Published in final edited form as:

Behav Ther. 2007 June ; 38(2): 155–168. doi:10.1016/j.beth.2006.06.005.

Does Altering the Writing Instructions Influence Outcome Associated With Written Disclosure?

Denise M. Sloan, Brian P. Marx, Eva M. Epstein, and Jennifer M. Lexington
Temple University

Abstract

This study examined the effect of changing the instructional set for written disclosure on psychological and physical health reports among traumatized college students with current posttraumatic stress symptoms. Eighty-two participants were randomly assigned to one of three writing conditions that focused on emotional expression (EE), insight and cognitive assimilation, or to a control condition. Participants assigned to the EE condition reported significant improvements in psychological and physical health 1 month following the writing sessions relative to the other two conditions. The EE participants also reported and displayed significantly greater initial psychophysiological reactivity and subsequent habituation compared with the other two conditions. These findings suggest the importance of emphasizing emotional expression during written disclosure and underscore the importance of examining how modifying the written disclosure protocol can affect outcome.

IN STUDIES OF THE WRITTEN disclosure procedure developed by Pennebaker and colleagues (see Pennebaker, 1997, for a review), researchers have typically examined the physical and psychological health effects associated with written disclosure by comparing participants who are asked to write about the most traumatic or stressful experience of their lives with as much emotion as possible with a group of participants who are asked to write about an experience with no emotion. Although some studies have suggested that written disclosure is associated with improvements in physical and psychological health, findings from other studies have suggested that written disclosure may not produce significant health changes (see Sloan & Marx, 2004b, for a review). These equivocal outcomes are not surprising given that a number of investigators have unsystematically altered various aspects of the procedure, such as the number of writing sessions used (Greenberg, Wortman, & Stone, 1996; Lepore, 1997; Stroebe, Stroebe, Schut, Zech, & van den Bout, 2002), the duration of the writing sessions (Greenberg et al., 1996; Schoutrop, Lange, Hanewald, Duurland, & Bermond, 1997; Stroebe et al., 2002), and the length of time between writing sessions (Esterling, Antoni, Fletcher, Marguiles, & Schneiderman, 1994; Schoutrop et al., 1997; Stanton et al., 2002). In general, investigators have not provided a rationale for such methodological alterations, nor do they include appropriate comparison groups to examine the effect of such alterations. Making findings even more difficult to interpret is the fact that some investigators have altered multiple aspects of the procedure within the same study (e.g., Batten, Follette, Hall, & Palm, 2002; Gidron, Peri, Connolly, & Shalev, 1996). That is, some studies have altered the instructional set, the duration of the writing sessions, and the number of writing sessions within the same study. Such alterations make it difficult to discern what might account for the null (Batten et al., 2002; Kloss & Lisman, 2002; Stroebe

et al., 2002) and detrimental effects (Gidron et al., 1996) associated with written disclosure that have been reported.

One important aspect of the procedure that has been repeatedly altered is the instructional set for the disclosure condition. The original instructions developed by Pennebaker (1997) allow participants to freely choose any experience considered to be traumatic or stressful during each session and then ask them to write about that experience with as much emotion as possible. In addition, participants are instructed that they can write about the same or different experiences during each session. Previous investigators have altered the instructions, such that participants have been required to write about specific topics, such as adjusting to college (Pennebaker & Francis, 1996), an upcoming graduate entrance exam (Lepore, 1997), past childhood sexual abuse (Batten et al., 2002), a specific recent traumatic experience (Gidron et al., 1996), recent death of a spouse (Stroebe et al., 2002), and a current physical illness (Stanton et al., 2002). The results from studies in which participants have been instructed to write about specific topics have been inconsistent in that some studies have noted beneficial effects for written disclosure (e.g., Pennebaker & Francis, 1996; Stanton et al., 2002), whereas others have not (e.g., Batten et al., 2002; Gidron et al., 1996; Stroebe et al., 2002).

Importantly, these same studies in which participants have been asked to write about specific experiences have also required that participants write about the same experience during each writing session, constituting another departure from the original protocol. Recently, Sloan, Marx, and Epstein (2005) examined the effects of writing about the same experience during each writing session. In this study, the effects of writing about the same traumatic experience during each session were compared with the effects of writing about different traumatic experiences during each session and objectively writing about a neutral topic. Participants who wrote about the same traumatic experience during each session reported fewer depressive and posttraumatic stress symptoms and fewer physical health complaints at follow-up assessment compared with participants assigned to the other two conditions. Interestingly, participants who wrote about different traumatic experiences during each session displayed no beneficial outcome associated with written disclosure. Additionally, only those participants who wrote about the same traumatic experience during each session showed a pattern of emotional responding (initially heightened reactivity followed by habituation) that was associated with psychological and physical health improvements. Taken together, these findings suggest that writing about the same traumatic experience during the written disclosure sessions confers greater benefits than writing about different traumatic experiences during each session.

It may be the case that instructing participants to write about their experiences in a particular manner may also affect written disclosure outcome. For instance, some investigators have suggested that written disclosure instructions that emphasize meaning making, shifts in perspective, and improved insight (e.g., describe how the experience has positively affected your life) might yield significant health benefits, and research appears to support this hypothesis (e.g., Alvarez-Conrad, Zoellner, & Foa, 2001; Amir, Stafford, & Freshman, 1998; King & Miner, 2000; Stanton et al., 2002). However, the conclusions that can be drawn from the written disclosure studies that have been conducted thus far are limited. For example, Stanton et al. (2002) and King and Miner (2000) studies included several deviations from the standard protocol and only used a measure of current mood to assess psychological change. Findings from King and Miner (2000) are also difficult to interpret as the group instructed to write about the perceived benefits of their traumatic experiences reported as much distress and used as many negative affect words in their writing as the group that wrote about their traumatic experiences using the standard instructional set.

Other researchers have suggested that written disclosure instructions that emphasize emotional expression might be particularly important in producing beneficial outcome (e.g., Bootzin, 1997; Sloan & Marx, 2004a). Indeed, emotional expression has been shown to be related to a number of health benefits across a variety of populations (e.g., Pennebaker, 1995). There is also a wealth of literature in the psychotherapy field demonstrating the importance of emotional expression for successful therapy outcome. For example, in the treatment of female rape survivors, Foa and Rauch (2004) found that prolonged exposure (PE) plus cognitive restructuring was no more efficacious than PE alone.

To further examine the impact of altering the writing disclosure instructional set, Ullrich and Lutgendorf (2002) conducted a study in which they investigated the relative importance of emphasizing cognitive assimilation and emotional expression in the written disclosure instructions. Participants instructed to write about a stressful experience in such a way that emphasized both emotional expression and cognitive assimilation (i.e., making sense of the event in order to gain acceptance of the experience) reported greater increases in awareness of the positive benefits of the stressful event compared with participants instructed to write about a stressful experience with a focus on emotional expression only and participants assigned to a control group. Moreover, the participants assigned to write about stressful experiences with a focus on emotional expression reported more severe illness symptoms during the 1-month study compared with the other two groups. However, Ullrich and Lutgendorf noted that the observed positive cognitive changes for the emotional expression and cognitive assimilation group might have resulted from demand characteristic as the participants were told to focus on attempting to gain meaning from these experiences. Moreover, participants were instructed to write (outside of the lab) at least twice a week for at least 10 minutes over the course of a 1-month period. For the emotional expression group, the sessions may not have been long enough for activation (or engagement) of negative affect and arousal, as well as subsequent habituation, to occur. Initial activation of negative affect and arousal and subsequent habituation of negative affect and arousal are factors that have been shown to be related to the observed beneficial effects of written disclosure (Sloan & Marx, 2004a; Sloan et al., 2005).

