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Long-Term Effects of an Internet-Based Treatment for Posttraumatic Stress

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Abstract. Advances in communication technology offer additional strategies for providing psychological treatment. Previous trials of Internet-based treatment approaches reported significant reductions in posttraumatic stress and related symptoms in response to Internet-based treatments relative to control groups. However, empirical data on the long-term effects of those approaches are sparse. In order to evaluate the long-term effect of an Internet-based intervention, the authors conducted an 18-month follow-up of an Internet-based cognitive behavioural therapy for posttraumatic stress. Severity of posttraumatic stress symptoms was the primary outcome. Additional measures were depression, anxiety, mental and physical health, and health care utilization during the follow-up period. Treatment group participants ($n = 34$) were assessed 1.5 years after completing treatment. Results indicated that reductions in symptoms of posttraumatic stress symptoms, depression, and anxiety found at posttreatment were sustained during the 18-month follow-up period. Preliminary evidence on long-term effects of Internet-based health care as shown in this study is promising. However, research with larger and clinically more diverse samples is needed to fully assess the clinical impact and potential of Internet-based health care provision. *Key words:* online therapy; Internet; randomized controlled trial; long-term effects; cognitive behavioural treatment; PTSD.

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In the past two decades, a substantial body of research has examined potential treatment possibilities for posttraumatic stress disorder (PTSD). Generally, it was found that psychotherapy for PTSD leads to large improvements in psychological functioning. A recent meta-analysis including 26 studies revealed an average effect size (Cohen's d) of 1.1 for active versus wait-list control group comparisons (Bradley, Greene, Russ, Dutra, & Westen, 2005). However, the majority of individuals who suffer from PTSD do not receive the care they need (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). High prevalence rates generate a need for the provision and

dissemination of alternative accessible and cost-effective therapeutic services (Newman, 2004). Despite scientific support for the efficacy of exposure therapies to treat PTSD and posttraumatic stress, they are neither widely available nor routinely used. The Internet represents a unique opportunity to influence the availability of expert therapeutic service in a dramatic way. Online therapeutic services could help to eliminate disparities in health resulting from inequities in people's access to resources. This applies especially to people challenged by financial, geographic, physical, or attitudinal barriers to traditional service (Taylor & Luce, 2003). Also, because

of its visual anonymity, the Internet might provide an alternative information and treatment opportunity for people who avoid care because of concerns about the stigma of receiving mental health treatment. A number of controlled and randomized controlled trials demonstrated that the Internet provides a feasible way of offering treatment for trauma survivors (Knaevelsrud & Maercker, 2006, 2007; Lange, Rietdijk, et al., 2003; Lange, van de Ven, Schrieken, & Emmelkamp, 2001; Litz, Engel, Bryant, & Papa, 2007). Previously, we reported on the efficacy of an Internet-based treatment approach for PTSD (Interapy). The 5-week intervention is a cognitive behavioural writing therapy and comprised three components: exposure, cognitive reappraisal, and social sharing (Lange, Rietdijk, et al., 2003).

Results of a randomized controlled trial (RCT) indicated that, relative to the wait-list group, the treatment group experienced significant statistical and clinical reductions in the severity of the posttraumatic stress symptoms as well as in depression and anxiety at posttreatment and at 3-month follow-up (Knaevelsrud & Maercker, 2007). Because Internet-based therapy is a relatively new form of treatment, very little is known about the long-term outcomes of Internet-based interventions. The goal of this follow-up study was to determine whether symptom improvement could be maintained for participants with PTSD and general psychopathology presented in Knaevelsrud and Maercker (2007) at 18-month follow-up.

Method

Initially, an RCT was conducted to evaluate the efficacy of an Internet-based therapy (Interapy) for posttraumatic stress in a German-speaking population (Knaevelsrud & Maercker, 2007). Ninety-six participants with posttraumatic stress reactions were randomly allocated to either 10 sessions of Internet-based cognitive behavioural therapy (CBT) conducted over a 5-week period or to a wait-list control group. Severity of posttraumatic stress was the primary outcome. Secondary outcome variables were depression, anxiety, and mental and physical health. Applicants were sent screening questionnaires by e-mail and completed the assessment using their home computer. The wait-list group received treatment after

