

E-Mailed Standardized Cognitive Behavioural Treatment of Work-Related Stress: A Randomized Controlled Trial

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Abstract. The aim of this study was to assess the effects of a 7-week standardized cognitive behavioural treatment of work-related stress conducted via e-mail. A total of 342 people applied for treatment in reaction to a newspaper article. Initial screening reduced the sample to a heterogeneous (sub)clinical group of 239 participants. Participants were assigned randomly to a waiting list condition ($n=62$), or to immediate treatment ($n=177$). A follow-up was conducted 3 years after inception of the treatment. The outcome measures used were the Depression Anxiety Stress Scales (DASS-42) and the Emotional Exhaustion scale of the Maslach Burnout Inventory – General Survey (MBI-GS). Fifty participants (21%) dropped out. Both groups showed statistically significant improvements. Intention-to-treat analysis of covariance (ANCOVAs) revealed that participants in the treatment condition improved significantly more than those in the waiting control condition ($0.001 < p \leq 0.025$). In the treatment group, the effects were large to moderate (0.9 (stress) $\geq d \geq 0.5$ (anxiety)). The between-group effects ranged from $d=0.6$ (stress) to $d=0.1$ (anxiety). At follow-up, the effects were more pronounced, but this result requires replication in view of high attrition at follow-up. The results warrant further research on Internet-driven standardized cognitive behavioural therapy for work-related stress. Such research should include the direct comparison of this treatment with face-to-face treatment, and should address the optimal level of therapist contact in Internet-driven treatment. *Key words:* treatment manual; Internet-driven therapy; chronic stress; burnout; stress management; cognitive behaviour therapy; Interapy; E-health

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Globalization, organizational restructuring, and the universal adoption of information technology have transformed the demands on employees in many organizations (Sparks, Faragher, & Cooper, 2001). The pressure to adapt to rapid technological and organizational demands has contributed to an increase in the prevalence of chronic stress among employees. Despite considerable efforts to counter this trend, the rates of work incapacity and sick leave due to work-related stress are high in the Netherlands compared with other European countries (Schaufeli & Kompier, 2001).

Stress is not necessarily harmful, i.e. a degree of stress is necessary to achieve desired levels of performance (Van Doornen, 2001). However, it may become a serious problem if people are exposed to high levels of stress over extended periods of time. Work-related stress is defined as excessive chronic stress caused by a mismatch between work-related demands and available coping skills (Health & Safety Executive, 2001). It is characterized by a variety of negative emotional and physiological reactions to aspects of the work itself, to the environment, and to the organization (Levi & Levi, 1995). Common psychological

reactions to work-related stress are depression, anxiety, and emotional exhaustion (Cooper, Dewe, & O'Driscoll, 2001).

Cognitive behavioural therapy (CBT) and relaxation therapy are moderately effective in reducing work-related stress (Van der Klink, Blonk, Schene, & Van Dijk, 2001). In CBT, clients are instructed how to address the causes of their stress by changing their coping skills with regard to demands and pressures. In relaxation therapy, clients learn to lower their physiological arousal. In a meta-review, Van der Klink et al. (2001) estimated the effects of CBT and relaxation therapy to be $d=0.7$ and $d=0.4$, respectively.

The implementation of these interventions, however, requires trained professionals, who are relatively few in number (World Health Organization, 2001). In addition, clients may be hesitant to seek help, due to limited mobility, travelling distance, or a lack of awareness concerning their condition, or the possibility of treatment. Finally, fear of stigmatization may discourage potential clients from seeking help. Given the obstacles to seeking face-to-face therapy, there is an increasing interest in methods to provide evidence-based treatment using the Internet (Barak, 1999; Emmelkamp, 2005; Newman, 2004). Online therapy may reduce the present burden on the available mental health resources, and may provide a viable alternative for people who face geographical, physical, psychological and/or financial barriers in seeking traditional, face-to-face care.

Critics of Internet-driven therapy have questioned its feasibility and have expressed ethical concerns (e.g. Bauer, 2000; Bongor, 1988). However, at present, the main question concerning online therapy is not whether, but rather how exactly, it should be undertaken. Over the years, the accumulation of studies evaluating online therapy has resulted in a body of results. Reviews to date indicate that online therapy provides an effective alternative to existing methods for early intervention (e.g. Griffith & Christensen, 2006; Wantland, Portillo, Holzemer, Slaughter, & McGhee, 2004). However, these reviews also show many challenging, open-ended issues that remain to be addressed. For example, the available evidence on the effectiveness of online therapy is limited to a relatively small number of disorders, and the effectiveness is

found to vary considerably across studies (e.g. Spek et al., 2006). Furthermore, dropout-rates tend to be high. Wantland et al. (2004) reported an average dropout-rate of 21%.

Studies vary greatly in the degree of therapist involvement. Some studies relied entirely on self-help material (e.g. Klein & Richards, 2001). Others explicitly involved a personal therapist, and included explicit structuring of the remote client-therapist interaction to facilitate the desired changes. The involvement of a therapist allows for personalization of the interventions and encourages the development of a therapeutic alliance (Knaevelsrud, Jager, & Maercker, 2004). In a meta-analysis of Internet-based interventions for anxiety and depression, Spek et al. (2006) found that the effects of interventions with therapist support were considerably larger than the effects of interventions without therapist support.

