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A test of written emotional disclosure as an intervention for posttraumatic stress disorder

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Abstract

This study examined the efficacy of the written emotional disclosure (WED) procedure with a sample of young adults who met diagnostic criteria for posttraumatic stress disorder (PTSD). Participants were randomly assigned to either WED or a control writing condition and were assessed at baseline and one month following the writing sessions. During each writing session, participants' heart rate was recorded; participants also provided self-report ratings of emotional responding. Findings indicated no significant group differences for PTSD and depression symptom severity at follow-up assessment. Relative to control participants, WED participants displayed significantly greater heart rate activity and reported greater emotional responding during the first writing session; however, no reduction in emotional responding occurred for either condition from the first to the last writing session. Taken together, these findings indicate that WED may not be an efficacious intervention for PTSD. Suggestions are made for future work in this area.

Keywords

PTSD; Trauma; Depression; Written disclosure; Exposure therapy

Written emotional disclosure (WED) is a procedure developed by Pennebaker et al. (e.g., 1986, 1997) in which individuals are asked to write about their most traumatic or distressing experience. Typically, individuals write about these experiences for 20 min, during three writing sessions held on consecutive days. In their writing, individuals are required to incorporate specific descriptive and emotional information from their experiences. Since the first published study on WED (Pennebaker & Beall, 1986), research has consistently shown that WED is associated with a number of psychological and physical health benefits among a variety of samples (for a meta-analysis see, Frattaroli, 2006).

Several studies of WED have reported that the procedure may reduce posttraumatic stress symptoms and other related psychopathology among trauma survivors. For example, Sloan et al. (Sloan & Marx, 2004a; Sloan, Marx, & Epstein, 2005; Sloan, Marx, Epstein, & Lexington, 2007) have found that trauma exposed participants assigned to a WED condition reported significant reductions in posttraumatic stress disorder (PTSD) and depression symptoms one month after writing about their traumas compared with participants assigned

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to a neutral writing control condition. Sloan and Marx (2004b) speculated that WED may operate much like currently available extinction-based PTSD treatments that promote therapeutic change by repeatedly ‘exposing’ the individual to previously avoided trauma-related stimuli (i.e., traumatic memories), thereby reducing trauma-related affective responses. In fact, some existing treatments for PTSD, such as cognitive processing therapy (CPT; e.g., Monson et al., 2006; Resick et al., 2008) and narrative exposure therapy (NET; Bichescu, Neuner, Schauer, & Elbert, 2007; Neuner et al., 2008; Schaal, Elbert, & Neuner, 2009) incorporate written trauma narratives in the treatment protocols.

Further bolstering the possibility that WED may represent a form of exposure-based therapy are findings from Sloan et al. studies (Sloan & Marx, 2004a; Sloan et al., 2005, 2007) showing that the critical elements of the exposure model (e.g., Foa & Kozak, 1986; Rachman, 1980) are present during WED sessions. Specifically, relative to control participants, WED participants report and display (via salivary cortisol and heart rate) initially high levels of negative affect and arousal during the first writing session. This increased affect and arousal, however, subsequently diminishes by the last session.

In contrast to the work of Sloan et al., other research examining the effects of WED on PTSD symptoms among trauma survivors has reported less favorable outcomes. For example, Gidron, Peri, Connolly, and Shalev (1996) found that participants with PTSD assigned to a WED condition did not significantly differ from PTSD participants assigned to a control writing condition on PTSD symptom severity five weeks after the writing sessions. Similarly, Smyth, Hockemeyer, and Tulloch (2008) found no significant differences in PTSD symptom severity at a 3 month follow-up assessment between PTSD participants assigned to WED and PTSD participants assigned to a control condition. However, relative to the control group participants, significant reductions were found for the WED participants on self-reported tension and anger.

