Published in final edited form as:

Anxiety Stress Coping. 2014 September ; 27(5): 477–493. doi:10.1080/10615806.2013.868887.

Computer-based Written Emotional Disclosure: The Effects of Advance or Real-time Guidance and Moderation by Big 5 Personality Traits

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Abstract

Standard written emotional disclosure (WED) about stress, which is private and unguided, yields small health benefits. The effect of providing individualized guidance to writers may enhance WED, but has not been tested. This trial of computer-based WED compared two novel therapist-guided forms of WED—advance guidance (before sessions) or real-time guidance (during sessions, through instant messaging)—to both standard WED and control writing; it also tested Big 5 personality traits as moderators of guided WED. Young adult participants ($n = 163$) with unresolved stressful experiences were randomized to conditions, had three, 30-min computer-based writing sessions, and were reassessed 6 weeks later. Contrary to hypotheses, real-time guidance WED had poorer outcomes than the other conditions on several measures, and advance guidance WED also showed some poorer outcomes. Moderator analyses revealed that participants with low baseline agreeableness, low extraversion, or high conscientiousness had relatively poor responses to guidance. We conclude that providing guidance for WED, especially in real-time, may interfere with emotional processing of unresolved stress, particularly for people whose personalities have poor fit with this interactive form of WED.

Keywords

Written emotional disclosure; expressive writing; computer; internet; stress; guidance; feedback; Big 5 personality; traits

The written emotional disclosure (WED) or expressive writing paradigm was developed to test whether the inhibition of trauma-related emotions is maladaptive (Pennebaker & Beall, 1986). Participants randomized to WED conditions are typically given instructions to write about a stressful experience and their deepest thoughts and feelings. Outcomes are measured at baseline and weeks to months after writing, and WED versus control conditions are compared to determine the effects of WED. Although writings are typically submitted to the researchers, there is no guidance or feedback about the writings or other potentially therapeutic interactions.

Although some researchers have integrated WED into larger interventions, such as exposure-based therapy (Sloan Marx, Bovin, Feinstein, & Gallagher, 2012) or expressive-disclosure group therapy (Carmack et al., 2011), most studies have examined WED as a stand-alone technique. A comprehensive meta-analysis found a small ($d = .15$) but statistically significant overall effect (Frattaroli, 2006), with substantial variability likely attributable to people's approach to this task, the content of their writing, and their ability to engage in cognitive and affective change on their own. Various studies suggest that better outcomes follow disclosure writing that has certain characteristics, such as a coherent narrative; revisiting the same trauma across sessions; language reflecting emotion, insight, and self-affirmation; and a search for meaning (Creswell et al., 2007; Sloan, Marx, & Epstein, 2005; Sloan, Marx, Epstein, & Lexington, 2007; Stanton et al., 2002).

There are several potentially valuable new directions for research on WED. First, all studies have tested only standardized instructions given to all participants—either generic instructions presented before the first writing session, or session-by-session instructions that give a different focus to each writing session (Broderick, Smyth, Stone, & Kaell, 2004; Gidron et al., 2002; Nazarian & Smyth, 2013). Research, however, has not yet examined the effects of providing individualized or tailored guidance to each writer in an attempt to improve the quality and effectiveness of the person's writing. It is possible that such guidance over the course of the writing sessions can generate more effective writing and enhance the benefits of WED. Moreover, affirming or validating responses from a reader or guide could counter any shame and reduce the negative effects of secrecy (Radcliffe, Lumley, Kendall, Stevenson, & Beltran, 2007). Individualized guidance may be akin to having a therapist help a client disclose and process trauma more effectively. We hypothesized, therefore, that providing individualized guidance to writers would enhance the efficacy of WED compared to the standard, no-guidance WED technique.

A second new direction is to test computer-based rather than handwritten WED. Real-time computer-based methods of communication, like texting or instant messaging, as well as asynchronous communication, such as email or blogging, are increasingly common (Punyanunt-Carter, 2006). Such approaches facilitate the distribution of one's writing, the receipt of feedback from others, and later linguistic analysis of transcripts. Yet surprisingly few studies have examined computer-based WED, and the results are inconsistent (e.g., Baikie, Geerligs, & Wilhelm, 2012; Possemato, Ouimette, & Geller, 2010). No studies have yet examined the ability of either real-time or asynchronous WED with individualized guidance to reduce stress.

A third new direction is to understand who is most likely to benefit from WED, especially a novel approach such as individually-guided WED. Many factors have been explored as moderators of standard WED, including social constraints, alexithymia, and emotional approach coping; however, results are inconsistent (Frattaroli, 2006), possibly due to the common approach of engaging in post-hoc exploration of numerous highly specific or narrow constructs. We propose that the field would benefit by having an established theoretical model guide the selection of potential moderators *a priori*. The five-factor model of personality (Big 5) might provide a theoretically-driven focus as well as substantial coverage of a range of personality dimensions that potentially moderate the effects of WED.

