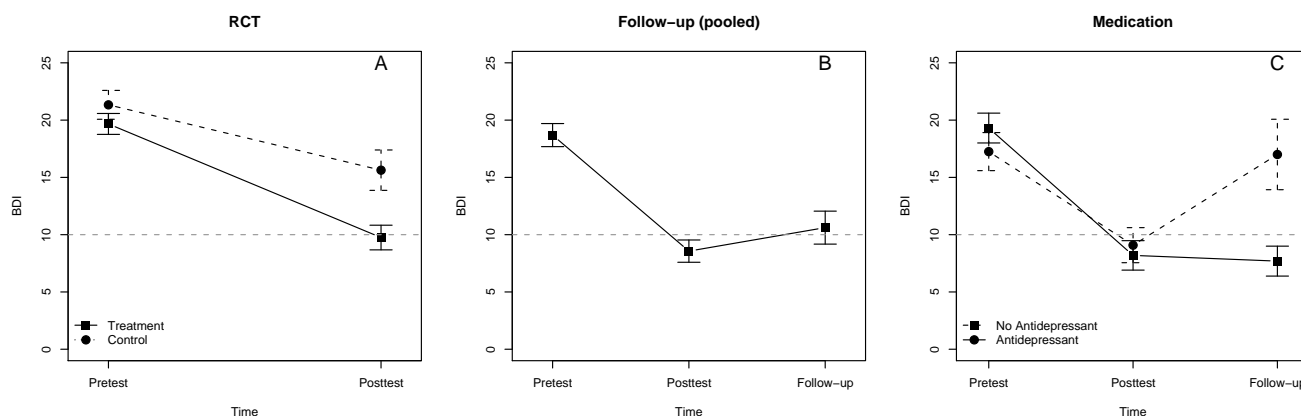


Table 4

Pooled Outcome of Web-CBT at Pretest, Posttest, and after 18 Months (n = 39).

Measure	Pre		Post		FU		Pre-FU ES	
	M	SD	M	SD	M	SD	d	CI <sub>.95</sub>
BDI-IA	18.5	6.6	8.6	6.1	10.6	9.0	1.0	$\pm .4$
SCL-90-R DEP	39.2	10.0	25.5	7.8	29.6	13.4	.8	$\pm .4$
DASS DEP	18.6	9.6	5.8	6.4	9.2	10.3	.9	$\pm .5$
DASS ANX	6.9	5.6	2.2	2.6	3.3	4.8	.7	$\pm .4$
DASS STR	17.1	9.2	8.2	6.8	9.8	8.1	.8	$\pm .4$

<sup>a</sup>BDI-IA: Beck Depression Inventory; SCL-90-R DEP: Symptom Check List - Revised Depression scale; DASS: Depression Anxiety Stress Scales.

<sup>b</sup>ES: Effect size.

erable higher level of symptoms at follow-up ( $r_{pb} = -.29$ ). Further examination showed that participants, who started taking medication after treatment, clearly displayed more severe symptoms at follow-up compared to those who did not [ $M = 16.8$  vs.  $8.0$ ,  $t(36) = 3.0$ ,  $p = .005$ ]. Again, at pretest and posttest, the two groups reported similar depression levels.

When medication usage both during and after treatment was considered, there was a significant medication effect ( $r_{pb} = -.52$ ,  $p < .001$ ). Figure 2c illustrates the effect. On average, those who took medication during or after the trial ( $n = 13$ ) did not improve from pretest to follow-up ( $d = .04$ ). In contrast, those who did not take any medication ( $n = 26$ ) reported large improvements ( $d = 1.6$ ).

### Discussion

Compared to a waiting list, standardized therapist-guided Web-based CBT induced large and clinically relevant improvements in depression, anxiety and well-being in a community sample of adults with chronic symptoms of mild to moderate depression. The follow-up indicated these effects to be persistent, although the use of medication was highly

predictive of a negative long-term outcome. Despite the lack of face-to-face contact, participants were highly satisfied with the treatment and their therapist.

### Primary results

After controlling for improvements in the control group, Web-CBT had an effect size of  $d = .9$ . This compares well with the effects found in meta-analyses of face-to-face CT and CBT trials ( $d = .8$ : Gloaguen, Cottraux, Cucherat, & Blackburn, 1998;  $d = .9$ : Cuijpers et al., 2007) and therapist-guided Web-CBT (Spek et al., 2007:  $d = 1.0$ ). Furthermore, the low drop-out rate of 10% in the present trial was encouraging, given that poor adherence has been identified as one of the major challenges of online intervention (Eysenbach, 2005).

With regard to negative affect, results were less clear. Significant results were found with the anxiety subscale of the DASS. The effects on DASS depression and DASS stress just fell short of statistical significance. However, given the magnitude of observed effects ( $.5 < d < 1.0$ ), we expect future trials to find positive results.