the postassessment of the Interapy treatment condition. Follow-up assessments were conducted at the end of treatment and 3 months after treatment. Participants were recruited by means of radio and newspaper advertisements as well as advertisements posted on Web sites for different groups (e.g. crime victims, sexual abuse victims, bereaved parents). To be initially included in the study, participants had to (a) have experienced a traumatic event (based on *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition, criteria; American Psychiatric Association, 1994) that occurred at least 1 month before treatment; (b) be 18 years of age or older, (c) not exceed the cutoff scores for dissociation and psychosis, (d) not abuse alcohol or other drugs, (e) not consume neuroleptics, (f) be fluent in written German, and (g) not be receiving treatment elsewhere. All contact between therapists and participants during the 5-week period of 10 writing assignments occurred via e-mail. The treatment comprised three modules: exposure, cognitive restructuring, and social sharing. Participants were sent two weekly 45-min writing assignments and received individual feedback on their writing exercises (for further details of the treatment protocol, see Knaevelsrud & Maercker, 2007; Lange, Rietdijk, et al., 2003). Pretreatment, posttreatment, and 3- and 18-month follow-up self-report assessments were administered through e-mail. The treatment was conducted by cognitive behavioural psychologists who had received special training in therapeutic writing in the treatment of posttraumatic stress. The therapists also participated in weekly supervision sessions.

Participants

Of the 41 participants who were initially included in the treatment group and who completed the treatment, 34 (83%) participated in the 18-month follow-up study. The final sample included 30 (88%) women and four (12%) men, with a mean age of 34 years. Sixteen (47%) had a university degree, 10 (29%) had a high school diploma, and the remaining eight (24%) had attended secondary school. Participants reported the most distressing traumatic event to be sudden or violent death of a close person ($n = 14$ [41%]) and sexual abuse incest or rape ($n = 13$ [38%]). Time elapsed since the traumatic

99 event at the beginning of the treatment ranged
100 from 2 to 432 months ($M = 103$, $SD = 123$).

102 Procedure

103 All participants who completed the treatment
104 were contacted through e-mail 18 months
105 after treatment completion and were invited
106 to complete the 18-month assessment. If we
107 received no response within 14 days, we
108 approached participants via telephone. As
109 before, participants performed the assessment
110 through e-mail from their home computer.
111 Eight participants were untraceable at the
112 18-month follow-up because of an inactive
113 e-mail address or change of phone number.
114 Whether some of these participants did not
115 receive the e-mail or alternatively refused to
116 complete the questionnaire was unclear. An
117 analysis comparing 18-month follow-up com-
118 pleters with noncompleters revealed no sig-
119 nificant differences in terms of pretreatment
120 and posttreatment measures of posttraumatic
121 stress, depression, and anxiety (all $ps > .10$).
122 The same accounted for differences concern-
123 ing demographic variables such as age,
124 educational level, and time elapsed since the
125 traumatic event between the two groups.

125 Measures

126 The revised version of the Impact of Event
127 Scale (IES-R; Weiss & Marmar, 1997) was
128 used to assess symptoms of posttraumatic
129 stress. The Depression and Anxiety subscales
130 of the short form of the Symptom Checklist-90
131 (Brief Symptom Inventory [BSI]; Derogatis,
132 1992) measured symptoms of depression and
133 anxiety. The Short Form-12 (SF-12; Ware,
134 Kosinski, & Keller, 1996), a 12-item short
135 form of the Medical Outcome Study Self-
136 Report, was used to assess physical and
137 psychological functioning. A detailed descrip-
138 tion of all measurements and a complete
139 overview of all screening instruments are given
140 in Knaevelsrud and Maercker (2007).

141 Statistical analysis

142 Descriptive statistics was used to examine the
143 demographic data. Chi-square analyses were
144 conducted to determine differences in terms of
145 gender, education level, and marital status
146 between those who completed the 18-month
147 follow-up and those who did not. Independ-
ent-samples t tests were used to assess

differences in terms of age, years since the
trauma, as well as pretreatment and posttreat-
ment psychopathology of 18-month follow-up
completers and noncompleters. Paired t tests
were used to analyze treatment effects at two
time points (pretest and follow-up and
posttest and follow-up) of the follow-up
completers. Effect sizes were calculated using
Cohen's d for repeated measures to quantify
the magnitude of change in mean symptoms
between pretest and 18-month follow-up,
respectively. By Cohen's standards for
research in the behavioural sciences, an effect
size of $d = 0.8$ for treatment effects in
psychotherapy is considered large.