This model, however, has rarely been tested, and results are not consistent. Baseline neuroticism predicted outcomes of standard WED in different directions in two studies (Hoyt & Yeater, 2011; Zakowski, Herzer, Barrett, Milligan, & Beckman, 2011), and high extraversion predicted better outcomes of standard WED conducted by email (Sheese, Brown, & Graziano, 2004). How might the Big 5 predict the outcomes of computerized, guided WED? The interpersonally-oriented traits should influence responses to this approach. We hypothesized that more agreeable and extraverted people would welcome the interaction with another person and benefit from guided WED. Also, given the substantial literature on the many advantages associated with conscientiousness (Bogg & Roberts, 2004), we anticipated that more conscientious participants would respond to guidance more reliably and, therefore, beneficially.

This study investigated the effects of different forms of computer-based WED among young adults with unresolved stress. There were four conditions, two of which were from the traditional paradigm: standard WED (no guidance) and emotionally neutral control writing. The other two conditions were novel: one presented individualized advance guidance before writing sessions (like email or blogging), and the other provided individualized real-time guidance during writing sessions using instant messaging. These conditions were first compared on stressors disclosed, immediate mood reactions, and the language used in writing, both to confirm that they were implemented as intended and understand any differences in the writing experience created by the use of guidance. Next, conditions were compared on outcomes (unresolved stress, psychological, and physical symptoms) at 6-week follow-up. We hypothesized that both forms of guided WED would lead to greater symptom reduction than either standard WED or control writing. We also examined whether participants who were agreeable, extraverted, and conscientious would respond best to having individualized guidance. We had no hypotheses about openness or neuroticism.

Method

Participants, Screening, and Recruitment

Participants were 163 undergraduate psychology students (age $M = 21.9$ years, $SD = 6.6$; 83.4% women and 16.6% men; Caucasian = 36.2%, African American = 30.1%, Middle Eastern = 15.3%, Asian = 7.4%, and other = 11.0%) who reported experiencing “a traumatic or very stressful experience” during their lives, excluding stress related only to school, work, or not having enough time. (We sought to target more clinically relevant, serious traumas, which we also thought would be more responsive to WED than would daily hassles.) Because WED is designed to address *unresolved* traumatic experiences, participants had to report currently experiencing all three DSM-IV-TR core symptoms of posttraumatic stress disorder (PTSD) either “somewhat” or “very much”: avoidance (“trying to avoid thinking about, remembering, or being reminded of the experience”); intrusions (“having the experience enter your mind, even when you do not want it to”); and hyperarousal (“having feelings of tenseness, anxiety, or emotional upset when reminded about or thinking of this experience”). To obtain a sample that was not participating solely for course credit, we included only participants who wanted “to address or try to get over or resolve this stressful experience.”

Procedure

Participants came individually to the laboratory, provided written consent, and completed computer-based questionnaires about their symptoms and personality. Each participant returned within 1 week for the first of three writing sessions. At the first session, participants provided mood ratings and then were informed of their randomly assigned condition by reading a condition-specific rationale and instructions. Randomization was computer-generated and stratified by gender in randomized blocks of four or eight, to yield equivalent sample sizes and proportions of each gender per condition. In all conditions, participants were left in a room for 30 minutes to type on a computer. All participants returned for the other two sessions over the next week, and then returned for a follow-up assessment of outcome measures 6 weeks after writing session 1. Participants received course credit, up to \$50, or a combination as compensation.

An internet-based interface with a back-end database obtained assessment data and provided a portal for writings and guidance. Doctoral students in clinical psychology were guides for the two guided conditions and used a manual of principles based on the literature of the characteristics of effective disclosure writing. A licensed psychologist provided initial training and subsequent supervision. Guides did not meet participants and were described to them only as “doctoral students in clinical psychology trained in effective writing about stress.”

Experimental Conditions

Standard WED ($n = 41$)—Participants were instructed to write for 30 minutes for each of the three sessions about the trauma, stressful event, or conflict that they consider to be the most significant to them. They were instructed to write about the facts and their deepest feelings and how the experience has affected them, and not to worry about grammar, spelling, or sentence structure. These instructions were repeated for sessions 2 and 3, and participants were encouraged to write about the same experience over the three sessions and to briefly review the prior session’s writing each time. Verbatim instructions are presented in a supplemental file.