Although it is unclear why Gidron et al. (1996) and Smyth et al. (2008) did not observe significant group differences, both of these investigations used WED procedures that differed significantly from the standard WED procedures used by Sloan et al. Specifically, unlike the standard WED protocol, Gidron et al. had participants complete their writing sessions at home and then read their most distressing narrative to an experimenter during the last session. Smyth et al. had participants complete their three, 20 min writing sessions in a single day, with a 15 min break between writing sessions. Smyth et al. also varied the WED instructions, such that participants identified the traumatic event and then described associated thoughts and feelings in the first writing session. In the second session participants were asked to “tell a story” about the traumatic event while focusing on how the event affected them. In the final writing session participants examined the rationality of their negative beliefs and then re-told their stories with a focus on insight and/or benefit derived from the writing sessions. Another important difference between these studies is that, whereas Gidron et al. and Smyth et al.’s participants met diagnostic criteria for PTSD, meeting PTSD diagnostic criteria was not an inclusion criteria in any of the Sloan et al. studies; participants only needed to report at least moderate severity levels of PTSD symptoms for inclusion. This important difference raises the possibility that WED is only efficacious for trauma survivors with more mild levels of PTSD symptom severity. Given the equivocal findings and the methodological differences of the WED studies with trauma survivors conducted to date, it remains unclear whether the standard WED protocol is efficacious for individuals who meet diagnostic criteria for PTSD.

The current study further examined the efficacy of WED for PTSD. Based on our prior studies, we expected that fewer participants who were randomly assigned to WED would meet diagnostic criteria for PTSD at the follow-up assessment relative to participants

randomly assigned to a control writing condition. We also hypothesized that participants assigned to WED would display significant reductions in overall PTSD symptom and depression symptom severity, a common trauma-related symptom (Huppert, 2009), relative to participants in the control writing condition. Also consistent with our previous findings, we expected that compared with participants in the control writing condition, participants assigned to the WED condition would display significantly greater initial (i.e., first session) emotional responding followed by a significant reduction in emotional responding from the first to the last writing session.

Method

Participants

Participants were undergraduate students at a large, urban university who met diagnostic criteria for PTSD. Potential participants were initially screened for PTSD using the Posttraumatic Stress Diagnostic Scale (PDS; Foa, 1996), which they completed as part of a larger battery of questionnaires in exchange for partial fulfillment of an introductory psychology research course requirement. Potential participants were identified if they reported a PTSD criterion A (DSM-IV, APA, 1994) trauma event (occurring more than 3 months prior) and related posttraumatic stress symptoms of at least moderate symptom severity as defined by the PDS manual (Foa, 1996).

In order to determine the number of participants that would be needed to detect between-group differences on our PTSD primary outcome measure, we conducted an *a priori* power analysis using the large effect size ($r = .87$) for PTSD outcome obtained by Sloan et al. (2005); this effect size was similar to those found in our other studies (Sloan & Marx, 2004a; Sloan et al., 2007). The power analysis indicated that a sample size of 14 in each of the two conditions would be needed to detect between-group differences. Using a conservative estimated attrition rate of 30%, we aimed to recruit approximately 20 participants per condition.

Potential participants identified through the completed PDS were contacted and asked to volunteer for a study in which they would be asked to write “about their life” in exchange for either research course credit or financial compensation. Of the 72 potential participants that were contacted and asked to participate in the study, 57 (79%) agreed to participate. Of the 12 individuals who declined participation, 8 indicated that they did not have any available time for participation and 4 reported that they had already fulfilled their research course requirement. Fig. 1 presents a flowchart of progress of participants through the study. Participants who dropped out did not significantly differ on baseline PTSD symptom severity from those who completed the study (89% retention rate).

The sample of 42 participants who completed the study was racially diverse, consisting of 24 Caucasian, 9 African-American, 4 Hispanic, 3 Asian-American, and 2 “other” or mixed racial background individuals. The mean age for the sample was 18.9 years ($SD = 1.1$). Index traumatic events included sexual assault ($n = 17$), physical assault by stranger ($n = 13$), motor vehicle accident ($n = 6$), witness to a murder ($n = 3$) and warzone experience ($n = 3$). Over 75% of the participants indicated that their index trauma occurred at least 6 months prior (30% indicated the event happened more than 5 years prior).