Results

Findings on posttraumatic stress, depression,
anxiety, and general psychological and phys-
ical functioning are summarized in Table 1.
Because outcomes at posttreatment and
3- month follow-up relative to pretreatment
have been reported previously (Knaevelsrud &
Maercker, 2007), the present analysis is
restricted to outcomes at 18-month follow-up
relative to pre- and posttreatment. Table 1
documents the means and standard deviations
at all four time points for illustrative purposes.

Paired t tests revealed that the treatment
gains observed in the three symptom domains
of posttraumatic stress at posttreatment were
maintained at 18-month follow-up: intrusion,
 $t(33) = 0.87$, $p = .390$; avoidance, $t(33) =$
 0.85 , $p = .404$; and hyperarousal, $t(33) =$
 0.77 , $p = .446$. The same applies to BSI scores
for depression, $t(33) = -0.63$, $p = .536$, and
anxiety, $t(33) = 0.68$, $p = .504$ (see Table 1).
Likewise, scores on the SF-12 subscales
assessing general psychological functioning,
 $t(31) = -0.94$, $p = .355$, did not reflect
significant change in symptoms since
posttreatment. A small but nonsignificant
decline on physical functioning was found,
 $t(31) = -0.81$, $p = .424$.

Accordingly, paired t tests revealed highly
significant symptom improvements from pre-
treatment to 18-month follow-up, with large
effect sizes on all relevant psychological
constructs (all $ps < .001$): intrusion,
 $t(33) = 8.5$, $p < .001$, $d = 1.9$; avoidance,
 $t(33) = 6.1$, $p < .001$, $d = 1.4$; and hyper-
arousal, $t(33) = 9.4$, $p < .001$, $d = 1.8$. The
same applies to BSI scores for depression,

Table 1. Mean scores (and standard deviations) for posttraumatic stress, depression, anxiety, and psychological/physical functioning at pretreatment, posttreatment, and 3-month and 18-month follow-up ($N = 34$)

Variable	Pretreatment	Posttreatment	3-month follow-up	1.5-year follow-up
Impact of Event Scale				
Intrusion	23.9 (6.4)	10.9 (7.7)	11.7 (7.2)	9.7 (8.5)
Avoidance	17.7 (10.2)	7.1 (8.0)	6.2 (6.8)	6.0 (5.4)
Hyperarousal	21.5 (6.7)	8.6 (7.8)	8.2 (7.1)	7.7 (8.6)
Brief Symptom Inventory				
Depression	9.9 (4.1)	4.2 (3.6)	3.8 (3.5)	4.7 (4.2)
Anxiety	9.1 (3.3)	4.5 (3.3)	4.3 (3.4)	4.1 (3.8)
Short Form-12				
Mental Health	34.5 (6.1)	41.3 (7.3)	40.9 (7.7)	42.6 (6.9)
Physical Health	46.4 (5.9)	46.7 (5.4)	47.8 (5.8)	45.7 (6.6)

Note. Higher scores on the Impact of Event Scale and Brief Symptom Inventory indicate more severe symptoms. Higher scores on the Short Form-12 indicate higher levels mental/physical functioning.

$t(33) = 6.1$, $p < .001$, $d = 1.3$, and anxiety, $t(33) = 7.1$, $p < .001$, $d = 1.4$ and general psychological functioning, $t(31) = -5.1$, $p < .001$, Cohen's $d = 1.2$. As previously found in the RCT study, no significant improvement could be detected with regard to the level of physical functioning, $t(31) = 0.73$, $p = .727$, $d = -0.1$.

In addition to outcome questionnaires, participants were specifically asked about their health care utilization in the last 18 months. After completing the Interapy treatment, eight (24%) participants utilized some sort of psychotherapy for a variety of mental health problems. Comparison of the scores of those who engaged in later treatment with those who did not revealed no significant differences with regard to pretreatment posttraumatic stress, $t(30) = 0.72$, *ns*, depression, $t(30) = -0.00$, *ns*, and anxiety, $t(30) = 0.87$, *ns*, and posttreatment posttraumatic stress, $t(30) = 0.72$, *ns*, depression, $t(30) = 1.8$, *ns*, and anxiety, $t(30) = 1.3$, *ns*. In addition to the outcome assessment, participants were asked whether they had reread their essays or their therapist's comments. The majority of participants reread their own essays ($n = 21$ [62%]) and their therapists' comments ($n = 17$ [50%]).