Advance guidance WED ($n = 41$)—The standard WED instructions were provided first, along with additional guidance before each session. Before session 1, to help them identify the most relevant stressor, participants were given a list of possible major stressors and conflicts as well as signs that a stressor is not resolved (a brief descriptions of cognitive and behavioral avoidance, intrusions, and hyperarousal). The guide read the participant’s writing within a day after each session and provided written guidance on the website, which the participant read at the start of sessions 2 and 3, to incorporate into their next writing. The guide’s responses were validating and attempted to make the writing more powerful. Although guidance generally varied with the needs of the writer, guidance for session 2 usually encouraged the participant to focus on a specific stressor, solicited clarifying details as necessary, or suggested deeper reflection on emotions. If the participant already accomplished these goals, guidance encouraged writing about the ways the stressor affected their thoughts, feelings, actions, and relationships. Session 3 guidance encouraged an

examination of coping with the stressor, evaluating coping success, generating new coping ideas, and reflecting on what they have learned from their experience.

Real-time guidance WED ($n = 41$)—The standard WED instructions were given, along with the fact that the guide would provide guidance to writers via instant messaging during each session. Participants used an instant message platform, and the guide read along and provided empathic reflections, questions, and directive suggestions in real-time to shape the writing. Specific guidance topics were the same as those given in the advance guidance WED condition.

Control writing condition ($n = 40$)—This emotionally neutral condition focused on time management. Participants wrote about their plans for different future time periods: Session 1: next 24 hours; Session 2: next week; and Session 3: rest of semester. See supplemental file.

Descriptive and Manipulation Check Measures

Written disclosure content—Participants' writings were read, and the primary topic of each day's disclosure was assigned to one of 12 stressor categories. Also, the "severity" of the stressor each day was rated: 0 (*daily hassle or minor irritant*); 1 (*moderate disruptions or multiple areas, such as home, school, work, or relationships*); or 2 (*major disruptions such as abuse, unexpected deaths, or substantial threats*). Ratings were averaged across writing sessions.

Immediate mood reactions—Before and after each session, participants rated adjectives from the Positive and Negative Affect Schedule-Expanded (PANAS-X; Watson & Clark, 1994) from 1 (*not at all*) to 7 (*a great deal*) regarding how they felt at that moment. We analyzed several mood scales found to differentiate WED from control writing (calm, happy, sad, afraid, and angry). We calculated a mean of the change scores (post minus pre) over the three sessions.

Linguistic characteristics of writing—The Linguistic Inquiry Word Count (LIWC2001; Pennebaker, Francis, & Booth, 2001) program counted the total number of words written and the percentage of words that reflected negative emotion (i.e., anger, anxiety, sadness), positive emotion, insight, and inhibition. We averaged each index across the three writing sessions.

Outcome Constructs and Measures

Primary outcomes were the three core symptoms of PTSD. We selected other relevant constructs that were relatively independent from each other and from the three stress symptoms (i.e., they correlated less than $r = .5$ with all other outcome measures in this sample.)

Unresolved stress symptoms—The three subscales of the Impact of Event Scale–Revised (IES-R; Weiss & Marmar, 1997) assessed avoidance, intrusions, and hyperarousal. Symptoms were rated from 0 (*not at all*) to 4 (*extremely*) and averaged. Internal

consistencies (Cronbach's alpha) at baseline for this sample were: avoidance (.75), intrusions (.88), and hyperarousal (.81).

Psychological and somatic symptoms—Three scales from the Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983) assessed depression, somatization, and obsessive-compulsiveness. Items were rated from 0 (*not at all*) to 4 (*extremely*) and averaged. We also used the upper respiratory infections scale of the Physical Health Symptoms Scale (Greenberg, Wortman, & Stone, 1996); items were rated from 0 (*not at all*) to 4 (*extremely severe*), and averaged. Alphas at baseline for this sample were: depression (.80) somatization (.76), obsessive-compulsiveness (.81), and upper respiratory infections (.78).

Moderator Constructs and Measure

Big 5 personality traits—The 44-item Big Five Inventory (BFI; John, Donahue, & Kentle, 1999) has a stable factor structure, and the scales converge with other Big 5 measures (John, Naumann, & Soto, 2008). Items were rated from 1 (*strongly disagree*) to 5 (*strongly agree*) and averaged for each scale. Internal consistencies in this sample were: agreeableness (.76), extraversion (.85), conscientiousness (.74), openness (.68), and neuroticism (.80).

Data Analyses

Analyses were conducted on all 163 randomized participants (i.e., “intent-to-treat”); 12 participants were missing outcome data, so multiple imputation was used to replace missing values. To test the hypotheses that the conditions would change differentially over time, multivariate repeated-measures ANOVAs were conducted, with condition as the between-subjects variable, and time (baseline and follow-up) as the within-subject variable. Initial, omnibus tests simultaneously tested for time main effects and also compared all four conditions on change over time. Because comparing four conditions is rather conservative, we compared each of the two guided WED conditions with the others, and also controlled for word count, which differed among the conditions. The effect of interest was the multivariate condition $\times$ time interaction, and significant interactions ($p < .05$ based on Wilk's lambda F) were followed by paired t -tests to determine if each condition changed significantly from baseline to follow-up. Within-condition effect sizes (d) were calculated as the difference between baseline and follow-up means, divided by the SD of the change scores; negative d values indicate reductions in symptoms over time.