Outcome measures

PTSD Symptom Scale-Interview (PSS-I, Foa, Riggs, Dancu, & Rothbaum, 1993)

—The PSS-I is a 17-item semi-structured interview that assesses the presence and severity of PTSD symptoms over the past month. The 17 questions correspond to the DSM-IV

(APA, 1994) criteria for PTSD, each rated on a 4-point frequency-severity scale. Both PSS-I symptom severity score and PTSD diagnostic status were used as outcome measures in this study.

The PSS-I was administered at baseline and one month after the writing sessions. Advanced doctoral students in clinical psychology trained to administer the PSS-I and unaware of participant condition assignment conducted the assessments. All assessments were audio recorded and supervised by the first author.

Beck Depression Inventory, second version (BDI-II; Beck, Steer, & Brown, 1996)—The BDI-II is a 21-item self-report measure that assesses the cognitive, affective, motivational, and physiological symptoms of depression. The BDI-II was included in this study to examine changes in depressive symptom severity.

Self-report and physiology responding measures

Physiological reactivity—Heart rate (HR) activity was included to examine changes in levels of autonomic arousal during the writing sessions. In this study, participants' HR was recorded continuously, for both a 5 min resting baseline period prior to each writing session and during each 20 min writing session using a Polar S810 HR monitor (Lake Success, NY). As with our prior studies (Epstein, Sloan, & Marx, 2005; Sloan et al., 2007), change scores (M writing session HR – M baseline HR) were used to examine HR reactivity during each writing session.

Self-reported emotion—The paper-and-pencil version of the Self-Assessment Manikin (SAM; Bradley & Lang, 1994) was used to obtain participants' ratings of valence (pleasantness) and arousal in response to each writing session. The valence and arousal dimensions of the SAM are rated on a 9-point Likert-type scale.

Linguistic Inquiry and Word Count, 2007 (LIWC2007, Pennebaker, Booth, & Francis, 2007)—As a manipulation check, the narratives were analyzed for linguistic content (i.e., negative emotion and cognitive insight) using LIWC2007. The LIWC2007 is a computerized text analysis program that searches individual text files and computes the percentage of words in a variety of word categories. For this study the average percentage of negative emotion words (e.g., sad, afraid, hate, worthless) and cognitive insight words (e.g., think, know, because) for the three writing sessions was examined.

Procedure

Individuals who agreed to participate were scheduled for the first session within one week of phone contact. During the first session informed consent was obtained followed by administration of the PSS-I and completion of the BDI-II and a demographic questionnaire. At the end of the assessment session participants were compensated for their time and informed they would be contacted within a few days and told whether or not they were eligible to continue participation in the study. Participants who met PTSD diagnostic criteria were scheduled to return to the laboratory within one week of their initial assessment. Participants who did not meet diagnostic criteria were debriefed over the phone.

Randomization to condition was conducted prior to the first writing session. For all participants, the writing sessions took place on three consecutive days, with participants writing alone in a private room for 20min each session. Upon arriving to the laboratory for the writing sessions, participants were asked to wear the HR chest strap, which they were told would record their bodily reactions, and were given instructions for the resting period. For the resting baseline period, participants were instructed to focus on their breathing and

to clear their minds of all thoughts. Participants were then left alone in a dimly lit room for 5 min while resting HR was recorded. The writing session, during which HR activity was continuously recorded, immediately followed the resting recording period.

Participants were given their writing instructions in a sealed envelope. Following standard procedures (Pennebaker, 1997), participants assigned to the WED condition were asked to write about the most traumatic experience of their lives with as much emotion and feeling as possible. Participants were also instructed to write about the same traumatic experience at each session. Those assigned to the control writing condition were asked to write about how they spent their time each day without describing any emotion or opinions. Participants completed the SAM immediately after the writing session, with instructions to rate how they felt in reaction to the session. The same procedure was followed for the remaining writing sessions. The experimenters conducting the experimental sessions were unaware of writing condition assignment of the participants.

The PSS-I and BDI-II were completed during a follow-up assessment that occurred one month after the writing sessions. The time frame for follow-up assessment was selected for two reasons. First, the follow-up assessment period is consistent with our previous investigations, thus permitting a comparison of the findings to similar studies. Second, the one-month period is consistent with the time frame queried by the PSS-I as well as the diagnostic criteria for PTSD. Conducting an assessment of PTSD symptom severity immediately following the writing sessions would not have been informative given that the sessions take place on three consecutive days and the time frame used to assess PTSD symptoms is the past month. The study was approved by the local university Institutional Review Board.