Zetterqvist, Maanmies, Ström, and Andersson (2003) tested the efficacy of e-mailed self-help for stress management with minimal therapist contact. The treatment involved relaxation training, development of problem-solving and time-management skills, cognitive restructuring, and behavioural exercise. Compared with a waiting list control group, participants in the programme displayed significantly greater improvement on the Perceived Stress Scale (PSS: S. Cohen, Kamarck, & Mermelstein, 1983) and the Hospital Anxiety and Depression Scale (HADS: Zigmond & Snaith, 1983). The reported summary statistics suggest large to moderate (controlled) effect sizes of $d=0.6$ (PSS), $d=0.5$ (HADS Anxiety) and $d=0.8$ (HADS Depression). Unfortunately, 26% of the participants dropped out, and intention-to-treat analyses failed to reveal significant differences between the 2 groups.

Based on principles of online therapy developed earlier for the treatment of post-traumatic stress (Lange, Rietdijk, et al., 2003), we designed a standardized treatment of work-related stress, which can be conducted via e-mail. The treatment is based upon interventions that have proved their worth in clinical trials and clinical practice (De Jong & Emmelkamp, 2000; Lange, Richard, Gest, De Vries, & Lodder, 1998). The treatment involves psycho-education, awareness training, applied relaxation, cognitive restructuring,

positive self-verbalization, social skills training and time-management. The content of the treatment is similar to that of Zetterqvist et al. (2003). In contrast to the Zetterqvist et al. study, where client-therapist interaction was incidental and not standardized, the treatment manual includes explicit structuring of the client-therapist interaction. Specifically, it specifies the timing, nature, and frequency of the therapist instructions and feedback.

Below, we present the results of a randomized controlled trial that we conducted to assess the effects of our Internet-based standardized CBT on work-related stress. We compared the effects of treatment with those observed in a waiting list control group. We hypothesized that, in comparison to the waiting-list, the treatment would substantially reduce levels of stress. We also expected the treatment to reduce stress-related complaints, in particular depression, anxiety, and emotional exhaustion. In addition, we report the results of a 3-year follow-up study in which we assessed the long-term effects among those who had completed treatment.

Method

Design

The study comprised a waiting-list controlled pre-post trial. Participants were randomly assigned to 2 groups. One group started the 7-week treatment immediately (experimental group), while the other started it after 7 weeks (waiting list control group). Three years after the completion of the pre-test, a follow-up study was conducted among the clients of the experimental group who had completed the therapy, in order to determine the long-term effects of the intervention.

Participants

Recruitment. A national Dutch quality newspaper published an interview with 1 of the authors about Internet-driven therapy. The article announced the current study, and referred interested readers to a website. This site provided psycho-education on work-related stress, explained the purpose and design of the study, and contained an application form.

Screening. Respondents were screened by means of self-report questionnaires with respect to the following exclusion criteria: age < 18 years, heightened risk of dissociation or psychosis, suicidal ideation, drug abuse, use of neuroleptic medication, and concurrent other treatment. In addition, respondents were required to download, print, and return a signed informed consent form. Excluded respondents were referred to other mental health institutions.

Sample. Of the 342 respondents, who applied for the treatment, 65 did not complete the screening and 38 met the exclusion criteria (see Figure 1 for details). The final sample ($n=239$) comprised 143 females (60%) and 96 males (40%), aged between 22 and 60 years ($M=44$, $SD=8$). Most of the participants were highly educated (84% completed tertiary education), and reported a wide variety of professional occupations. The majority (80%) were in full-time paid employment. Seven participants were unemployed, because of work-related stress. Ten participants suffered from stress in unpaid jobs (housewives, volunteers, and students). In 167 (70%) of the participants, the level of stress was above the clinical cut-off on the stress outcome measure (described in the *measures* section). On average, the duration of the reported symptoms was 30 months ($SD=34$, range=1–180 months). A number of participants (38%) was on partial or full sick leave. All participants attributed their complaints to their job, although many (65%) reported additional (unspecified) personal issues.

Randomization. One month after the publication of the newspaper article, participants were randomly assigned to the 2 experimental groups by means of the random number generator procedure of SPSS 10. Assuming a correlation of $r=0.5$ between a pre-test and post-test measurement, a significance level of 0.05 would require 49 participants per group to provide an 80% probability to detect a medium ($d=0.5$) effect size (J. Cohen, 1988). Because we had a fairly large sample of participants, we assigned 3 times as many participants to the immediate treatment condition, while retaining a large enough sample-size in the control condition to ensure sufficient statistical power to detect treatment effects. Thus, 177 participants (74%) were randomly assigned to immediate treatment,