Finally, we tested each Big 5 personality trait separately as a potential moderator of the effects of condition (independent variable; dummy coded 1 to 4) by repeating the multivariate repeated-measures ANOVAs above, this time also entering the personality trait (centered) and the condition by trait interaction term. Significant interactions were followed by post-hoc probing to interpret the interaction: simple slopes (standardized Betas) were calculated for each condition between the personality trait and outcome change score (follow-up minus baseline values), and interactions were plotted. These analyses focused on potential moderation by the personality trait of the two guided WED conditions compared to other conditions.

Results

Participant flow through the study is shown in Figure 1. The four conditions did not differ at baseline on demographics or symptoms (all $p > .32$), suggesting successful randomization. Only five participants did not complete all writings; these five and seven others provided no follow-up data. The 151 completers did not differ from these 12 non-completers on demographics, baseline symptoms, or condition assignment (all $p > .40$).

Descriptive and Manipulation Check Measures

Across WED conditions, about 25% of the writings were about family conflicts, 14% to 17% were about abuse or relationship conflicts, 10% were about the writer's own mental or physical health problems, and smaller percentages were about pregnancy/abortion, crime, accidents, or religious conflicts. The mean stressor severity rating was significantly lower ($p = .035$) for advance guidance WED ($M = 0.99$, $SD = 0.65$), and marginally lower ($p = .097$) for real-time guidance WED ($M = 1.06$, $SD = 0.67$), than for standard WED ($M = 1.31$, $SD = 0.68$). Both real-time and advance guidance WED tended to write less often about abuse and death and more often about family conflicts and one's health. See supplemental file for details of stressors.

Table 1 shows writing content and mood data. Conditions differed on all LIWC categories (all $p < .01$). Both advance guidance and standard WED wrote more words than did controls; real-time guidance WED wrote the fewest. Real-time guidance used more positive emotion words than did standard WED and controls, and advance guidance used more positive emotion words than did controls. All three WED conditions used more anxiety, sadness, and anger words than did controls, but real-time guidance WED had fewer anger words than standard WED. All three WED conditions had more insight words than controls, but only real-time guidance WED had more inhibition words than the other three conditions.

Conditions differed on all five immediate mood reactions (all $p < .01$). Participants in both standard and advance guidance WED reported less calmness and happiness and greater sadness, fear, and anger than controls. Real-time guidance WED was somewhat different; it led to more calmness and less anger than the other two WED conditions, and to less happiness and more sadness than controls.

Main Effects of Conditions on Outcomes

Table 2 presents the baseline, follow-up, and change score data of the outcome measures for the conditions. The 4-condition, omnibus repeated-measures ANOVAs revealed significant time main effects for avoidance, intrusions, hyperarousal, obsessive-compulsiveness (all $p < .001$), and depression ($p = .05$), but not somatization or upper respiratory infections. Thus, there was a reduction in stress and psychological symptoms over time for the entire sample. More importantly, there were 4-condition $\times$ time interactions for somatization, $F(3, 159) = 2.61$, $p = .05$; and obsessive-compulsiveness, $F(3, 159) = 2.97$, $p = .03$; and a marginal interaction for upper respiratory infections, $F(3, 159) = 2.41$, $p = .07$.

Subsequent analyses compared the two guided WED conditions with the others. Contrary to our hypotheses, the two guided WED conditions, particularly real-time guidance, had the poorest outcomes, as detailed next.

For real-time guidance WED, there were significant condition $\times$ time interactions compared to: a) controls on upper respiratory infections, $F(1, 79) = 7.71, p = .007$; b) standard WED on hyperarousal, $F(1, 80) = 4.18, p = .044$; somatization, $F(1, 80) = 7.67, p = .007$; and obsessive-compulsiveness, $F(1, 80) = 9.49, p = .003$; and c) advance guided WED on hyperarousal, $F(1, 80) = 3.99, p = .049$. For all of these outcome measures, real-time guidance WED did not change from baseline to follow-up (within-condition change-score d values ranging from $+0.24$ SD to -0.09 SD), whereas standard WED had significant reductions in hyperarousal ($d = -.051$), somatization ($d = -0.38$), and obsessive-compulsiveness ($d = -0.77$); as did the control condition on upper respiratory infections ($d = -0.39$); and advance guidance WED on hyperarousal ($d = -0.62$). These effects were unchanged after controlling for the number of words written, except real-time guidance and standard WED no longer differed on hyperarousal.