Discussion

Posttreatment symptom levels were maintained at 18-month follow-up. These findings apply to both posttraumatic stress symptoms as well as indicators for general psychological

complaints (depression, anxiety). This is in line with prior findings of Internet-based treatment of posttraumatic stress (Lange, van de Ven, & Schrieken, 2003) and complicated grief (Wagner & Maercker, 2007). The majority of the participants indicated that they reread their own essays and half of the participants reread their therapist's comments. This might have functioned as relapse prevention. By rereading the therapeutic materials, participants might get back in touch with initial reactions and the alternative and more constructive actions/thoughts they developed as a result of their therapy. It would be interesting to compare follow-up results from two different conditions that either prevent or allow the use of the therapeutic documents after therapy ended to gain more insight into the influence of the archiving of the therapeutic process.

Because it was a naturalistic follow-up, about 24% of the participants indicated that they engaged in face-to-face therapy during the follow-up period. This is substantially lower than the findings of Lange, van de Ven, and Schrieken (2003), who reported that 47% of their sample engaged in some sort of psychotherapy during the follow-up period. There is an ongoing controversy concerning the comparability of Internet samples and face-to-face samples. Naturally, online participants tend to be self-selected (Kraut et al., 2004). However, in their review, Gosling, Vazire, Srivastava, and John (2004) concluded that Internet users do not differ from nonusers

197 on markers of adjustment and depression.
198 Other controversial aspects refer to the
199 psychometric issues and the comparability of
200 online and offline assessments. Ritter, Lorig,
201 Laurent, and Matthews (2004) compared the
202 psychometric properties of Internet-based
203 versus mailed paper-and-pencil question-
204 naires. They found that questionnaires admin-
205 istered through the Internet were reliable and
206 answered as often as the paper-and-pencil
207 questionnaire. Still, in an earlier review by
208 Buchanan (2002), mixed findings concerning
209 the psychometric properties for Internet-based
210 questionnaires were presented. Because of the
211 lack of comparative studies including face-to-
212 face conditions, the findings reported in this
213 study should not be generalized to offline
214 clinical populations.

215 Additional study limitations include the use
216 of self-reports. Treatment outcomes were
217 exclusively measured by self-rated question-
218 naires administered through the Internet.
219 Clinical interviews and other independent
220 sources of assessment would have added
221 more evidence to the validity and clinical
222 value of the results. In addition, there is no
223 control for a comparison of the natural course
224 of disorder. Because we used a wait-list
225 controlled design, it would have been unethi-
226 cal to deny treatment to those participants
227 originally randomized to the wait list. Conse-
228 quently, there was no control group against
229 which the outcomes of the treated sample
230 could be compared. Also, the sample size is
231 small. Therefore, subtle effects that would
232 affect outcome may not be detectable and
233 could affect conclusions that can be drawn
234 from the data. We lost 17% from the 3-month
235 follow-up to the 18-month follow-up.
236 Although this is comparable to other long-
237 term follow-ups (Cottraux et al., 2008), it
238 clearly reduces the generalizability of the
239 results. Recruitment and retention are regular
240 problems in studies examining the psycho-
241 pathological long-term response of trauma
242 victims. In the present study, respondents were
243 comparable to dropouts in pre- and posttest
244 psychopathology. However, there might be
245 psychopathological dimensions that have been
not captured, so that potentially more healthy
participants took part in the long-term follow-
up. In addition, only four respondents (12%)
were males and the sample was highly
educated. Additional research is needed to

determine the degree to which our results
would generalize to male trauma victims and
trauma victims with lower education levels.
Moreover, participants were recruited by
means of announcements in the print media
and on specific Web sites for trauma victims.
Therefore, our sample may have been biased
in that participants were already actively
looking for help on the Internet and might
felt more comfortable using the Internet. This
is particularly relevant, because Carey, Wade,
and Wolfe (2008) found that regular prior
technology use significantly influenced treat-
ment response.

Despite these limitations, this study pro-
vides preliminary support for the efficacy of
Interapy for posttraumatic stress. PTSD and
posttraumatic stress are frequent disabling
and potentially chronic conditions (Kessler
et al., 1995) and thus are a considerable public
health concern. Therefore, effective and
accessible treatment alternatives such as
Interapy are of substantial interest from the
viewpoint of public health.

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read and approved the final article.

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