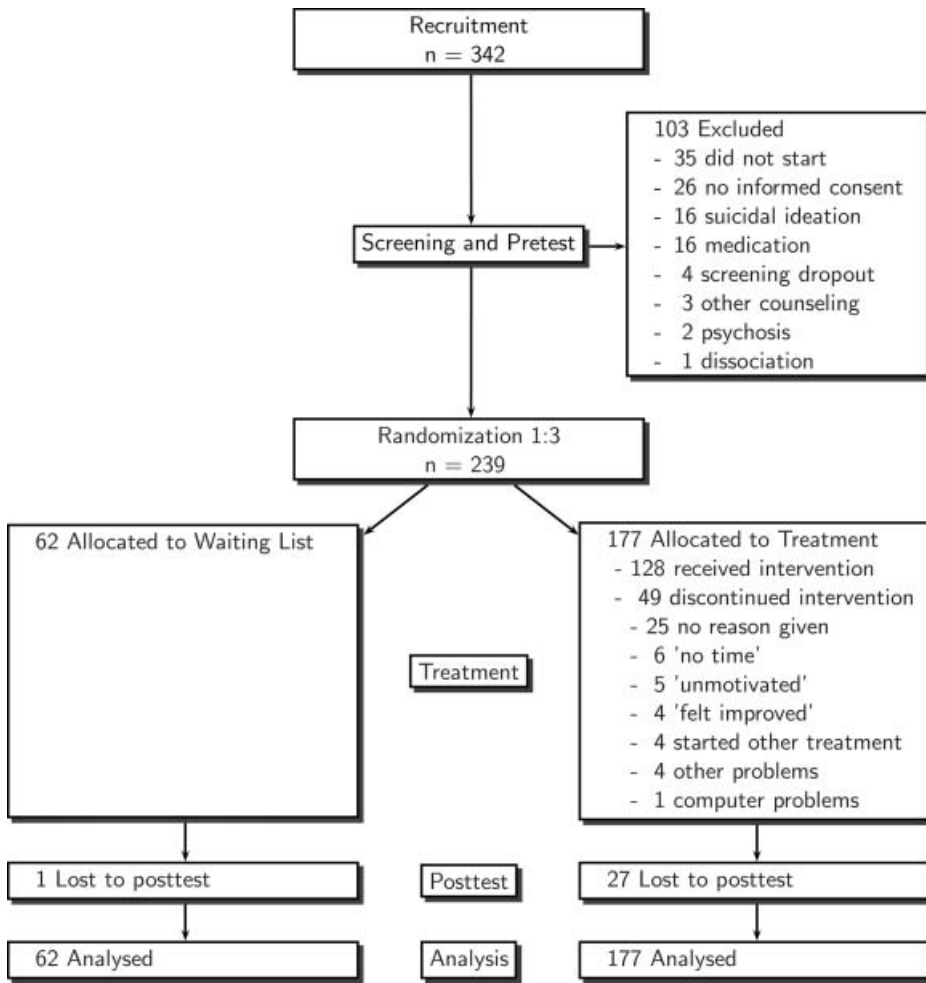


Figure 1. Participant flow in the randomized controlled trial (RCT).

and 62 (26%) to the waiting list control condition. Table 1 provides an overview of the characteristics of the 2 groups. To check the randomization, χ^2 tests or t-tests (where appropriate) were conducted with respect to the outcome measures, gender, age, marital status, education, work contract, work years, working hours, duration of symptoms, and sick leave status. As expected, no significant difference was found ($t(238)=0.26-1.75$, $p=0.08-0.80$; $\chi^2=0.002-4.1$, $p=0.13-0.96$).

Procedure

Setting. Communications took place entirely through e-mail, without any face-to-face session. Participants underwent the treatment

at home. Incidentally, telephone contact was necessary (e.g. to inquire about the reasons for drop-out when e-mails remained unanswered). **Privacy.** Several procedures secured the privacy of the participants. An e-mail server was set up exclusively for the study and located at a professional Internet host. The server, running Linux OS, was protected by a firewall and remotely administered through an encrypted communication channel. The therapists worked from a central computer-room that was accessible only with proper authorization. Each therapist received a private password-protected account to login to the computers and to the e-mail server. Participants were informed of mail-client extensions to secure their e-mail, and received

Table 1. *Characteristics of participants.*

Characteristics	Control <i>n</i> =62		Treatment <i>n</i> =177		Total <i>n</i> =239	
Demographic						
Gender: female	68%	42	57%	101	60%	143
Age (M, SD)	42	9	44	8	44	8
Education: tertiary	83%	50	85%	144	84%	194
Marital status: married	27%	17	18%	32	21%	49
living together	42%	26	54%	96	51%	122
Unmarried	21%	13	21%	38	21%	51
Divorced/widow(er)	10%	6	6%	11	7%	17
Work						
Employment: full-time	77%	48	81%	140	80%	188
Years in current profession (M, SD)	9	9	11	9	10	9
Working hours per week (M, SD)	35	13	36	13	36	13
Complaints						
Months with complaints (M, SD)	26	29	32	36	30	34
Sick leave: no	56%	35	65%	114	63%	150
Partial	23%	14	12%	21	15%	35
Full	21%	13	23%	41	23%	54

help in configuring these extensions on request.

Materials. Participants needed a personal computer connected to the Internet and an e-mail account. For screening and outcome measurement, validated questionnaires were delivered in the body text of e-mails and in documents that were attached to these e-mails. The attachments were formatted in a common cross-platform computer format (Rich Text Format).

Treatment. The treatment comprised 7 phases, as described in detail below. Each phase required approximately 1 week to complete. The schedule allowed the participants to adjust the pace of completion within limits to their own situations. Treatment integrity was guaranteed by a manual that specified each step of the treatment in detail (e.g. the order and the nature of the assignments, the contents of the psycho-education, and the timing of the therapist feedback). The manual also provided default text templates for feedback and instructions. The therapists tailored these texts to the specific needs of their clients. They were required to email their feedback after 1 working day. This provided the therapists with ample time to think through their feedback, or to discuss difficult cases with colleagues or a supervisor. The treatment manual specified 10 feedback-moments. Composing the feedback

took approximately 30 minutes. Thus, a full treatment took approximately 5 hours of therapist time.