For advance guidance WED, there were significant condition $\times$ time interactions compared to standard WED on intrusions, $F(1, 80) = 5.83, p = .018$, and somatization, $F(1, 80) = 4.20, p = .044$. Although advance guidance WED decreased significantly on intrusions ($d = -0.39$), this reduction was less than occurred after standard WED ($d = -0.80$). Advance guidance WED did not change on somatization ($d = +0.10$), whereas standard WED significantly decreased ($d = -0.38$). These effects were unchanged after controlling for word count. Advance guidance WED also had less reduction in upper respiratory infections than controls, after controlling for word count, $F(1, 78) = 4.77, p = .03$. Advance guidance WED did not change upper respiratory infections ($d = +0.01$), whereas the controls decreased on this ($d = -0.39$).

Finally, standard WED surpassed controls on only obsessive-compulsiveness, $F(1, 79) = 4.14, p = .045$, but this effect was no longer significant after controlling for word count.

Moderation of Effect of Guided WED Conditions by Personality Traits

Table 3 presents the results of moderator analyses for each personality trait and outcome. Simple slopes (standardized Beta) of the relationship between the personality trait and outcome are presented for each condition. Figure 2 depicts all of the significant interactions, which are described next. (All significant interactions were $p < .05$, except where noted as $p < .01$).

Agreeableness—As hypothesized, baseline agreeableness predicted more reduction in symptoms after real-time guidance WED compared to: a) standard WED, on avoidance and upper respiratory infections ($p < .01$); b) the control condition on depression ($p < .01$); and c) advance guidance WED on somatization and upper respiratory infections. (See Figure 2 A–D)

Extraversion—As hypothesized, increased levels of extraversion predicted less upper respiratory infections after real-time guidance WED, compared to standard WED. (Figure 2 E)

Conscientiousness—Contrary to the hypothesis, this trait predicted poorer outcomes for both guided WED conditions, compared to the other two conditions. Greater baseline conscientiousness predicted increased hyperarousal for both guided conditions, and increased intrusions for advance guidance WED, compared to both standard WED and control ($p < .01$ for both comparisons between advance guidance and control). (Figure 2 F–G)

Openness—Higher baseline openness predicted more reduction of intrusions after advance guidance WED compared to real-time guidance WED, and reduced upper respiratory infections compared for advance guided compared to standard WED ($p < .01$) and control writing. (Figure 2 H–I)

Neuroticism—This trait did not moderate any condition effects.

Finally, although not the focus of this study, analyses indicated that none of the personality traits moderated the effects of standard WED compared to control writing.

Discussion

This study tested the effects of two novel, individually-guided forms of computer-based WED—real-time guidance by instant messaging, and advance guidance—compared to standard, non-guided WED and control writing. This study also explored how Big 5 personality traits moderated the effects of the guided WED conditions. Although we hypothesized that providing guidance would enhance the health benefits of WED, this clearly did not occur. Rather, providing individualized guidance in real-time to participants who wrote about stress led to less symptom reduction, compared to each of the other three conditions, but particularly when compared with standard WED. Providing guidance prior to each writing session yielded a similar, albeit less robust, pattern of poorer outcomes compared to standard WED.

How can we explain these surprising findings? Although real-time guidance led to fewer words written during sessions than did other two WED conditions (perhaps due to the writer's need to wait for and then read the guide's responses), controlling for word count did not eliminate the poorer outcomes of both real-time and advance guidance WED, so differential writing extent does not explain the poorer effects of providing guidance. Other clues in the data, however, suggest possible answers.

An examination of the language and mood reactions to real-time guidance reveals that these writers had a different experience than the other WED writers. Real-time guidance writers did not decrease in calmness or increase in fear and anger to the extent of the other two WED conditions, suggesting less emotional activation. Real-time guidance WED also had fewer anger words and more inhibition words than standard WED, and research shows that activation and subsequent inhibition of anger is particularly detrimental to health (Burns,

Quartana, & Bruehl, 2008). Also, both real-time guidance and advance guidance WED wrote about experiences that were rated by judges as less stressful and potentially traumatic than occurred in standard WED, such as accidents and family issues rather than childhood abuse or unplanned pregnancy issues.

We suspect that the presence of a person whom writers did not know, but who read their writings and interacted with them, led writers to monitor and censor or inhibit their disclosures. Guided writers tended to select less private or stressful topics, which attenuated their negative emotions, particularly the expression of anger, and interfered with potential stress reduction. Although instant messaging with a friend about one's problems may be beneficial (Dolev-Cohen & Barak, 2013), our findings are consistent with those of Iacovelli and Johnson (2012) who found that one session of instant message disclosure of feelings after watching a disturbing video was less effective in reducing physiological arousal less face-to-face disclosure. The early "confession study" of Pennebaker, Hughes, and O'Heeron (1987), which involved disclosing to an unknown person behind a screen, found that such an arrangement also inhibited people from disclosing. Indeed, Pennebaker (1997) argued that WED is effective precisely because the writer can focus internally and engage in adaptive cognitive-emotional processing, without worrying about the responses of others. Our results support this view.