To further examine the impact of altering the instructional set for written disclosure, the present study instructed some participants to write about the same traumatic experience with as much emotion as possible during each writing session (emotional expression condition), whereas other participants were instructed to write about the same traumatic experience during each writing session with a focus on how the experience had affected their lives and what it has meant to them (insight and cognitive assimilation condition). These two disclosure groups were compared with a neutral writing control group whose participants were asked to describe how they spent their time each day, without including any emotion or opinions. The sample consisted of college students who reported a trauma history and current posttraumatic stress symptoms. In addition to examining outcome, self-reported emotion and physiological reactivity to each writing session were also assessed. We anticipated that participants assigned to the emotional expression (EE) condition would display significantly better outcomes associated with written disclosure compared with participants assigned to the other two conditions. We also predicted that participants assigned to the insight and cognitive assimilation (ICA) condition would display significantly better outcomes associated with written disclosure relative to the participants assigned to the control condition. Given previous findings (Sloan & Marx, 2004a; Sloan et al., 2005), it was anticipated that the participants assigned to the EE condition would display a pattern of initial reactivity and subsequent habituation of this reactivity compared with participants assigned to the other two conditions. In turn, participants assigned to the ICA condition were expected to show greater initial reactivity and subsequent habituation relative to the control participants.

Method

PARTICIPANTS

Participants were 85 undergraduate students at a large, urban university in the northeastern United States. The recruitment procedure for this study was identical to the procedure employed in our earlier studies (Sloan & Marx, 2004a; Sloan et al., 2005). Briefly, participants were selected based upon their responses to the Posttraumatic Stress Diagnostic Scale (PDS; Foa, 1996) that they completed in exchange for partial fulfillment of an introductory psychology course research requirement. In order to be selected for participation, individuals had to report a trauma history (occurring more than 3 months prior) and subsequent posttraumatic stress symptoms of at least moderate severity as defined by the PDS manual (e.g., scores of 10 or higher; Foa, 1996). In addition, individuals were excluded from participation if they reported currently being in psychotherapy or the current use of psychotropic medication. This exclusion criterion was added to reduce the possibility of confounding variables.

Potential participants were contacted by one of the authors and asked to volunteer for a study in which they would be asked to write about stories related to their life in exchange for either research course credit or financial compensation (\$10 per session). All participants entered the study within 3 weeks of completing the PDS screening measure. The study was reviewed and received approval by the university Institutional Review Board.

Of the 85 participants who entered the study, one dropped out after the first writing session (female) and another 2 (1 female) completed all the writing sessions but failed to return for the follow-up assessment. The remaining 82 participants (66 females) completed all 3 writing sessions and returned for the follow-up session 1 month later (96% retention rate); these 82 participants are included in subsequent data analyses.

The sample was racially diverse, consisting of 48 Caucasian, 23 African-American, 4 Hispanic, 2 Asian-American, and 5 mixed racial background individuals. The mean age for the sample was 18.7 years ($SD = 1.1$). The most frequently reported traumatic events were sexual assault (65%), physical assault by stranger (48%), motor vehicle accident (43%), and witness to murder (15%). As is typical for many individuals who have experienced a traumatic event (McFarlane & deGirolamo, 1996), 68% ($n = 56$) of the participants reported experiencing more than one traumatic event.

MEASURES

Posttraumatic Stress Diagnostic Scale (PDS; Foa, 1996)—The PDS is a 49-item self-report measure designed to aid in the detection and diagnosis of PTSD. Respondents report on PTSD symptoms that they have experienced within the last month. This measure was chosen because it yields a PTSD symptom severity score and has strong psychometric properties including test-retest reliability (Foa, Cashman, Jaycox, & Perry, 1997). Symptom severity scores are calculated by summing responses to the items, with a possible range of 0 to 51. Severity scores below 10 are considered mild, 10–20 moderate, 21–35 moderate to severe, and above 35 is severe (Foa, 1996). In addition to the total severity score, the PDS provides scores for the reexperiencing, avoidance/emotional numbing, and hyperarousal symptom clusters. These clusters were not examined in this study in order to reduce Type 1 error. The items on the PDS closely correspond to the *DSM-IV* PTSD criteria (American Psychiatric Association, 1994). Psychometric characteristics of the symptom severity score of the PDS indicate high test-retest reliability, high internal consistency, and high convergent validity. PDS symptom severity scores were included in this study to examine changes in PTSD symptoms from baseline to follow-up among participants. Because

symptoms change over time, this measure was completed during the screening procedure and then again when participants entered the study. The baseline PDS scores reported here are from the second administration of the measure.

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. Each item consists of four statements reflecting severity level and individuals are requested to select the statement that best describes their recent feelings (i.e., past 2 weeks) and experiences. The BDI-II has good to excellent psychometric properties in terms of internal consistency, temporal stability, and convergent and discriminant validity. The BDI-II was included to examine changes from baseline to follow-up in depressive symptoms.

Pennebaker Inventory of Limbic Languidness (PILL; Pennebaker, 1982)—This is a 54-item scale that measures the frequency of a group of common physical symptoms and sensations. The PILL is scored by summing the total number of items on which the frequency occurs at least every month, with a mean score of 17.9 ($SD = 4.5$) based on a college sample. The PILL has good internal consistency and test-retest reliability (Pennebaker, 1982). This measure of self-reported physical health was used in this study to examine changes in physical symptom complaints among the participants.

Physiological reactivity—Heart rate (HR) activity was included in the study to examine changes in levels of physiological arousal during the writing sessions. HR was selected because cardiovascular changes have been found to be common and detectable measures of changes in one's psychological and arousal states (Hugdahl, 1995). In this study, participants' HR was recorded continuously, for both a 5 min baseline period prior to each writing session and during each 20 min writing session using a Polar S810 HR monitor (Lake Success, NY). The Polar HR monitor is an ambulatory system that consists of a wristwatch receiver and the T61 transmitter chest strap. A water-soluble transmitting gel was applied to the transmitter chest strap to facilitate conduction. These signals were transmitted to the wristwatch receiver that calculated the interbeat interval (IBI) between R waves, which was subsequently downloaded to a computer text file.