Therapists. The therapists were 25 doctoral students in clinical psychology and 1 post-graduate student, aged between 22 and 42 years ($M=26$, $SD=4.7$). They had followed advanced courses in CBT. Additional training taught the therapists how to tailor the feedback and instruction templates of the manual to the needs of their clients, how to increase motivation by adopting a stimulating empathetic attitude, how to avoid the pitfalls of electronic, text-based communication (e.g. Brennan & Ohaeri, 1999), and how to make use of the asynchronous nature of the communication to enhance the quality of the feedback (e.g. by discussing cases with one another or the supervisor). Once a week, a senior specialist in Internet-driven CBT supervised the therapists. The supervisor assigned participants to therapists on the basis of the availability of the therapists.

Post-test and follow-up. Immediately after treatment, participants received the post-test measurement (the outcome questionnaires and an evaluation questionnaire). Those who did not complete treatment received a telephone call to inquire about the causes of dropout. Dropouts were also asked to complete the post-test measurements. Three years

after the pre-test measurements, participants, who had completed treatment, were invited by e-mail to complete the outcome questionnaires.

Cognitive behavioural treatment

Phase 1. Inducing awareness: monitoring and writing. This phase comprised 1 week of monitoring stress and 2 writing assignments to increase participants' awareness of somatic, cognitive, emotional and behavioural signs of stress. Participants kept records of stressful events: they described the situation, associated feelings and thoughts, and rated the degree of stress on a 10-point scale. Subsequently, they conveyed their ratings graphically and reflected on the results. In addition, the participants spend 2 periods of 45 minutes writing about stressful events, in the present tense and in as great a detail as possible (Lepore & Smyth, 2002; Alford, Malouff, & Osland, 2005).

Phase 2. Relaxation. First, participants were taught muscle relaxation or mental relaxation, depending on their own preference. Subsequently, they practised 6 times a day. In addition, they were encouraged to take short breaks during their work to reduce their overall pace, and to engage in physical exercise. Participants who reported sleeping complaints received instructions how to regain healthy sleeping habits: i.e. not sleeping during the day, not sleeping too long during the night, avoiding stressful activities (e.g. stressful conversations) before going to bed, and not trying to force themselves to sleep (Morin, 1993).

Phase 3. Worrying, rumination, and challenging dysfunctional thoughts. Participants were taught to recognize events that trigger worrying and ruminating. They were instructed to limit ruminating to predetermined, fixed moments, rather than indulging in it at all hours of the day (McKay, Davis, & Fanning, 1997). When they started worrying and ruminating spontaneously, they were instructed to make a brief note, then read their previously generated self-instruction card to determine the next fixed moment for ruminating. Furthermore they were required to focus on their notes and to challenge dysfunctional (black and white) thinking, overgeneralization, catastrophic thinking, self-blaming, and neglect of positive aspects

(Beck, 2005). They did this 3 times a week for 20 minutes.

Phase 4. Positive self-verbalization. Participants were taught to focus on their positive qualities by using the technique of positive self-verbalization (Lange, Richard, Gest, De Vries, & Lodder, 1998; Lange, Richard, Kiestra, & Van Oostendorp, 1997). They wrote an essay on their positive traits and summarized this on a small card. The participants were encouraged to read the summary on the card frequently, and read it aloud.

Phase 5. Positive assertiveness/social skills training and behavioural experiments. Participants received a short social skills training. They were encouraged to reflect on the reciprocity of the interactions with their fellow-workers. Subsequently, they received instructions on how to experiment with new strategies to improve negative reciprocal behaviours. They were, for instance, taught to communicate wishes in a positive and constructive manner, to give compliments, and to express their interest in the well-being of others. If they questioned the validity of these strategies, the therapist helped to create behavioural experiments, in which the new approaches could be put to test in a simple and realistic manner.

Phase 6. Time management. Participants were made aware how they managed the demands of both their work and their private life. In the evening, participants reflected on the activities of the day, after which they planned the activities for the next day. The participants learned how to set priorities, to reject requests that they found too demanding, to plan time for relaxation and self-reward, and to avoid unrealistic scheduling. They were encouraged to take their time to decide consciously whether to start an activity immediately, postpone it, or to pass it on to someone else.

Phase 7. Future, reintegration, and relapse prevention: the toolkit. Participants reflected on symptoms that might signal relapse. They were encouraged to formulate their personal "relapse prevention toolkit", using the techniques they had mastered in therapy. They were encouraged to print the toolkit, and place it in a visible place at home as a symbol of what they had mastered. Participants who were partially or fully on sick leave received suggestions for gradual reintegration.

Screening measures

Demographic characteristics, substance abuse and medication. The participants completed a multiple-choice questionnaire to record age, gender, marital status, education, work contract, work years, working hours, duration of symptoms, sick leave status and perceived causes of stress. In addition, alcohol dependency and drug abuse was registered. To assess the use of neuroleptics, participants answered open-ended questions concerning medicine brands and prescribed doses.

Dissociation. Risk of dissociation was assessed using the 5-item Somatoform Dissociation Questionnaire (SDQ-5) (Nijenhuis, Spinhoven, Van Dyck, Van der Hart, & Vanderlinden, 1997). The internal consistency of this self-report instrument is good (Cronbach's $\alpha=0.80$). A cut-off of 8 (used in this study) results in good discrimination between groups of patients and non-patients (sensitivity=0.94; specificity=0.96).