Another clue explaining the poorer outcomes of real-time and advance guidance WED comes from the moderator analyses, which illuminate the types of people who responded better or worse to guidance. Agreeableness was the most robust predictor. As hypothesized, agreeable participants had better outcomes of real-time guidance compared to the other conditions, whereas those lower on agreeableness had poorer outcomes. This personality trait may be uniquely relevant to the interpersonal context of real-time guidance. Like the constructs of reactance or resistance, which predict poor outcomes of therapies that are directive or controlled by the therapist (Beutler, Harwood, Michelson, Song, & Holman, 2011), participants low in agreeableness likely responded negatively to the guide's attempts to direct their writings. Agreeable participants, however, likely welcomed this direction and made use of it. Higher extraversion, although less consistently a moderator, also predicted a better outcome of real-time guidance WED, and we interpret this finding similarly. More extraverted people are comfortable interacting with others, whereas less extraverted people experience inhibition.

In contrast to our hypothesis, conscientious participants had poorer outcomes of both types of guided WED. Perhaps high conscientiousness led to an increased focus on appeasing the guide, being a "good participant," or making sure that one wrote "correctly." Interestingly, the typical WED instruction to write without worrying about spelling, grammar, or sentence structure may be more effective for conscientious people when no one is reading. Finally, greater openness predicted better outcomes after advance guidance WED relative to standard and real-time guidance. We did not have hypotheses about this moderator, and the pattern of effects is not clear, so their reliability is unknown. But it may be that high openness includes an interest in others' idea and willingness to shift one's own.

Although our primary goal was not to test the effects of standard WED compared to control writing, we should address the fact that standard WED did not reduce symptoms more than control writing. Our manipulation checks suggested that WED was implemented effectively—standard WED contained more emotion words and also led to a more negative and less positive mood than did the control writing. Meta-analyses, however, have shown that standard WED has a very small effect (about 0.15 *SD*), and many studies have null findings (Frattaroli, 2006); thus, our lack of a standard WED effect is not that surprising. Few studies of WED have tested computer writing, and it may be equivalent to traditional handwriting (Sharp & Hargrove, 2004), or it may be weaker than handwriting (Brewin & Lennard, 1999), perhaps because handwriting leads to greater deliberation and reflection, and the experience becomes more concrete or real than occurs on a computer. It also is possible that control writing about one's plans had some unexpected benefits, thereby minimizing the comparative WED benefit. Indeed, our focus on future rather than past behaviors might have been helpful, as was found in another study that used a "future plans" control condition (Frayne & Wade, 2006). Disclosure researchers should consider the issue of appropriate control conditions, and a no-writing control might be added to WED study designs.

This study has various limitations. First, the participants, although selected for unresolved stressful experiences, were psychology students and mostly women, and the majority of people meeting study criteria did not participate; thus generalization is limited. Second, outcome measures that tap physiology or behavior would be ideal supplements to the self-report measures used in this study, and a longer follow-up would help determine the time-course of the effects. Third, our test with respect to guidance is limited by our use of unseen strangers. It is likely that the audience for whom one writes matters, and being given guidance by a "clinical psychology doctoral student" could have been either intimidating ("a psychologist") or disappointing ("a student"). Guidance from others, such as one's family, friends, or therapist might elicit better responses. Also, although the guides received training and supervision, we did not systematically evaluate the quality of their guidance. Indeed, although our guides followed written principles based on research regarding optimal writing characteristics, the poorer outcomes of guided WED might have been due to poorly delivered guidance, or encouraging the wrong characteristics. Finally, we conducted multiple analyses across conditions and outcome variables, including separate analyses of each personality trait moderator, thus increasing chances of a Type 1 error. We think, however, that the novelty of these interventions and moderators calls for learning about whatever patterns might be present, and replication certainly is needed.

This study has important implications. Providing tailored or individualized guidance may not enhance the effects of standard WED, and when guidance is provided in real-time, as in instant messaging, the effects could be negative. We should be cautious in recommending the use of disclosure to others in real-time venues such as instant messaging or texting, at least when the other person is a stranger. We recommend further study of the effects of giving *standardized* (non-tailored) session-by-session guidance, which is not only less resource-demanding, because a guide is not needed for each participant, but likely will avoid any negative consequences associated with constraint or censorship that accompanies individually-guided WED. Finally, this study suggests that Big 5 personality traits

matter for interventions, especially those that involve social interaction. Certain techniques appear to fit some personality traits better than others, and we encourage further study of these traits as moderators.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This article is based on the doctoral dissertation of the first author under the supervision of the second author. Preparation of this article was supported NIH grants AR057808 and AR057047.