In accordance with face-to-face CBT, 47% of the participants in the Web-CBT condition recovered from their depression immediately after treatment. However, when this rate was compared with the recovery rates in the control group, strong significant differences in recovery rates between the experimental groups were found with the SCL-90, but not with the BDI-IA. While the recovery rate on these measures were comparable in the treatment group (49% and 44%), the recovery rates in the control group diverged (SCL-90: 6% vs. BDI-IA: 28%). Both rates of spontaneous recovery appear extreme based on what is known about the natural course of untreated depression (Posternak & Miller, 2001). Future studies should aim to resolve this issue.

In accordance with previous follow-up studies of online therapist-guided CBT (Andersson et al., 2004; Lange, Van de Ven, & Schrieken, 2003; Ruwaard et al., 2007; Spek et al., 2007; Wagner & Maercker, 2007) and face-to-face CT (Gloaguen et al., 1998), the effects were found to be stable in the long term. This is encouraging, given that the participants self-reported chronic and recurrent depressive symptoms before treatment. Apparently, this treatment made a lasting difference.

Importantly, the persistent improvements were not explained by additional treatment, which some participants had sought in the 18-month period. On the contrary: pharmacotherapy was highly predictive of relapse on the long term. We would have expected the use of an antidepressant to have resulted in slightly lower, rather than higher, follow-up scores (Pampallona, Bollini, Tibaldi, Kupelnick, & Munizza, 2004). Participants, who took an antidepressant during treatment, may have terminated their medication too soon, because of the short-term improvements as a result of the internet treatment. Alternatively, these participants may have attributed the immediate improvements not to their own efforts, but to the medication. Also, participants, who started pharmacotherapy after treatment, may have done so simply because they did not experience long-term benefit from Web-CBT. In any case, there is a clear need of updating the treatment manual to address combined therapy. Additionally, future trials should control for medication in a more rigorous manner.

The present treatment and the internet-based guided self-help programme of Andersson et al. (2005) appear equally effective, even though the present treatment requires more therapist time (2 hours vs. 7 to 14 hours). However, in the trial of Andersson and co-workers, the attrition rate was higher (27% vs. 10% in the present treatment), and the effects on anxiety were lower ( $d = .5$  vs.  $d = 1.0$ ). Furthermore, the differences in efficacy may be obscured by differences in control group improvements. Andersson and co-workers (2005) found a small effect of  $d = .2$  in the control group, while the present study revealed a large effect in the control group ( $d = .8$ ). Clearly, it would be interesting to compare both approaches directly.

## Limitations

We did not make use of a structured diagnostic interview to establish a formal diagnosis of depression or dysthymia. Face-to-face interviewing was not an option, given that we aim to develop fully internet-based treatment. Instead, we used cut-off scores of self-report scales to determine the clinical status of the participants. Although the consequences of these cut-offs are known, observer-rated diagnoses may add to the validity of the results. Telephonic diagnostic interviews may provide a future solution.

A second limitation concerns the generalizability of the results. We excluded respondents with BDI-IA scores indicating severe depression ( $> 29$ ). Therefore, the results of the present study should not be generalized to individuals with severe depression. The generalizability of results might be further limited by our exclusion criteria. Note, however, that most excluded respondents were rejected because they suffered from posttraumatic stress or panic disorder, for which effective online alternative treatments exist, or because of dissociation and suicidal ideation, for which, presently, we consider online treatment unsuited given the lack of face-to-face contact.

Another limitation is that the period between pre-test and post-test differed somewhat between the groups studied in this trial. To control for this discrepancy, we used linear extrapolation to estimate the changes in the control group. As a result, the observed improvements in the control group were more pronounced. Thus, the extrapolation resulted in a conservative estimate of treatment efficacy. Nevertheless, replication studies should aim to avoid such corrections, for example by using the observed estimate of treatment duration (16 weeks), or by measuring both groups after a fixed interval, regardless of treatment progress. As a final limitation, we remind the reader that the long-term follow-up study was uncontrolled, and that it included only those participants who completed treatment. The positive outcome of the long-term follow-up needs to be corroborated, preferably by a comparative study.

## Future directions

The present results certainly are encouraging and warrant further study of this programme. The treatment shares many characteristics with existing computer-aided CBT, but includes more therapist guidance and appears to be more effective. The results therefore underscore the suggestion of Palmqvist et al. (2007) and Spek et al. (2007) that the efficacy of internet-based CBT is related to the amount of therapist guidance. However, the cost-benefit of various approaches of internet-based CBT awaits further exploration. Future trials should aim for direct comparisons between programmes with varying amounts of therapist guidance, and should evaluate patient preference and treatment adherence as well as efficacy and costs.

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