Psychosis. Participants, who scored above the cut-off value of 13 on the Screening Device for Psychotic Disorder (SDPD) (Lange, Schrieken, Blankers, Van de Ven, & Slot, 2000) were excluded. The cut-off value of 13 was established in the Dutch norm group. The 7-item self-rate inventory (Cronbach's $\alpha=0.82$) is a good predictor of psychotic episodes. Agreement between self-report in a group of 33 schizophrenic patients and the ratings by their clinicians is high ($r=0.85$) (Lange et al., 2000).

Suicidal ideation. This was measured by an inventory similar to that of Joiner et al. (2003). It comprises 6 multiple-choice questions, including "Do you currently have plans to end your life?" and "Are you currently feeling desperate?" Participants were excluded if they had a history of suicide attempt(s) within the past 2 years ago, or if there was immediate risk of suicide.

Outcome measures

The primary outcome measure was the Stress subscale from the Depression Anxiety Stress Scales (DASS-42: Lovibond & Lovibond, 1995; Dutch version: De Beurs, Van Dyck, Marquenie, Lange, & Blonk, 2001). Secondary measures were the Depression and Anxiety subscales from the DASS and the Emotional Exhaustion subscale of the

Dutch version of the Maslach Burnout Inventory – General Survey (MBI-GS: Maslach, Jackson, & Leiter, 1996; Dutch version by Schaufeli & Van Dierendonck, 2000).

DASS. The DASS is a self-report instrument that assesses depressive symptoms, physical anxiety (fear), and mental stress (nervous tension). It contains 42 items, 14 per subscale, that relate to the experience of symptoms in the past week. The items are measured on a 4-point scale ranging between 0 ("did not apply to me") to 3 ("applied to me very much, or most of the time"). Higher scores denote less favourable conditions.

All subscales of the Dutch adaptation are characterized by good internal consistencies (Cronbach's α between 0.94 and 0.97, present sample: 0.86–0.92). Test-retest reliabilities for the Depression, Anxiety and Stress scale are $r=0.75$, $r=0.89$, and $r=0.79$, respectively (De Beurs et al., 2001). Clinical cut-off scores of $c=12$ and $c=5$ for depression and anxiety are recommended by Nieuwenhuijsen, De Boer, Verbeek, Blonk, & Van Dijk (2003). The corresponding percentile score of stress (14) observed in a large ($n=1771$) non-clinical sample in the UK (Crawford & Henry, 2003) was used as the clinical cut-off in this study.

MBI-GS Emotional Exhaustion. The MBI-GS is a self-report questionnaire to assess burnout across professional occupations. The Emotional Exhaustion subscale assesses emotional fatigue, i.e. the feeling of being "worn-out". The scale contains 5 items that are measured on a 7-point scale scored from 0 to 6, where higher scores indicate higher levels of emotional exhaustion. The internal consistency of the subscale ranges between $0.84 \leq \alpha \leq 0.90$ (present sample: $\alpha=0.84$). The 8-month test-retest reliability is satisfactory ($0.58 \leq r \leq 0.85$). Well-established clinical cut-off scores are unavailable for the Exhaustion scale. To indicate burnout, Brenninkmeijer and Van Yperen (2003) recommend a cut-off score of 2.67, which was used in the present study. With this cut-off score, they found a false positive rate of 9.1% and a false negative rate of 13.8%.

Methods of analysis

Intention-to-treat. The analyses were on an intention-to-treat basis and included all

participants. Dropouts, who did not complete the post-test measurements, were assumed to have gained nothing. Their pre-test scores also served as their post-test scores.

Statistical significance. One-way analyses of covariance (ANCOVAs) (using the pre-test scores as a covariate) were conducted to test the difference in means of the 2 groups at post-test ($\alpha=0.05$). The statistical significance of the within-group pre-post gain scores were assessed using paired t-tests.

The assumptions of ANCOVA were met. The homogeneity of the regression coefficients in the 2 groups was confirmed by non-significant interactions between the covariates (pre-test scores) and experimental condition. The distributions of the outcome variables were approximately normal, and the variance across the experimental groups was found to be homogeneous.

Effect size. To express the magnitude of the effects, gain scores on the outcome measures were standardized to Cohen's *d*'s (J. Cohen, 1988), representing the number of standard deviations separating the 2 means. Point estimates and 95% confidence intervals of *d* were determined both for the within- and the between-group effects following a procedure described in detail by Robey (2004). In this procedure, between-group effect sizes are calculated using the pooled standard deviation, and confidence intervals are approximated on the basis of the central t-distribution.

Clinical relevance. We tested the higher probability of statistically reliable improvement and recovery after treatment compared with the control group with Fisher's exact tests, and expressed the difference in this probability between the treatment and the control group in terms of odds ratios (Hillis & Woolson, 2002). We used the Reliable Change Index (RCI) to test the significance of individual improvement (Jacobson & Truax, 1991; $\alpha=0.05$; critical RCI=1.96; "no change" and "deterioration" were pooled into a single "unimproved" category). Participants were considered recovered if they reliably improved from a pre-test score above the cut-off to a post-test score below cut-off. Therefore, participants scoring below cut-off at pre-test were excluded from the recovery analysis.

Follow-up. Participants who had completed the treatment were invited by e-mail to complete the follow-up measures on a specially constructed website. These participants include members of the treatment group and members of the control group, who followed the treatment at a later date. Pre-test to follow-up data of those who participated in the follow-up were analysed using repeated measures ANOVAs with time of measurement as the within factor. Differences between the means at the times of measurement were tested for significance using Bonferroni adjustments to keep the family-wise Type I error at $\alpha=0.05$.