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Figure 1.
Flow of participants through the study.

Figure 2.

Graphs of all significant interactions between writing condition and baseline levels of each of the Big 5 personality traits. Only conditions that were involved in significant interactions are included for each personality moderator / outcome pair. See Table 3 for slopes and significant differences.

Table 1

Manipulation Check Data: Mood Reactions and Linguistic Content for the Four Experimental Writing Conditions

Mood	Standard WED (<i>n</i> = 41) <i>M</i> (<i>SD</i>)	Advance Guidance WED (<i>n</i> = 41) <i>M</i> (<i>SD</i>)	Real-time Guidance WED (<i>n</i> = 41) <i>M</i> (<i>SD</i>)	Control Writing (<i>n</i> = 40) <i>M</i> (<i>SD</i>)
Mood Reactions				
Calmness	−1.11 (1.33) ^a	−0.94 (1.59) ^a	−0.17 (1.44) ^b	0.27 (1.09) ^b
Happiness	−0.98 (1.01) ^a	−0.91 (0.92) ^a	−0.70 (1.39) ^a	−0.04 (0.75) ^b
Sadness	1.09 (1.61) ^a	0.85 (1.13) ^a	0.59 (1.52) ^a	−0.15 (0.68) ^b
Fear	0.46 (1.33) ^a	0.46 (0.81) ^a	0.09 (1.07) ^{ab}	−0.19 (0.70) ^b
Anger	1.09 (1.37) ^a	1.15 (1.48) ^a	0.21 (1.20) ^b	−0.27 (0.79) ^b
Linguistic Content				
Word Count	803.0 (259.1) ^a	806.4 (372.6) ^a	536.2 (173.6) ^b	668.4 (335.3) ^c
Positive Emotion	1.90 (0.54) ^{ac}	2.13 (0.65) ^{ab}	2.35 (0.52) ^b	1.85 (0.68) ^c
Anger	0.76 (0.47) ^a	0.69 (0.37) ^{ab}	0.55 (0.34) ^b	0.15 (0.16) ^c
Anxiety	0.64 (0.49) ^a	0.58 (0.38) ^a	0.67 (0.44) ^a	0.35 (0.41) ^b
Sadness	0.57 (0.36) ^a	0.65 (0.47) ^a	0.56 (0.37) ^a	0.15 (0.15) ^b
Insight	2.61 (0.71) ^a	2.91 (0.55) ^b	2.76 (0.76) ^{ab}	1.23 (0.59) ^c
Inhibition	0.33 (0.18) ^a	0.31 (0.18) ^{ab}	0.42 (0.23) ^c	0.24 (0.22) ^b

Note: means with different superscripts differ significantly ($p < .05$).

Table 2

Baseline, Follow-up, and Change Scores for Outcome Measures for Each Condition

Outcome Measure Time point	Standard WED (<i>n</i> = 41) <i>M</i> (<i>SD</i>)	Advance Guidance WED (<i>n</i> = 41) <i>M</i> (<i>SD</i>)	Real-time Guidance WED (<i>n</i> = 41) <i>M</i> (<i>SD</i>)	Control Writing (<i>n</i> = 40) <i>M</i> (<i>SD</i>)
Avoidance				
Baseline	2.00 (0.83)	1.97 (0.82)	1.91 (0.70)	1.97 (0.78)
Follow-up	1.61 (0.91)	1.47 (0.85)	1.55 (0.92)	1.46 (0.78)
Change	−0.39 (0.60)	−0.50 (0.67)	−0.35 (0.86)	−0.51 (0.77)
Intrusions				
Baseline	2.20 (1.10)	1.62 (0.84)	1.84 (0.87)	2.01 (0.92)
Follow-up	1.48 (1.05)	1.33 (0.93)	1.42 (0.99)	1.53 (0.95)
Change	−0.73 (0.91) ^a	−0.29 (0.73) ^b	−0.42 (0.96) ^{ab}	−0.48 (0.95) ^{ab}
Hyperarousal				
Baseline	1.55 (1.10)	1.26 (0.95)	1.36 (0.84)	1.35 (0.81)
Follow-up	1.09 (0.92)	0.86 (0.82)	1.28 (0.91)	0.97 (0.89)
Change	−0.46 (0.90) ^a	−0.40 (0.64) ^a	−0.08 (0.81) ^b	−0.37 (0.93) ^{ab}
Depression				
Baseline	1.03 (0.67)	0.91 (0.72)	1.20 (0.87)	1.04 (0.66)
Follow-up	0.80 (0.82)	0.79 (0.78)	1.17 (0.87)	0.96 (0.64)
Change	−0.23 (0.73)	−0.12 (0.65)	−0.03 (0.83)	−0.08 (0.69)
Somatization				
Baseline	0.85 (0.79)	0.51 (0.52)	0.60 (0.55)	0.60 (0.56)
Follow-up	0.69 (0.80)	0.57 (0.55)	0.72 (0.66)	0.61 (0.70)
Change	−0.16 (0.43) ^a	0.05 (0.52) ^b	0.12 (0.49) ^b	0.02 (0.47) ^{ab}
Obsessive-Compulsive				
Baseline	1.76 (0.96)	1.46 (0.88)	1.63 (0.78)	1.55 (0.73)
Follow-up	1.29 (0.94)	1.28 (0.95)	1.61 (0.89)	1.38 (0.72)
Change	−0.47 (0.61) ^a	−0.18 (0.77) ^{ab}	−0.02 (0.72) ^b	−0.17 (0.69) ^b
Upper resp infections				
Baseline	0.61 (0.52)	0.52 (0.41)	0.47 (0.45)	0.59 (0.68)
Follow-up	0.49 (0.59)	0.53 (0.50)	0.60 (0.49)	0.38 (0.45)
Change	−0.12 (0.74) ^{ab}	0.01 (0.54) ^{ab}	0.13 (0.54) ^a	−0.20 (0.52) ^b