Results

To investigate the adequacy of randomization, participants assigned to the two writing conditions were first compared on demographic characteristics using independent *t*-tests (age, number of traumatic events) or chi-square tests (gender, racial background; time since traumatic event; history of psychotherapy/psychotropic medication). No significant condition differences were found (smallest $p = .32$).

Manipulation check

The LIWC2007 analysis indicated that the participants assigned to the WED condition used significantly greater average percentage of negative words ($M = 1.58$, $SD = 0.49$; $t(41) = 8.57$, $p < .001$) and cognitive insight words ($M = 10.02$, $SD = 1.9$; $t(41) = 3.07$, $p < .01$) compared with participants assigned to the control condition ($M = 0.38$, $SD = 0.18$; $M = 8.02$, $SD = 1.6$, respectively).

Outcome assessment

Between-group differences on each outcome variable were examined using repeated measures analysis of variance (ANOVA) with condition as the between-subjects factor and time as the repeated measures factor. Effect sizes were calculated using $r_{\text{effect size}}$ (Rosenthal, Rosnow, & Rubin, 2000).

Table 1 provides summary information for the PTSD symptoms and depression symptom severity outcome measures as a function of condition and assessment period. For the PSS-I, findings indicated a significant main effect for time ($F(1,40) = 25.18$, $p < .001$, $r_{\text{effect size}} = .61$), such that all participants reported a decrease in PTSD symptom severity from baseline ($M = 24.99$, $SD = 5.3$) to the one-month follow-up assessment ($M = 15.50$, $SD = 8.7$).

Contrary to predictions, the Time $\times$ Condition interaction was not significant (see Table 1). Examination of the percentage of participants who met PTSD diagnostic criteria at follow-up assessment also indicated no significant between-group difference (WED = 67%; control = 78%; $\chi^2 = 0.33$). Also contrary to the hypotheses, no significant main effect or interaction was found for the depression outcome measure (see Table 1).

Emotional arousal and habituation

Fig. 2 displays HR change scores as function of condition and writing session. A one-way ANOVA was conducted to examine whether the predicted increased HR activity occurred during the first writing session for the WED participants, relative to the control participants. As expected, a significant effect for condition was obtained, $F(1,41) = 4.28, p < .05$, $r_{\text{effect size}} = .31$, with participants assigned to the WED condition displaying significantly greater HR during the first writing session ($M = 3.85, SD = 1.75$) compared with participants assigned to the control writing condition ($M = 0.49, SD = 0.87$).

To examine whether the expected reductions in HR activity occurred from the first to the last session for the WED participants, paired t -tests were conducted by examining the difference in HR between the first and last writing sessions, separately for each condition. Contrary to our predictions, findings indicated no significant reduction in HR activity from the first to last session for the WED condition ($t(20) = 0.05, p > .90, r_{\text{effect size}} = .01$). As expected, no significant reduction in HR activity was observed for control condition ($t(20) = 1.01, p > .30, r_{\text{effect size}} = .22$).¹

For self-reported emotional responding, one-way ANOVAs indicated that the writing conditions significantly differed at the first writing session for both unpleasantness ratings ($F(1,41) = 20.51, p < .001, r_{\text{effect size}} = .58$) and arousal ratings ($F(1,41) = 22.87, p < .001, r_{\text{effect size}} = .60$). As expected, participants assigned to the WED condition reported significantly greater unpleasantness and arousal during the first writing session relative to participants assigned to the control writing condition (see Fig. 3). Similar to the HR findings, however, WED participants did not report a significant reduction in unpleasantness ($t(20) = 0.23, p > .90, r_{\text{effect size}} = .05$) or arousal ($t(20) = 0.86, p > .80, r_{\text{effect size}} = .19$) from the first to the last writing session. The same pattern of findings was observed for the control condition (unpleasantness $t(20) = 0.16, p > .80, r_{\text{effect size}} = .04$; arousal $t(20) = 0.14, p > .80, r_{\text{effect size}} = .03$).