Results

Main outcome

Dropout. Fifty participants (21%) dropped out from the study, 49 from the treatment group and 1 from the control group. Of these 50, 25 (50%) dropped out without providing a reason (see Figure 1). Twenty-two dropouts (44%) completed the post-test. None of the variables used to check the randomization were predictive of dropout.

Statistical significance. Table 2 shows the results of the pre-test and post-test measurements on intention-to-treat basis. As hypothesized, the treatment group improved statistically significant with respect to stress ($t(176)=11.76$, $p<0.001$), and the secondary outcome measures (all paired t tests $p<0.0001$). However, the improvement of the waiting list control group also reached statistical significance with respect to stress ($t(61)=2.14$, $p<0.036$), and all secondary outcome measures, except DASS depression ($t(61)=1.46$, $p=0.15$). Nonetheless, the ANCOVAs showed that the treatment group improved significantly more than the control group, on both stress and the secondary measures (see Table 2).

Effect size. The within-group effects in the treated group were large to moderate, ranging between $d=0.9$ (stress) and $d=0.5$ (anxiety, exhaustion). Because the control group also improved, the effect sizes of treatment as compared with no treatment were smaller: the between effects ranged between $d=0.6$ (stress) and $d=0.1$ (anxiety) (see Table 2).

Clinical relevance. Table 3 shows the improvement and recovery rates in the 2

Table 2. *Randomized controlled trial results (intention-to-treat): treatment (n=177) vs waiting list control (n=62).*

Measure ^a	Pre		Post ^{b,c}		Within ES ^d		Between ES		ANCOVA	
	M	SD	M	SD	d	95%CI	d	95%CI	F _{1,236}	p
DASS Stress										
Treatment	19.4	8.0	12.0	8.5	0.9	±0.2	0.6	±0.3	23.9	<0.001
Control	19.7	8.0	17.6	9.3	0.2	±0.2				
DASS										
Depression										
Treatment	11.8	6.7	7.8	6.6	0.6	±0.2	0.4	±0.3	10.0	0.002
Control	12.1	7.3	10.7	7.3	0.2	±0.3				
DASS Anxiety										
Treatment	8.2	6.2	5.2	5.2	0.5	±0.1	0.1	±0.3	5.1	0.025
Control	9.6	6.7	7.3	5.5	0.4	±0.2				
MBI Em.										
Exhaustion										
Treatment	3.1	1.2	2.5	1.3	0.5	±0.1	0.3	±0.2	8.8	0.003
Control	3.4	1.2	3.2	1.2	0.2	±0.2				

^aDASS=Depression Anxiety Stress Scales; MBI=Maslach Burnout Inventory, General Survey. DASS scores are mean sum scores, MBI scores are mean average scores.

^bThe means and standard deviations reflect the raw data, whereas the F-statistics reflect the results of the test of the difference in post-test means after pre-test adjustments (ANCOVA).

^cPre-test scores were carried forward for participants who did not complete the post-test measurement (n=28).

^dES=effect size: Cohen's d point estimate and 95% confidence interval (d-95%CI to d+95%CI).

ANCOVA=analysis of covariance; 95%CI=95% confidence interval.

experimental groups. In the treatment group, with respect to stress, 53% of the participants reliably improved, and half the clinical subgroup recovered from clinical stress. The odds

of improvement and recovery were significantly higher in the treatment condition than in the waiting list. With respect to the secondary measures, the effects varied.

Table 3. *Clinical relevance: reliable improvement and recovery.*

Measure	Improved					Recovered				
	n	%	OR ^b	p ^c	c _n ^d	c _% ^d	n	%	OR ^b	p ^c
DASS Stress										
Treatment	93	53	2.9	<0.001	124	70%	62	50	5.1	<0.001
Control	17	27			43	69%	7	16		
DASS Depression										
Treatment	64	36	3.3	0.001	78	44%	41	53	3.5	0.007
Control	9	15			29	47%	7	24		
DASS Anxiety										
Treatment	55	31	1.1	0.448	110	62%	38	35	1.9	0.097
Control	18	29			41	66%	9	22		
MBI Em. Exhaustion										
Treatment	62	35	1.8	0.047	106	60%	36	34	2.6	0.024
Control	14	23			43	69%	7	16		

^aDASS=Depression Anxiety Stress Scales; MBI=Maslach Burnout Inventory, General Survey.

^bOdds ratio (OR): the ratio of the odds of improvement/recovery in the treatment group compared with the odds in the control group.

^cThe p-values represent results of Fisher's exact tests of the observed 2 × 2 tables.

^dColumn c_n and c_% represent the number and percentage of participants that scored in the clinical range at pre-test.

Concerning depression, the effects were similar to the effects on stress. The effects were smaller, but statistically significant, with regard to emotional exhaustion. With respect to anxiety however, the differences were not significant. Concerning anxiety, there was substantial improvement and recovery in the control group that was not compensated by much additional improvement and recovery in the treatment group.

Long-term follow-up

Participants. After approximately 3 years (the mean number of months to follow-up was 34, $SD=2.1$), participants who had completed treatment ($n=167$) were invited to complete the follow-up questionnaires. Of these 167, 73 could not be traced. Of the remaining 94 participants, 63 (67%) completed the follow-up questionnaires.