HR obtained using the Polar Monitor system has been found to be highly correlated with cardiovascular recordings during exercise, mental challenges (e.g., arithmetic challenges), and resting periods, indicating that the system is a reliable device for recording HR activity in the laboratory (Goodie, Larkin, & Schauss, 2000). For data analyses, change scores (M writing session HR – M baseline HR) were used to examine HR reactivity to each writing session.¹

Self-reported emotion—The paper-and-pencil version of the Self-Assessment Manikin (SAM; Bradley & Lang, 1994) was used to obtain participants' self-report ratings of valence (pleasantness) and arousal in response to each writing session. Previous research has demonstrated that the valence and arousal dimensions reliably covary with physiological reactions associated with emotional experience (e.g., HR, skin conductance, and facial electromyography), suggesting that the SAM is a valid measure of emotional responding (e.g., Lang, Greenwald, Bradley, & Hamm, 1993). The SAM uses manikin figures on a 9-point scale for each of the affective dimensions. On the valence dimension, the SAM figures range from a happy, smiling figure (1, very pleasant) to an unhappy, frowning figure (9, very unpleasant). On the arousal dimension, the SAM figures range from a calm figure with

¹There were no condition differences in baseline HR; therefore, the use of change scores was considered appropriate.

closed eyes and an inactive body (1, very calm) to an excited figure with eyes wide open and an active body (9, very aroused). Immediately after each writing session, participants marked the point along the valence and arousal scales that represented their responses to the writing session. The SAM was chosen for this study because of its ability to discriminate between valence and arousal, its ability to index valid emotional responses, and because this measure has been used in other investigations of written disclosure (Sloan & Marx, 2004a, Sloan et al., 2005).

Manipulation check—In order to verify that the altered instructional sets elicited the intended effect, the narratives were analyzed for linguistic content (i.e., positive emotion, negative emotion, and cognitive insight) using the Linguistic Inquiry and Word Count, 2001 (LIWC2001, Pennebaker, Francis, & Booth, 2001). The LIWC2001 is a computerized text analysis program that searches individual text files and computes the percentage of words in a variety of word categories. The program uses an extensive dictionary file comprised of over 2,100 words and word stems to calculate the total number of words, sentences, percentages of unique words, and dictionary words. The sums of each of these scales are converted to a percentage of total words to correct for differences in text length between participants. For this study, the written essays for each session of each participant were converted to a computer text file and a linguistic analysis of these text passages was conducted using the LIWC2001. For the analyses conducted in this study the average percentage of negative emotion words (e.g., *sad, afraid, hate, worthless*), positive emotion words (*happy, joy, peaceful*), and cognitive insight words (e.g., *think, know, because*) for the three writing sessions was examined.

PROCEDURE

A blocked (according to PDS symptom severity score) randomization procedure was used to assign participants to the EE ($n = 28$), ICA ($n = 27$), or the control writing condition ($n = 27$). For all participants, the writing sessions took place on 3 consecutive days, with all participants writing alone in a private room for 20 min each session. Briefly, participants assigned to the EE condition were asked to write about the most traumatic experience of their lives with as much emotion and feeling as possible. Participants assigned to the ICA condition were requested to write about the most traumatic experience of their lives with a focus on what the event has meant to them, how the event has changed their lives—in both good and bad ways—and to challenge their dissonant thoughts about the event. For both the EE and ICA conditions, participants were requested to write about the same experience at each writing session. This instruction was included based on the findings that writing about the same traumatic experience during each session is more beneficial than writing about different traumatic experiences (Sloan et al., 2005). Those assigned to the control writing condition were asked to write about how they spent their time without describing any emotion or opinions. The control group writing instructions were consistent with those used in our previous investigations (Epstein, Sloan, & Marx, 2005; Sloan & Marx, 2004a; Sloan et al., 2005). See Appendix A for complete writing instructions.

During the first session, prior to writing and after obtaining informed consent, participants completed the PDS, BDI-II, PILL, and a demographic questionnaire. Following completion of the questionnaires participants were asked to put on 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. HR recording was then started and the participants were left alone in a dimly lit room for 5 min. The writing session, during which HR activity was continuously recorded, immediately followed the resting baseline period. Following the

completion of the writing session, participants completed the SAM. The same procedure was followed for the remaining writing sessions.

With the exception of the demographic questionnaire, the same measures were completed at the follow-up assessment which was scheduled for 1 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 (Sloan & Marx, 2004a; Sloan et al., 2005), which would permit comparison of the findings across studies. Second, the 1-month period is consistent with the time frame described in the instructions for two of the outcome measures included in this study (PDS and PILL).

Results

Possible group differences in demographic characteristics were examined using chi-square (racial background, gender) analyses and one-way analysis of variance (ANOVA) (age). The groups did not differ in terms of age, racial background, or gender (see Table 1).

MANIPULATION CHECK

An ANOVA (for each linguistic category) was conducted to examine whether participants followed the writing instructions for each group. As seen in Table 2, a significant condition effect was found for all three linguistic categories. Scheffe post hoc tests indicated that the participants assigned to the EE condition used a significantly greater proportion of negative emotion words and positive emotion words compared with participants assigned to the other two conditions ($ps < .05$). In turn, the participants assigned to the ICA condition used a significantly greater proportion of negative emotion words and positive emotion words compared with the participants assigned to the control condition ($p < .05$). Participants assigned to the ICA condition also used a significantly greater proportion of cognitive insight words relative to participants assigned to the EE condition and the control condition ($ps < .05$), whereas the participants assigned to the EE condition used a significantly greater proportion of cognitive insight words relative to the control condition ($ps < .05$). Taken together, these findings provide support that the instructional manipulation elicited the intended effect.

OUTCOME MEASURES

Table 3 provides summary information about each outcome measure as a function of condition and time. To examine condition differences on the outcome measures, a 3 (Condition) X 2 (Time) repeated measures ANOVA was conducted using time as the repeated measures variable, separately for each outcome measure.² As shown in Table 3, significant interactions were found for all three outcome measures. Scheffe post hoc tests indicated that the significant interaction effect for all three outcome measures was the result of condition differences at the follow-up assessment. That is, for the PDS symptom severity score, participants assigned to the EE condition reported significantly fewer PTSD symptoms at follow-up assessment compared with participants assigned to the ICA ($p < .05$) and control conditions ($p < .01$). Participants assigned to the EE condition also reported significantly fewer depressive symptoms at follow-up compared with the participants assigned to the control condition ($p < .01$). Lastly, participants assigned to the EE condition reported significantly fewer physical health complaints at follow-up relative to participants assigned to the ICA ($p < .05$) and control conditions ($p < .01$).

²Although the study included a fairly small number of males in each condition, gender was included as a between subjects factor for analyses of the outcome measures. However, no main effects or interactions were found (largest $F=1.65$, $p>.20$); thus, gender was not included in the reported analyses.

EMOTIONAL RESPONSES

Figure 1 displays HR change score for each writing session as a function of condition. To examine whether there were HR activity condition differences in response to the first writing session, a one-way ANOVA was conducted. Findings indicated a significant condition effect, $F(2,79) = 9.44$, $p < .001$, $r_{\text{effect size}} = .33$, with Scheffe post hoc tests indicating that the participants assigned to the EE condition displayed significantly greater HR activity in response to the first writing session ($M = 6.34$, $SD = 6.52$) compared with participants assigned to the ICA condition ($M = 2.63$, $SD = 2.47$, $p < .01$) and the control condition ($M = 1.46$, $SD = 2.73$, $p < .001$). No other condition differences were observed.