Discussion

Contrary to our predictions, we found that PTSD participants assigned to the standard WED condition did not report significant reductions in PTSD symptoms, relative to PTSD participants assigned to the control writing condition. This finding is consistent with those of other studies (Gidron et al., 1996; Smyth et al., 2008) that have examined the efficacy of modified versions of the WED protocol with PTSD participants. As previously discussed, participants in the current study all met diagnostic criteria for PTSD. In our prior studies that found efficacious outcome for WED (e.g., Sloan & Marx, 2004a, 2004b; Sloan et al., 2005, 2007) participants were selected for at least moderate PTSD symptom severity but PTSD diagnosis was not assessed. It is likely that participants in the current study had greater PTSD symptom severity than participants assessed in our prior studies.

¹Because it is possible that averaging heart rate over the 20 min rating session may have obscured peak reactivity during the writing sessions, we examined peak heart rate during each session. However, using peak heart rate, we found no difference between the first (M peak heart rate = 84.42) and the last (M peak heart rate = 85.01) writing session for the WED condition.

Consistent with our findings that heart rate and self-reported emotion did not diminish over time, one potential explanation for our null findings is that the small number of sessions and relatively brief session duration may not have allowed for sufficient habituation of negative affect elicited during the WED procedure. Habituation of such negative affect and arousal has been considered critical for the successful treatment of PTSD (e.g., Foa & Kozak, 1986; Nayak, Powers, & Foa, in press). As such, most exposure-based treatments for PTSD promote the successful habituation to trauma-related stimuli through the confrontation of such stimuli over the course of many sessions (e.g., 9 or more), during which the individual is confronted with trauma-related stimuli (e.g., memories) for prolonged periods of time (45–90 min). If this explanation is correct, then WED may be efficacious if it included a greater number and longer duration of writing sessions. Recently, however, there has been some discussion of the fact that the originally proposed and subsequently assumed mechanism of action for exposure-based therapy, namely fear activation and habituation, lacks strong empirical support. Instead, Craske et al. (2008) and others (e.g., Bouton, 2004) have suggested that exposure-based treatments work not through fear reduction, but rather through inhibitory learning and distress toleration. Future work with WED should examine these possible mechanisms of action.

As previously noted, several effective treatments for PTSD incorporate written exposure in the treatment protocol, such as CPT and NET. In contrast to the WED protocol in which the intervention could be regarded as an exposure only intervention, both CPT and NET consist of written exposure with a focus on cognitive restructuring of the trauma memory.

Another possible explanation for the null findings is that no treatment rationale or psychoeducation of PTSD was included in WED. The omission of treatment rationale in the WED protocol could be important given previous findings that treatment rationale and its acceptance by study participants predicts successful treatment outcome (e.g., Addis & Jacobsen, 2000). Moreover, all evidence-based treatments for PTSD include psychoeducation of PTSD within the treatment protocol (Hamblen, Schnurr, Rosenberg, & Eftekhari, 2009). Another potentially important contributor to the lack of significant group differences is that participants in this study were not seeking treatment for their PTSD symptoms nor were they informed that the WED might be associated with reductions in their symptomatology.

Although our sample size was relatively small (i.e., 21 participants per condition), the null findings were not the result of inadequate statistical power. *A priori* power analysis indicated that we were sufficiently powered to detect between-group differences for the PTSD outcome measure, though the power analysis was conducted assuming a large effect. Additionally, inspection of the means show symptom reduction in both groups, which is not the pattern that would be expected if it were simply a case of inadequate power.

Although we did not observe any significant between-group differences, all participants displayed a significant reduction in PTSD symptom severity. This reduction is not unusual as PTSD clinical trials have reported substantial reductions in PTSD symptom severity for waitlist comparison conditions (e.g., Foa et al., 2005). Nevertheless, it is possible that the PTSD interview conducted at baseline served as an exposure to the trauma memory, and this exposure resulted in a substantial reduction in PTSD symptoms observed at follow-up assessment. Indeed, some treatments for PTSD do involve a single exposure session (e.g., Basoglu, Salcioglu, Livanou, Kalender, & Acar, 2005).