A few differences were found between participants who completed the follow-up and those who did not. The former were more highly educated ($\chi^2=4.9$; $p=0.034$). In addition, their treatment length was shorter compared with those who did not participate in the follow-up ($t(117)=3.3$, $p=0.001$). At pre-test and post-test, the 2 groups did not differ on stress, anxiety or depression ($t(164)=0.27-1.0$, $p=0.30-0.78$). However, the mean pre-test score on emotional exhaustion of participants completing the follow-up ($M=3.4$) was higher than that of participants who did not ($M=3.0$; $t(164)=2.47$, $p=0.014$). At post-test this difference was not statistically significant ($t(157)=1.19$, $p=0.23$).

Long-term effects. Table 4 shows the means and variances of the mean scores of the

participants at pre-test, post-test, and the 3-year follow-up. There was no relapse: the effects became more pronounced. The 3-year follow-up means show significantly less pathology than the post-test means. In terms of effect size, the gains from pre-test to follow-up were large (1.3 (anxiety) $\leq d \leq 1.8$ (stress)).

With respect to stress, the main effect of time was significant, $F(2, 126)=79.90$, $p<0.0001$. The pre-post improvement ($p<0.001$) was maintained, and was greater at the 3-year follow-up (pre-test to follow-up: $p<0.001$; post-test to follow-up: $p=0.020$). The same pattern emerged with respect to depression ($F(2, 126)=60.73$, $p<0.0001$; post-test to follow-up: $p=0.002$) and emotional exhaustion ($F(2, 120)=51.68$, $p<0.0001$; post-test to follow-up: $p<0.001$). However, with respect to anxiety, the effects remained constant ($F(2, 126)=49.52$, $p<0.0001$; post-test to follow-up: $p=0.34$).

Effects of other treatments. Between the post-test and the 3-year follow-up, 41% ($n=26$) of the participants received additional treatment (psychotherapy, other forms of counselling, or medication). Those who followed additional therapy tended to display more complaints at follow-up compared with those who did not undergo additional treatment, although the difference was statistically significant only with respect to emotional exhaustion ($t(60)=3.1$, $p<0.001$). At pre-test and post-test, the groups did not differ on the outcome measures.

Treatment satisfaction

After completing treatment, participants rated the overall value of the treatment on a scale of 1 to 10 with an average of 7.6 ($SD=1.0$; Range: 5–10). The different treatment phases

Table 4. Results of the 3-year follow-up ($n=63$).

Measure ^a	Pre		Post		FU		Pre-FU ES	
	M	SD	M	SD	M	SD	<i>d</i>	<i>CI</i> _{.95}
DASS Stress	19.6	7.6	10.1	7.9	7.3	6.6	1.8	± 0.3
DASS Depression	11.6	6.5	5.6	5.8	3.3	4.1	1.5	± 0.3
DASS Anxiety	8.6	5.2	3.8	3.6	3.0	3.7	1.3	± 0.3
MBI Emotional Exhaustion	3.4	1.4	2.5	1.3	1.7	1.0	1.6	± 0.3

^aDASS=Depression Anxiety Stress Scales; MBI=Maslach Burnout Inventory, General Survey. DASS scores are mean sum scores, MBI scores are mean average scores.

FU=follow-up.

were consistently rated favourably. Increasing awareness through writing received the highest mean rating ($M=8.1$; $SD=1.4$), relaxation was rated lowest ($M=7.1$; $SD=1.8$).

The participants rated various aspects of the relationship with their therapists on 3-point multiple-choice response scales. Overall, the relationship was rated as pleasant (88%) and personal (75%), and was perceived to have grown during treatment (57%). Sixty-eight percent indicated that they had not missed face-to-face contact.

Mediating variables

Comparison of the outcome in completers of the treatment group and participants of the control group who completed the treatment at a later date revealed no significant differences. Therefore, the treatment completers in both groups were pooled ($n=167$) to obtain more power for the detection of significant predictors of outcome in multiple regression. However, no significant mediating variables were found. After controlling for pre-treatment stress-levels, post-treatment stress levels were not predicted by gender ($F(1,163)=0.52$, $p=0.47$), age ($F(1,153)=0.45$, $p=0.45$), education ($F(1,156)=0.72$, $p=0.40$), working years ($F(1,157)=0.004$, $p=0.95$), working hours ($F(1,157)=0.12$, $p=0.73$), duration of symptoms ($F(1,110)=0.10$, $p=0.75$) or length of treatment ($F(1,115)=0.001$, $p=0.97$). Similar results were obtained with the secondary measures.

Discussion

Compared with no treatment, e-mailed standardized CBT moderately reduced stress and induced small to moderate improvements on depression and emotional exhaustion. Fifty percent of the participants had recovered from clinical stress following treatment. The effects on anxiety appeared to be small. However, after 3 years the (uncontrolled) effects were large on all outcome measures. Participants were highly satisfied with their treatment and their therapists.

Evaluation of effect sizes

The substantial improvement of the participants in the waiting list control group considerably deflated the effects between treatment and control group. The improvement observed in the waiting-list control

group is comparable to that observed in other studies (Lange, Van de Ven, & Schrieken, 2003; Zetterqvist et al., 2003). Zetterqvist et al. (2003) provided several explanations for these improvements, including the beneficial effects of pre-testing and the prospect of treatment. In the current study, the recruiting article and the website provided psycho-education that may have had beneficial effects. Possibly, the participants in the control condition benefited from the information they received, combined with the knowledge that they would start the active treatment in the near future. However, these explanations remain speculative. The use of different types of control groups may shed light on the source of the effects in the control group.