Next, to examine condition differences in activity across the writing sessions, paired t tests were conducted using change scores (first to last session). A significant reduction in HR activity from the first to last session occurred for participants assigned to the EE condition, $t(27) = 4.52$, $p < .001$, $r_{\text{effect size}} = .65$, and for participants assigned to the ICA condition, $t(26) = 2.31$, $p < .05$, $r_{\text{effect size}} = .41$. To examine whether the significant habituation pattern differed between the two disclosure conditions, a t test was conducted using a change score in HR activity from the first to last writing session. As predicted, participants assigned to the EE condition displayed significantly greater reductions in HR activity, $t(54) = 2.03$, $p < .05$, compared with participants assigned to the ICA condition.

Figure 2 displays self-reported ratings of valence (top panel) and arousal (bottom panel) as a function of condition. To examine condition differences in self-reported emotional responding to the first writing session, one-way ANOVAs were conducted, separately for valence and arousal. A significant main effect for condition was revealed, $F(2, 79) = 56.23$, $p < .001$, $r_{\text{effect size}} = .64$. Scheffe post hoc tests indicated that participants assigned to the EE condition reported significantly greater unpleasantness in response to the first writing session compared with participants assigned to the ICA ($p < .001$) and control ($p < .001$) conditions. In turn, participants assigned to the ICA condition reported significantly greater unpleasantness to the first writing session relative to participants assigned to the control condition ($p < .001$). A significant group effect was also found for self-reported arousal, $F(2, 79) = 39.50$, $p < .001$, $r_{\text{effect size}} = .58$, with post hoc tests indicating a similar pattern of findings. That is, participants assigned to the EE condition reported significantly greater arousal in response to the first writing session compared with participants assigned to the ICA ($p < .001$) and control ($p < .001$) conditions. In turn, participants assigned to the ICA condition reported significantly greater arousal relative to the participants assigned to the control condition ($p < .01$).

To examine condition differences in changes in self-reported emotional responses from the first to the last writing session, paired t tests were conducted. Similar to findings for HR activity, a significant reduction in self-reported valence was found for participants assigned to the EE ($p < .001$) and ICA ($p < .001$) conditions only. Likewise, a significant reduction in self-reported arousal was observed for participants assigned to the EE ($p < .001$) and ICA ($p < .001$) conditions only. Also consistent with the findings for HR activity, t tests indicated that the EE participants reported significantly greater reductions in valence, $t(54) = 2.61$, $p < .01$, and arousal $t(54) = 4.30$, $p < .001$, from the first to the last writing session relative to participants assigned to the ICA condition.

MEDIATION ANALYSES

For exploratory purposes, we used the available data to examine the mechanism(s) through which the EE condition promoted change in the various outcomes by performing several mediation analyses. These analyses used several relevant process-related variables as mediators. Specifically, following the work of others (e.g., Lepore & Greenberg, 2002; Low,

Stanton & Danoff-Burg, 2006; Pennebaker, Mayne, & Francis, 1997), we examined initial activation (indexed by self-reported valence and arousal and mean HR for Session 1), habituation (indexed by changes in mean HR and self-reported valence and arousal scores from Session 1 to Session 3), the mean proportion of positive and negative emotion words (LIWC) used in participant narratives, and the mean proportion of cognitive insight-related words (LIWC) used in participant narratives as mediators of the relation between experimental condition and psychological outcome. For the purposes of these analyses, experimental condition was recoded as a dummy variable and then Baron and Kenny's (Baron & Kenny, 1986; Kenny, Kashy, & Bolger, 1998) criteria for mediation were followed. More specifically, four conditions had to be met: (1) the independent variable (IV; experimental condition) must be significantly associated with the mediator (s); (2) the IV must be significantly associated with the dependent variables (DVs; change scores for PDS, BDI-II, and PILL); (3) the mediator(s) must be significantly associated with the DVs, and (4) the impact of the IV on the DV must be significantly less after controlling for the mediator(s).

Separate regression analyses were first conducted to examine whether the initial criteria for mediation were met. These analyses revealed that experimental condition predicted all psychological and physical symptom outcomes. Experimental condition also predicted all mediators (see Table 4). The next step in examining mediation was to examine whether all mediator variables predicted changes in outcome. To investigate this question, separate regression analyses were conducted in which PDS, BDI-II, and PILL change scores were regressed separately on all the mediator variables. All mediator variables except HR change scores significantly predicted changes in PDS symptoms severity score. Results also indicated that several potential mediator variables were not related BDI-II change scores. Finally, all mediator variables except mean proportion of positive emotion words used in narratives predicted changes in PILL scores (see Table 5 for results). Any potential mediator that was not related to outcome was not included in subsequent mediation analyses.

Lastly, multiple linear regression analysis was used to examine whether the chosen variables mediated the relations between the outcome variables and experimental condition by regressing PDS, BDI-II, and PILL change scores on experimental condition and the proposed mediators that met all of Baron and Kenny's (1986) initial assumptions. These analyses revealed that the relation between experimental condition and PDS change scores was no longer significant when the mean proportion of positive emotion words used in all three narratives was included. Specifically, results showed an inverse relation such that using fewer positive words mediated the relation between experimental condition and changes in posttraumatic stress symptom severity. Furthermore, the relation between experimental condition and PDS change scores was no longer significant when changes in self-reported ratings of arousal were included. Specifically, results showed that greater changes in self-reported arousal mediated the relation between experimental condition and changes in posttraumatic stress symptom severity. Another finding that emerged was that the relation between experimental condition and BDI-II change scores was no longer significant when the mean proportion of cognitive insight words used in the three narratives was included. Specifically, results showed an inverse relation such that using fewer words related to cognitive insight mediated the relation between experimental condition and changes in depressive symptom severity. No other mediation analyses were significant (see Table 6).

Discussion

This study found that written disclosure instructions that emphasized emotional expression was associated with significantly greater beneficial outcomes relative to instructions that

emphasized insight and cognitive assimilation and a control writing condition. In contrast to expectations, the instructions that emphasized insight and cognitive assimilation were not associated with any beneficial outcome. Thus, for individuals with trauma-related psychopathology, altering the instructional set for written disclosure to emphasize emotional expression appears critical for producing significant beneficial psychological and physical changes.

In addition to examining outcome associated with written disclosure, we also examined response patterns associated with each writing condition. Written disclosure that emphasized insight and cognitive assimilation elicited greater self-reported emotional responding to the first writing session compared with the control condition but significantly less self-reported emotional responding compared with the EE condition. In addition, the ICA condition did not produce significant physiological reactivity in response to the first session compared with the other two conditions. In contrast, the EE condition elicited both significant self-reported emotion and physiological reactivity in response to the first session relative to the other two conditions. To understand the exact meaning of the HR activity value of the EE participants observed in this study, it is helpful to refer to a study by Cuthbert and colleagues (2003). In that study, individuals diagnosed with either a specific phobia or social anxiety disorder showed HR changes of 1.98 beats per minute during a personally relevant fear imagery task. This HR change is substantially lower than that observed for both the EE and ICA groups in this study. A likely explanation for the relatively higher HR changes seen in this study is that, although engaging in an imagery task does not require any physical exertion, the writing task does. However, the relative proportions of observed HR change that can be accounted for by movement artifact and disclosing personal material remain unclear.