Note: means with different superscripts differ significantly ($p < .05$).

Table 3

Results of Tests of Moderation (Interactions) Between Condition and Big 5 Personality Traits (Moderator) on Change in Outcome Symptoms. Presented are Standardized Betas of the Simple Slopes of the Relationship Between Trait and Outcome for Each Condition

Big 5 Trait Outcome	Standard WED	Advance Guidance WED	Real-time Guidance WED	Control Writing
Agreeableness				
Avoidance	.14 ^a	-.12 ^{ab}	-.28 ^b	-.13 ^{ab}
Intrusions	-.27	.10	-.23	.02
Hyperarousal	-.26	.02	-.07	.03
Depression	.05 ^{ab}	-.04 ^a	-.23 ^a	.39 ^{*b}
Somatization	-.07 ^{ab}	.28 ^a	-.18 ^b	.03 ^{ab}
Obsessive-compulsive	-.06	-.12	-.16	.07
Upper resp infections	.30 ^a	.16 ^a	-.28 ^b	.01 ^{ab}
Extraversion				
Avoidance	.20	.00	-.07	-.13
Intrusions	-.08	-.12	-.15	-.03
Hyperarousal	-.17	.13	.10	-.02
Depression	.30	.21	.24	-.01
Somatization	-.31 [*]	.03	.07	-.07
Obsessive-compulsive	.04	-.06	-.21	-.15
Upper resp infections	.18 ^a	.08 ^{ab}	-.28 ^b	-.00 ^{ab}
Conscientiousness				
Avoidance	-.04	-.05	-.17	-.21
Intrusions	-.29 ^a	.19 ^b	.07 ^{ab}	-.36 ^{*a}
Hyperarousal	-.29 ^a	.20 ^b	.15 ^b	-.34 ^{*a}
Depression	-.20	.16	-.12	-.14
Somatization	-.11	.13	-.13	-.15
Obsessive-compulsive	-.00	-.07	-.09	-.01
Upper resp infections	.20	.04	.13	.09
Openness				
Avoidance	.06	.02	.20	-.06
Intrusions	.03 ^{ab}	-.25 ^a	.29 ^b	-.08 ^{ab}
Hyperarousal	-.01	-.08	.18	.09
Depression	.01	.02	-.00	-.05
Somatization	-.18	-.04	.24	-.12
Obsessive-compulsive	-.06	-.08	.19	-.22
Upper resp infections	.18 ^a	-.44 ^{**b}	-.11 ^{ab}	-.07 ^a
Neuroticism				
Avoidance	-.26	.18	-.01	.16
Intrusions	-.09	-.05	-.03	.13

Big 5 Trait Outcome	Standard WED	Advance Guidance WED	Real-time Guidance WED	Control Writing
Hyperarousal	.07	-.20	-.07	.06
Depression	-.19	-.27	-.11	-.28
Somatization	-.20	-.13	-.03	.21
Obsessive-compulsive	-.06	-.12	-.08	.10
Upper resp infections	-.25	.13	.11	-.26

*
p < .05;

**
p < .01

Standardized Betas (simple slopes) in a row (i.e., for a given personality trait moderator and outcome) with no superscripts do not differ significantly, as determined by a condition $\times$ trait interaction. However, in rows with Betas that have superscripts, Betas with different superscripts are significantly different.