Ideally, we would have investigated moderators associated with WED outcome to examine if some PTSD participants benefited from the WED procedure. However, our sample size was too small to conduct this type of analysis. The examination of moderators associated

with beneficial WED outcomes will be an important area of investigation for future work. In general, continued work in this area would facilitate our understanding of the core components of successful PTSD treatment, as well as to advance our ability to develop more efficient, brief, and economical treatments for PTSD.

References

- Addis ME, Jacobsen NS. A closer look at the treatment rationale and homework compliance in cognitive-behavioral therapy for depression. *Cognitive Therapy and Research*. 2000; 24:313–326.
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 4th ed.. Washington, DC: Author; 1994.
- Basoglu M, Salcioglu E, Livanou M, Kalender D, Acar G. Single-session behavioural treatment of earthquake-related PTSD: a randomised waitlist controlled trial. *Journal of Traumatic Stress*. 2005; 18:1–11. [PubMed: 16281190]
- Beck, AT.; Steer, RA.; Brown, GK. *Beck depression inventory-second edition: Manual*. San Antonio, TX: The Psychological Corporation; 1996.
- Bichescu D, Neuner F, Schauer M, Elbert T. Narrative exposure therapy for political imprisonment-related chronic posttraumatic stress disorder and depression. *Behaviour Research and Therapy*. 2007; 45:2212–2220. [PubMed: 17288990]
- Bouton ME. Context and behavioral processes in extinction. *Learning and Memory*. 2004; 11:485–494. [PubMed: 15466298]
- Bradley MM, Lang PJ. Measuring emotion: the self-assessment manikin and the semantic differential. *Journal of Behavior Therapy and Experimental Psychiatry*. 1994; 25:49–59. [PubMed: 7962581]
- Craske MG, Kircanski K, Zelikowsky M, Mystkowski J, Chowdhury N, Baker A. Optimizing inhibitory learning during exposure therapy. *Behaviour Research and Therapy*. 2008; 46:5–27. [PubMed: 18005936]
- Epstein EM, Sloan DM, Marx BP. Getting to the heart of the matter: written disclosure, gender, and heart rate. *Psychosomatic Medicine*. 2005; 67:413–419. [PubMed: 15911904]
- Foa, EB. *Posttraumatic stress diagnostic scale*. Minneapolis, MN: National Computer Systems; 1996.
- Foa EB, Hembree EA, Cahill SP, Rauch SAM, Riggs DA, Feeny NC. Randomized trial of prolonged exposure for posttraumatic stress disorder with and without cognitive restructuring: outcome at academic and community clinics. *Journal of Consulting and Clinical Psychology*. 2005; 73:953–964. [PubMed: 16287395]
- Foa EB, Kozak M. Emotional processing of fear: exposure to corrective information. *Psychological Bulletin*. 1986; 99:20–35. [PubMed: 2871574]
- Foa EB, Riggs DS, Dancu CV, Rothbaum BO. Reliability and validity of a brief instrument for assessing posttraumatic stress disorder. *Journal of Traumatic Stress*. 1993; 6:459–473.
- Frattaroli J. Experimental disclosures and its moderators: a meta-analysis. *Psychological Bulletin*. 2006; 132:823–865. [PubMed: 17073523]
- Gidron Y, Peri T, Connolly JF, Shalev AY. Written disclosure in posttraumatic stress disorder: is it beneficial for the patient? *Journal of Nervous and Mental Disease*. 1996; 184:505–508. [PubMed: 8752081]
- Hamblen JL, Schnurr PP, Rosenberg A, Eftekhari A. A guide to literature on psychotherapy for PTSD. *Psychiatric Annals*. 2009; 39:348–354.
- Huppert, JD. Anxiety disorders and depression comorbidity. In: Antony, MM.; Stein, MB., editors. *Oxford handbook of anxiety and related disorders*. New York: Oxford University Press; 2009. p. 576–586.
- Monson CM, Schnurr PP, Resick PA, Friedman MJ, Young-Xu Y, Stevens SP. Cognitive processing therapy for veterans with military-related posttraumatic stress disorder. *Journal of Consulting and Clinical Psychology*. 2006; 74:898–907. [PubMed: 17032094]
- Nayak, N.; Powers, MB.; Foa, EB. Empirically supported psychological treatments: prolonged exposure (PE). In: Beck, JG.; Sloan, DM., editors. *Handbook of traumatic stress disorders*. New York: Oxford University Press; in press.