The number (i.e., 3) of writing sessions in this study was sufficient to allow for a significant habituation of both self-reported and physiological reactivity for both disclosure conditions, though the habituation pattern was significantly greater for the EE condition relative to the ICA condition. Taken together, these findings indicate that the EE condition produced the greatest degree of physiological reactivity and this reactivity pattern significantly habituated by the last writing session. As others have noted (e.g., Jaycox et al., 1998; Rachman, 1980), both significant initial engagement (i.e., reactivity) and subsequent habituation appear necessary for anxiety symptom reduction.

With respect to the mediation analyses, some interesting findings emerged that have implications for the proposed mechanisms of action of written disclosure. The findings that greater changes in self-reported arousal across sessions (indicating habituation) and reduced usage of positive emotion words across the sessions mediated the relation between EE condition and change in PTSD symptom severity provide some additional evidence (along with the group difference findings with respect to emotional reactivity) for the exposure hypothesis. These findings are consistent with those of Jaycox and colleagues (1998), who showed that reductions in self-reported distress across exposure sessions were related to better outcomes for individuals with PTSD. Although the results of this and the Jaycox et al. study corroborate previous claims that exposure leads to the reduction of pathological anxiety through the activation of the fear network and provision of corrective information (e.g., Foa & Kozak, 1986; Rachman, 1980), it is important to keep in mind that other potential indicators of exposure (e.g., use of negative emotion words, HR for Session 1, HR change from Session 1 to Session 3, self-reported arousal to the first session) did not mediate the relation between experimental condition and outcome. These findings underscore the importance for subsequent research to further examine the mechanism(s) of action of exposure-based therapies and the need to incorporate psychophysiological measures into such studies.

There has been some disagreement in the field regarding whether or not it is necessary to directly address maladaptive cognitions to successfully treat PTSD. For example, Foa and Kozak (1986) have argued and subsequently shown (e.g., Foa & Rauch, 2004) that maladaptive cognitions are corrected through the process of imaginal exposure. In contrast, Resick and colleagues (e.g., Resick & Schnicke, 1993; Resick et al., 2002) have argued and shown that directly addressing maladaptive cognitions in therapy can be as effective as imaginal exposure and might even be superior to exposure in addressing the cognitive sequelae to trauma (e.g., trauma-related guilt). The findings of this study may have implications for this debate. We found that ICA participants used a greater proportion of emotion words compared with the participants assigned to the control condition, and that EE participants used a greater proportion of cognitive insight words relative to the control condition. A significant reduction in HR reactivity from the first to last session occurred for both EE and ICA participants. In addition, ICA participants reported that the first writing session evoked significantly more feelings of unpleasantness and arousal relative to controls and that significant reductions in self-reported arousal were observed for EE and ICA participants. These results suggest that both approaches may promote similar curative processes. Consequently, it cannot be claimed that neither emotional expression nor cognitive processing is unimportant to the treatment of trauma survivors. Importantly, however, in this study only the EE condition was related to significant changes in psychological and physical health symptoms. This suggests that, although both processes are necessary for substantial change to occur, the specific therapy approach used will determine whether or not the optimal levels of emotional expression and cognitive processing needed to promote change are achieved. With respect to the written disclosure task, the results of this study suggest that writing instructions that emphasize insight and cognitive assimilation of traumatic or stressful events may not efficiently promote the levels of emotional expression and cognitive processing needed for change. On the other hand, written disclosure with an emphasis on emotional expression may do so.

The findings of this study appear to contrast with those obtained by Ullrich and Lutgendorf (2002). The discrepancies between the findings of this study and those of Ullrich and Lutgendorf may be accounted for by the differences in how the writing sessions were conducted. That is, Ullrich and Lutgendorf instructed participants to write outside of the lab for at least 10 minutes twice a week over the course of 1 month. In contrast, participants in this study wrote for 20 minutes on 3 consecutive days. In addition, although both studies examined college students, the participants in this study were selected on the basis of a trauma history and associated posttraumatic stress symptoms. The underlying mechanisms of written disclosure may vary for different samples and the efficacy of specific instructions may also differ depending on the sample being investigated. Indeed, empirically supported treatment manuals (e.g., Chu & Kendall, 2004) have some flexibility built into them in order to best serve the individual being treated. Such flexibility in written disclosure might also be necessary in order to produce beneficial outcomes. For this reason, it is important for investigators to continue to address questions pertaining to the underlying mechanisms of written disclosure and alterations to the written disclosure protocol that are appropriate for specific populations. The findings obtained using one particular sample may not be replicated with a different sample of participants.

The findings from this study, as well as the findings from other studies (e.g., King & Miner, 2000; Sloan et al., 2005; Stanton et al., 2002), suggest that altering the writing instructions has important implications for outcome. However, there are a number of other methodological aspects of the written disclosure procedure that should also be examined. For instance, researchers should systematically examine how many writing sessions are necessary and how long the sessions should last. It would also be of interest to examine the effect of altering the length of time between sessions. Most typically, investigators require

participants write on consecutive days, and this procedure is consistent with the standard protocol. However, there has been some suggestion that increased spacing (i.e., 1 week) between the writing sessions may lead to greater beneficial outcomes (Smyth, 1998). There are other aspects of the procedure that should be investigated as well (e.g., time to follow-up assessment, the context in which writing occurs, and the influence of the examiner conducting the sessions). However, the results of such alterations would likely vary depending upon the sample being examined. Similar to Paul's (1967) comment regarding the effectiveness of psychotherapy, it is not whether or not written disclosure is effective but rather for whom is it effective and under what conditions.

Although the findings of this study are intriguing, it is important to bear in mind that the participants were a group of non-treatment-seeking college students with a limited range of PTSD symptom severity. Thus, the findings reported here may have limited relevance for more severe, clinical samples. That being said, the sample examined in this study was drawn from an urban university setting that is ethnically and economically diverse and more similar to a community sample than most college student samples. Another limitation of this study is the relatively short time frame used for follow-up assessment. The time frame was selected in order to be consistent with our previous work and with the time frame used in two of the three outcome measures included in this study. However, it is possible that the beneficial effects observed for the EE condition may dissolve over longer periods of time, a possibility that was not examined here.

In summary, the results of this study indicate the importance of how alterations to the instructional set for written disclosure may affect associated outcome. It will be important to continue to investigate how alterations to the written disclosure procedure may affect outcome so that the field will have a better understanding of the critical aspects of this procedure and how manipulation of methodological aspects of the procedure are important for specific groups of individuals.

Acknowledgments

This study was supported by a grant from the National Institute of Mental Health (MH068223) awarded to Denise M. Sloan.