Notwithstanding the improvement in the control group, the observed between group effects are similar to those reported in the literature. The (controlled) effects on stress ($d=0.6$) and depression ($d=0.4$) compare well with the effects of face-to-face CBT ($d=0.7$ and $d=0.3$ respectively; Van der Klink et al., 2001). In addition, the results corroborate results obtained by Zetterqvist et al. (2003) in a RCT of an Internet-driven stress-reduction program. In that study, the effect sizes were high, but intention-to-treat analyses failed to reveal statistically significant between effects. In contrast, all between effects in the present study were significant on an intention-to-treat basis. This was perhaps due to the larger sample size and the use of a more powerful statistical technique.

Maintenance

The uncontrolled 3-year follow-up showed a high impact of the treatment with large effect sizes after 3 years, on stress and depression, and on emotional exhaustion and anxiety. This is consistent with our findings in the study on post-traumatic stress (Lange, Van de Ven, & Schrieken, 2003), in which effects also proved to be stable. We may conclude that participants, who complete this type of Internet-driven CBT, have a high chance to not relapse, and may even enjoy further improvements. These results are compelling, as the further improvements were not explained by any additional treatment, which some participants had sought in this 3-year period.

Limitations

Several aspects of this study limit the generalizability of the results. We will discuss the self-selection of the participants, the different time-frame between measurements in the experimental groups, and the dropout and attrition at follow-up.

Self-selection most clearly manifested itself in the high educational level of the participants. The high educational level is probably due to the fact that most participants were recruited through an article in a quality newspaper that is favoured by the well educated. Yet, high education seems to be rather typical of people who participate in Internet-based therapy (Andersson et al., 2006; Carlbring, Westling, Ljungstrand, Ekselius, & Andersson, 2001). Until the relation between education and Internet therapy is better understood, caution should be exercised in generalizing the present results to less well-educated populations.

Participants in the treatment condition were post-tested when they completed treatment. We expected them to complete treatment within the planned 7 weeks, but the average treatment took substantially longer (16 weeks). Consequently, the experimental group, on average, was post-tested several weeks after the control condition. Therefore, the between-effects may have been confounded by (uncontrolled) effects of the mere passage of time. However, if present, this effect was probably small. Exploratory analyses did not reveal a significant effect of treatment duration on the outcome variables. Nevertheless, to avoid such interpretative issues in our current studies, we now multiply the protocol time by 1.5 to estimate the actual length of treatment.

During the study, a considerable number of participants dropped out. Although the observed dropout rate of 21% is common in online therapy (Wantland et al., 2004), it is disconcerting that most dropout occurred in the treatment group. No significant predictors of dropout were found, and many dropouts did not provide a reason for terminating their participation. However, therapists noticed that participants often experienced problems in combining work and treatment demands. Perhaps some of the exercises required too much time for some participants or were otherwise too demanding. Thus, the treatment

may have presented a practical burden in terms of time and effort that was not experienced by control group participants.

Finally, the observed long-term reduction of complaints is promising, but was uncontrolled, and suffered considerable attrition. The long-term follow-up needs replication.

E-mail vs website

In this study, the website was used only for basic psycho-education and recruitment. Communication between clients and therapists took place though e-mails. At present, the treatment is delivered completely through a structured, database-driven website. This has several advantages over e-mail exchanges. Privacy is ensured by transparent encryption techniques and login procedures. Further, therapists and clients now use a graphical interface to access treatment elements, which enhances access to the treatment dossier and process overview. Furthermore, the website provides real-time calculation of results and multimedia interfaces that support and facilitate the execution of the exercises. Preliminary (unpublished) findings suggest that the website-driven manual decreases the number of dropouts to a mere 15%, and that it enhances the improvement rates. It would be interesting to directly test the results of an e-mail vs website-driven treatment protocol for chronic stress.

Client-therapist relation and treatment integrity

Knaevelsrud & Maercker (2006) and Spek et al. (2006) observed that positive relationships between therapists and clients are quite feasible in Internet-driven therapy. This observation is supported by the positive evaluation of our participants of their therapists. Yet, this study does not permit conclusions regarding the effect of working alliance or the amount of therapist involvement in Internet-driven treatment. Given that some studies investigating Internet-based self-help with minimal therapist contact report reasonable results (e.g. Carlbring, Furmark, Steckz , Ekselius, & Andersson, 2006), future research should focus explicitly on the role of the therapist: How much therapist contact is optimal? What is the effect of working alliance in Internet-based treatment?

Internet-based treatment with standardized therapist contact may have distinct

advantages over face-to-face treatment. In Internet-driven treatment it is easier to ensure treatment integrity than in manualized face-to-face treatment. In the present manual much attention is devoted to small details to ensure that the therapists use the manual in the intended way. The manual even specifies the motivating attitude that the therapists are required to adopt and convey to their clients. Furthermore, the weekly supervisions were intense, and exploited the full details of the exchanges between the therapists and their clients. The detailed manual provided the relatively young and inexperienced therapists with guidance and support in treating their clients. As a consequence, their results were on a par with the results of experienced therapists. Apart from the effects on clients, it is interesting to investigate the effects of Internet-driven manuals in the education and training of therapists.

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