- Neuner F, Onyut PL, Ertl V, Odenwald M, Schauer E, Elbert T. Treatment of posttraumatic stress disorder by trained lay counselors in an African refugee settlement: a randomized controlled trial. *Journal of Consulting and Clinical Psychology*. 2008; 76:686–694. [PubMed: 18665696]
- Pennebaker JW. Writing about emotional experiences as a therapeutic process. *Psychological Science*. 1997; 8:162–166.
- Pennebaker JW, Beall SK. Confronting a traumatic event: toward an understanding of inhibition and disease. *Journal of Abnormal Psychology*. 1986; 95:274–281. [PubMed: 3745650]
- Pennebaker, JW.; Booth, RJ.; Francis, ME. Linguistic inquiry and word count (LIWC): LIWC2007. Mahwah, NJ: Erlbaum Publishers; 2007.
- Rachman S. Emotional processing. *Behaviour Research and Therapy*. 1980; 18:51–60. [PubMed: 7369988]
- Resick PA, Galovski TE, Uhlmansiek MO, Scher CD, Clum GA, Young-Xu Y. Randomized clinical trial to dismantle components of cognitive processing therapy for posttraumatic stress disorder in female victims of interpersonal violence. *Journal of Consulting and Clinical Psychology*. 2008; 76:243–258. [PubMed: 18377121]
- Rosenthal, R.; Rosnow, RL.; Rubin, DB. Contrasts and effect sizes in behavioral research: A correlational approach. Cambridge, United Kingdom: Cambridge University Press; 2000.
- Schaal S, Elbert T, Neuner F. Narrative exposure therapy versus interpersonal psychotherapy. *Psychotherapy and Psychosomatics*. 2009; 78:298–306. [PubMed: 19628958]
- Sloan DM, Marx BP. A closer examination of the structured written disclosure procedure. *Journal of Consulting and Clinical Psychology*. 2004a; 72:165–175. [PubMed: 15065952]
- Sloan DM, Marx BP. Taking pen to hand: evaluating theories underlying the written emotional disclosure paradigm. *Clinical Psychology: Science and Practice*. 2004b; 11:121–137.
- Sloan DM, Marx BP, Epstein EM. Further examination of the exposure model underlying written emotional disclosure. *Journal of Consulting and Clinical Psychology*. 2005; 73:549–554. [PubMed: 15982152]
- Sloan DM, Marx BP, Epstein EM, Lexington J. Does altering the instructional set affect written disclosure outcome? *Behavior Therapy*. 2007; 38:155–168. [PubMed: 17499082]
- Smyth JM, Hockemeyer JR, Tulloch H. Expressive writing and post-traumatic stress disorder: effects of trauma symptoms, mood states, and cortisol reactivity. *British Journal of Health Psychology*. 2008; 13:85–93. [PubMed: 18230238]

Fig. 1.
Flowchart of participants through the study.

Fig. 2.
Mean heart rate change (beats per minute) as a function of writing session and condition.
Error bars represent standard error of the mean.

Fig. 3.
Top panel: mean self-reported unpleasantness as a function of writing session and condition.
Bottom panel: mean self-reported arousal as a function of writing session and condition.
Error bars represent standard error of the mean.

Table 1

Mean value (standard deviation) of outcome measures as a function of condition and assessment period.

	Written disclosure	Control writing	<i>F</i> (interaction)	<i>r</i> effect size
PSS-I				
Baseline	24.8 (5.5)	25.2 (5.2)		
Follow-up	16.0 (8.2)	15.0 (7.2)	.13	.06
BDI-II				
Baseline	17.2 (10.8)	19.0 (11.9)		
Follow-up	17.8 (13.3)	15.4 (12.1)	2.59	.24

Note. PSS-I = PTSD Symptom Scale-Interview; BDI-II = Beck Depression Inventory, second version.