Appendix A: INSTRUCTIONS GIVEN TO ALL PARTICIPANTS

This study is a very important project looking at writing. Over the next three days, you will be asked to write about one of several different topics for 20 minutes each day. Your instructions for writing will be located on the back of the front page of the blue booklet given to you at each writing session. You will complete your writing alone in a private room. The person who takes you to the room where you will write will wait until you have finished reading your writing instructions for the day. This person will leave the room when you have finished reading the instructions, closing the door as they leave. The closing of the door will be your signal to begin writing. At the end of the 20 minutes, the person will knock on your door to let you know that the 20 minutes are up and you are to stop writing.

The only rule we have about your writing is that you write continuously for the entire time. If you run out of things to say, just repeat what you have already written. In your writing, don't worry about grammar, spelling, or sentence structure. Just write. Different people will be asked to write about different topics. Because of this, please do not talk with anyone about the experiment. Because we are trying to make this a tight experiment, we can't tell you what other people are writing about or anything about the nature or predictions of the study. Once the study is complete, however, we will tell you everything. Right now, we expect the study to be complete in about 6 months. Another thing is that sometimes people

feel a little sad or depressed after writing. If that happens, it is completely normal. Most people say that these feelings go away in an hour or so. If at any time over the course of the study you feel upset or distressed, please contact the primary investigator of this study.

Your writing is completely anonymous and confidential. You are identified by an ID number, which is written on the front of your booklet. Please do not write your name on any of the booklets. Some people in the past have felt that they didn't want anyone to read them. That's OK, too. If you don't feel comfortable turning in your writing samples, you may keep them. We would prefer if you turned them in, however, because we are interested in what people write. We promise that none of the experimenters, will link your writing to you. The one exception is that if your writing indicates that you intend to harm yourself or others, we are legally bound to match your ID with your name. Above all, we respect your privacy. If you have any questions please ask your question to the person who is in the room with you. If, after reading this material you no longer wish to participate, that is okay. Just let the person who is with you know that you don't want to continue in the study.

EMOTIONAL EXPRESSION CONDITION

First Day

For the next 3 days, we would like you to write about the most traumatic, upsetting experience of your entire life. In your writing, I want you to really let go and explore your very deepest emotions and thoughts. Whatever you choose to write about, it is critical that you really delve into your deepest emotions and thoughts. Ideally, we would also like you to write about significant experiences or conflicts that you have not discussed in great detail with others. Remember that you have three days to write. You might tie your personal experiences to other parts of your life, like your childhood, your parents, people you love, who you are, or who you want to be. Again, in your writing, examine your deepest emotions and thoughts.

Second Day

Today please continue to write about the same traumatic experience that you wrote about yesterday. Today we really want you to explore your very deepest emotions and thoughts.

Third Day

Today is the last writing session. In your writing today, we again want you to explore your deepest thoughts and feelings about the most traumatic experience of your life. Remember that this is the last day and so you might want to wrap everything up. For example, how is this experience related to your current life and your future? But feel free to go in any direction you feel most comfortable with and delve into your deepest emotions and thoughts.

INSIGHT AND COGNITIVE ASSIMILATION CONDITION

First Day

For the next 3 days, we would like you to write about the most traumatic, upsetting experience of your entire life. In your writing, write about what the experience has meant for you and how this experience has affected your life in both good and bad ways. Also, we want you to really explore the recurring thoughts you have in response to the experience. Again, in your writing, examine what this experience has meant for you, how this experience has affected your life, and the recurring thoughts you have in response to your experience.

Second Day

Today please continue to write about the same traumatic experience that you wrote about yesterday. Like yesterday, examine how this experience has affected your life and recurring thoughts you have about the experience. In addition, today we would like you to challenge the thoughts you typically have about this experience. In other words, we want you to provide evidence from your experiences both for and against your thoughts.

Third Day

You have written now for two days and today is the last one. In your writing today, we again want you to examine your thoughts related to the traumatic experience you have written about over the past two days. Remember that this is the last day and so you might want to wrap everything up. For example, how is this experience related to your current life and your future? But feel free to go in any direction you feel most comfortable with and delve into your recurring thoughts and experiences that have provided evidence both for and against these thoughts.

CONTROL WRITING CONDITION

First day

What you are to write about over the next three days is how you use your time. Each day, you will be given a different writing assignment on the way you spend your time. In your writing, be as objective as possible. We are not interested in your emotions or opinions. Rather, try to be completely objective. Feel free to be as detailed as possible. In today's writing, describe what you did yesterday from the time you got up until the time you went to bed. For example, you might start when your alarm went off and you got out of bed. You could include the things you ate, where you went, which buildings or objects you passed by as you walked from place to place. The most important thing in your writing, however, is for you to describe your day as accurately and as objectively as possible.

Second day

Today please describe what you have done today since you woke up. Again, be as objective as possible, with no description of emotions or feelings. Please describe exactly what you have done up until coming to this experiment.

Third day

You have written now for two days and today is the last one. In your writing today, describe what you will be doing over the next week in as much detail and as accurately as possible. Please remember not to include any emotions or feelings in your writing.

References

- Alvarez-Conrad J, Zoellner L, Foa EB. Linguistic predictors of trauma pathology and physical health. *Applied Cognitive Psychology*. 2001; 15:S159–S170.
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 4th ed. American Psychiatric Association; Washington, DC: 1994.
- Amir N, Stafford J, Freshman MS, Foa EB. Relationship between trauma narratives and trauma pathology. *Journal of Traumatic Stress*. 1998; 11:385–392. [PubMed: 9565923]
- Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*. 1986; 51:1173–1182. [PubMed: 3806354]

- Batten SV, Follette VM, Hall MLR, Palm KM. Physical and psychological effects of written disclosure among sexual abuse survivors. *Behavior Therapy*. 2002; 33:107–122.
- Beck, AT.; Steer, RA.; Brown, GK. *Beck Depression Inventory–Second edition*: Manual. The Psychological Corporation; San Antonio, TX: 1996.
- Bootzin RR. Examining the theory and clinical utility of writing about emotional experiences. *Psychological Science*. 1997; 8:167–169.
- 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]
- Chu BC, Kendall PC. Positive association of child involvement and treatment outcome within a manual-based cognitive-behavioral treatment for children with anxiety. *Journal of Consulting and Clinical Psychology*. 2004; 72:821–829. [PubMed: 15482040]
- Cuthbert BN, Lang PJ, Strauss C, Drobos D, Patrick CJ, Bradley MM. The psychophysiology of anxiety disorder: Fear memory imagery. *Psychophysiology*. 2003; 40:407–422. [PubMed: 12946114]
- 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]
- Esterling B, Antoni M, Fletcher M, Marguiles S, Schneiderman N. Emotional disclosure through writing or speaking modulates Epstein-Barr virus antibody titers. *Journal of Consulting and Clinical Psychology*. 1994; 10:334–350.
- Foa EB, Kozak M. Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin*. 1986; 99:20–35. [PubMed: 2871574]
- Foa EG, Rauch SM. Cognitive changes during prolonged exposure versus prolonged exposure plus cognitive restructuring in female assault survivors with posttraumatic stress disorder. *Journal of Consulting and Clinical Psychology*. 2004; 72:879–884. [PubMed: 15482045]
- Foa, EB. *Posttraumatic Stress Diagnostic Scale*. National Computer Systems; Minneapolis: 1996.
- Foa EB, Cashman L, Jaycox L, Perry K. The validation of a self-report measure of posttraumatic stress disorder: The Posttraumatic Diagnostic Scale. *Psychological Assessment*. 1997; 9:445–451.
- Gidron Y, Peri T, Connonly JF, Shalev AY. Written disclosure in posttraumatic stress disorder: Is it beneficial for the patient? *Journal of Nervous and Mental Disease*. 1996; 184:505–507. [PubMed: 8752081]
- Goodie JL, Larkin KT, Schauss S. Validation of the polar heart rate monitor for assessing heart rate during physical and mental stress. *Journal of Psychophysiology*. 2000; 14:159–164.
- Greenberg MA, Wortman CB, Stone AA. Emotional expression and physical health: Revisiting traumatic memories or fostering self-regulation? *Journal of Personality and Social Psychology*. 1996; 71:588–602. [PubMed: 8831163]
- Hugdahl, K. *Psychophysiology: The mind-body perspective*. Harvard University Press; Cambridge, MA: 1995.
- Jaycox LH, Foa EG, Morral AR. Influence of emotional engagement and habituation on exposure therapy for PTSD. *Journal of Consulting and Clinical Psychology*. 1998; 66:185–192. [PubMed: 9489273]
- Kenny, DA.; Kashy, DA.; Bolger, N. Data analysis in social psychology. In: Gilbert, DT.; Fiske, ST.; Lindzey, G., editors. *The handbook of social psychology*. 4th ed. Vol. 1. McGraw Hill; New York: 1998. p. 233–265.
- King LA, Miner KN. Writing about perceived benefits of traumatic events: Implications for physical health. *Personality and Social Psychology Bulletin*. 2000; 26:220–230.
- Kloss JD, Lisan SA. An exposure-based examination of the effects of written emotional disclosure. *British Journal of Health Psychology*. 2002; 7:31–46. [PubMed: 14596716]
- Lang PJ, Greenwald MK, Bradley MM, Hamm AO. Looking at pictures: Affective, facial, visceral and behavioral reactions. *Psychophysiology*. 1993; 30:261–273. [PubMed: 8497555]
- Lepore SJ. Expressive writing moderates the relation between intrusive thoughts and depressive symptoms. *Journal of Personality and Social Psychology*. 1997; 73:1030–1037. [PubMed: 9364758]

- Lepore SJ, Greenberg MA. Mending broken hearts: Effects of expressive writing on mood, cognitive processing, social adjustment and health following a relationship breakup. *Psychology and Health*. 2002; 17:547–560.
- Low CA, Stanton AL, Danoff-Burg S. Expressive disclosure and benefit finding among breast cancer patients: Mechanisms for positive health effects. *Health Psychology*. 2006; 25:181–189. [PubMed: 16569109]
- McFarlane, AC.; de Girolamo, G. The nature of traumatic stressors and the epidemiology of posttraumatic reactions. In: van der Kolk, BA.; McFarlane, AC.; Weisaeth, L., editors. *Traumatic stress*. The Guilford Press; New York: 1996. p. 129-154.
- Paul G. Strategy of outcome research in psychotherapy. *Journal of Consulting and Clinical Psychology*. 1967; 31:53–70.
- Pennebaker, JW. *The psychology of physical symptoms*. Springer-Verlag; New York: 1982.
- Pennebaker, JW. Emotion, disclosure, and health: An overview. In: Pennebaker, JW., editor. *Emotion, disclosure, and health*. American Psychological Association; Washington, DC: 1995. p. 3-10.
- Pennebaker JW. Writing about emotional experiences as a therapeutic process. *Psychological Science*. 1997; 8:162–166.
- Pennebaker JW, Francis ME. Cognitive, emotional, and language processes in disclosure. *Cognition and Emotion*. 1996; 10:601–626.
- Pennebaker, JW.; Francis, ME.; Booth, RJ. *Linguistic Inquiry and Word Count (LIWC): LIWC2001*. Erlbaum; Mahwah, NJ: 2001.
- Pennebaker JW, Mayne TJ, Francis ME. Linguistic predictors of adaptive bereavement. *Journal of Personality and Social Psychology*. 1997; 72:863–871. [PubMed: 9108699]
- Rachman S. Emotional processing. *Behaviour Research and Therapy*. 1980; 18:51–60. [PubMed: 7369988]
- Resick PA, Nishith P, Weaver TL, Astin MC, Feuer CA. A comparison of cognitive processing therapy with prolonged exposure and a waiting condition for the treatment of chronic posttraumatic stress disorder in female rape victims. *Journal of Consulting and Clinical Psychology*. 2002; 70:867–879. [PubMed: 12182270]
- Resick, PA.; Schnicke, MK. *Cognitive processing therapy for rape victims: A treatment manual*. Sage Publications; Thousand Oaks, CA: 1993.
- Schoutrop MJA, Lange A, Hanewald G, Duurland C, Bermond B. The effects of structured writing assignments on overcoming major stressful events: An uncontrolled study. *Clinical Psychology and Psychotherapy*. 1997; 4:179–185.
- 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 written 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]
- Smyth JM. Written emotional expression: Effect sizes, outcome types, and moderating variables. *Journal of Consulting and Clinical Psychology*. 1998; 66:174–184. [PubMed: 9489272]
- Stanton AL, Danoff-Burg S, Sworowski LA, Collins CA, Branstetter AD, Rodriguez-Hanley A, Kirk SB, Austenfeld JL. Randomized, controlled trial of written emotional expression and benefit finding in breast cancer patients. *Journal of Clinical Oncology*. 2002; 20:4160–4168. [PubMed: 12377959]
- Stroebe M, Stroebe W, Schut H, Zech E, van den Bout J. Does disclosure of emotions facilitate recovery from bereavement? Evidence from two prospective studies. *Journal of Consulting and Clinical Psychology*. 2002; 70:169–178. [PubMed: 11860043]
- Ullrich PM, Lutgendorf SK. Journaling about stressful events: Effects of cognitive processing and emotional expression. *Annals of Behavioral Medicine*. 2002; 24:244–250.

FIGURE 1.

Mean HR reactivity change score (writing session – rest period) for each writing session as a function of condition. Bars represent standard error.

FIGURE 2.

Mean self-reported valence for each writing session as a function of condition (top panel) and mean self-reported arousal for each writing session as a function of condition (bottom panel). Bars represent standard error.

Table 1

Background information of participants as a function of condition

	<u>Emotional expression</u>	<u>Insight and assimilation</u>	<u>Control</u>
	<u>Condition</u>	<u>Condition</u>	<u>Condition</u>
	(<i>n</i> = 28)	(<i>n</i> = 27)	(<i>n</i> = 27)
Age (in years)	18.5 (0.76)	19.0 (1.3)	18.3 (0.87)
Ethnicity (<i>n</i>)			
White	17	15	15
African-American	8	7	8
Other	3	5	4

Note. Standard deviations are in parentheses.

Table 2

Mean proportion of words used in the essays as a function of linguistic content and condition

Content category	Emotional expression	Insight and assimilation	Control	<i>F</i>
	Condition	Condition	Condition	
	(<i>n</i> = 28)	(<i>n</i> = 27)	(<i>n</i> = 27)	
Negative Emotion	3.05 (1.12)	2.62 (0.77)	0.56 (0.33)	72.58 *
Positive Emotion	2.08 (0.63)	1.96 (0.66)	1.12 (0.44)	21.26 *
Cognitive Insight	7.87 (1.54)	8.57 (1.33)	4.05 (1.35)	97.37 *

* $p < .001$.

Table 3

Mean value (standard deviation) of outcome measures at baseline and follow-up assessment as a function of condition

Measure	Emotional expression	Insight and assimilation	Control	<i>F</i> (interaction)
	Condition	Condition	Condition	
	(<i>n</i> = 28)	(<i>n</i> = 27)	(<i>n</i> = 27)	
PDS				
Baseline	20.7 (9.1)	17.5 (9.1)	17.3 (5.7)	14.03 *
Follow-up	8.5 (7.5)	14.8 (10.9)	16.4 (5.9)	
BDI-II				
Baseline	16.1 (9.4)	13.6 (10.1)	13.3 (6.3)	11.57 *
Follow-up	6.8 (4.2)	9.6 (6.4)	13.0 (6.3)	
PILL				
Baseline	23.1 (8.6)	23.0 (9.7)	21.6 (8.1)	16.01 *
Follow-up	13.6 (7.0)	21.0 (11.4)	22.4 (8.7)	

PDS = Posttraumatic Stress Disorder Scale; BDI-II = Beck Depression Inventory, second version; PILL = Pennebaker Inventory of Limbic Languidness.

*
 $p < .001$.

Table 4

Regression results for prediction of outcome and mediator variables by experimental condition

Dependent variable	β	<i>R</i>	<i>R</i> ²	<i>F</i>
PDS Change Scores	-.69	.51	.26	13.66 **
BDI-II Change Scores	-.61	.47	.23	11.61 **
PILL Change Scores	-.72	.54	.29	16.21 **
Negative emotion words	.71	.81	.65	72.59 **
Positive emotion words	.34	.60	.36	21.26 **
Cognitive insight words	.65	.85	.72	97.37 **
Heart rate Day 1	.58	.45	.21	10.68 **
Heart Rate Change Scores	.37	.29	.08	3.77 *
SAM Valence Day 1	.79	.73	.54	48.20 **
SAM Arousal Day 1	.84	.69	.48	37.67 **
SAM Valence Change Scores	-.61	.55	.30	17.57 **
SAM Arousal Change Scores	-.76	.60	.36	23.27 **

Note. PDS = Posttraumatic Stress Diagnostic Scale; BDI-II = Beck Depression Inventory-II; PILL = Pennebaker Inventory of Limbic Languidness; SAM = Self-Assessment Manikin; Beta weights are standardized and indicate the direction of the effect of the predictor.

* $p < .05$.

** $p < .001$.

Table 5

Regression results for prediction of outcome variables by the mediator variables

Mediator variable	β	R	R^2	F
DV = PDS Change Scores				
Negative emotion words	-.32	.32	.11	8.89 *
Positive emotion words	-.40	.40	.16	14.68 ***
Cognitive insight words	-.40	.40	.16	14.72 ***
Heart rate Day 1	-.31	.31	.10	8.55 *
Heart Rate Change Scores	-.09	.09	.00	.65
SAM Valence Day 1	-.31	.31	.10	8.76 **
SAM Arousal Day 1	-.48	.48	.23	23.94 ***
SAM Valence Change Scores	.31	.31	.09	8.26 **
SAM Arousal Change Scores	.48	.48	.24	24.53 ***
DV = BDI-II Change Scores				
Negative emotion words	-.40	.40	.16	14.51 ***
Positive emotion words	-.18	.18	.03	2.53
Cognitive insight words	-.48	.48	.23	22.43 ***
Heart rate Day 1	-.13	.13	.02	1.38
Heart Rate Change Scores	.03	.03	.00	0.06
SAM Valence Day 1	-.42	.42	.18	17.20 ***
SAM Arousal Day 1	-.42	.42	.17	16.91 ***
SAM Valence Change Scores	.29	.29	.08	7.26 **
SAM Arousal Change Scores	.11	.11	.01	0.95
DV = PILL Change Scores				
Negative emotion words	-.35	.35	.12	10.49 **
Positive emotion words	-.20	.20	.04	3.30
Cognitive insight words	-.32	.32	.10	8.62 **
Heart rate Day 1	-.36	.36	.13	11.95 **
Heart Rate Change Scores	-.32	.32	.10	8.96 **
SAM Valence Day 1	-.30	.30	.09	8.05 **
SAM Arousal Day 1	.37	.37	.14	12.96 ***
SAM Valence Change Scores	.29	.29	.09	7.54 **
SAM Arousal Change Scores	-.38	.38	.14	13.54 ***

Note. PDS = Posttraumatic Stress Diagnostic Scale; BDI-II = Beck Depression Inventory-II; PILL = Pennebaker Inventory of Limbic Languidness; SAM = Self-Assessment Manikin; Beta weights are standardized and indicate the direction of the effect of the predictor.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 6

Regression results for mediation models predicting outcome variables

Mediator variable	β	New β for experimental condition
DV = PDS Change Scores		
Negative emotion words	.19	-1.11 **
Positive emotion words	-.28 *	.05
Cognitive insight words	-.09	-.41
Heart rate Day 1	-.11	-.54 *
SAM Valence Day 1	.10	-1.07
SAM Arousal Day 1	.26	-.95 ***
SAM Valence Change Scores	.07	-.59 **
SAM Arousal Change Scores	.28 *	-.28
DV = BDI-II Change Scores		
Negative emotion words	-.06	-.47
Cognitive insight words	-.38 *	.64
SAM Valence Day 1	-.15	-.05
SAM Arousal Day 1	-.16	-.77 ***
SAM Valence Change Scores	.04	-.55 *
DV = PILL Change Scores		
Negative emotion words	.05	-.84 *
Cognitive insight words	.10	-1.05
Heart rate Day 1	-.15	-.52 *
Heart Rate Change Scores	-.18	-.55 **
SAM Valence Day 1	.21	-1.51 **
SAM Arousal Day 1	.00	-.71 ***
SAM Valence Change Scores	.01	-.70 **
SAM Arousal Change Scores	.08	-.61 *

Note. PDS = Posttraumatic Stress Diagnostic Scale; BDI-II = Beck Depression Inventory-II; PILL = Pennebaker Inventory of Limbic Languidness; SAM = Self-Assessment Manikin; Beta weights are standardized and indicate the direction of the effect of the predictor.

* $p < .05$.

** $p < .01$.

*** $p < .001$.