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Randomized Controlled Trial of Online Expressive Writing to Address Readjustment Difficulties Among U.S. Afghanistan and Iraq War Veterans

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We examined the efficacy of a brief, accessible, nonstigmatizing online intervention—writing expressively about transitioning to civilian life. U.S. Afghanistan and Iraq war veterans with self-reported reintegration difficulty ($N = 1,292$, 39.3% female, $M = 36.87$, $SD = 9.78$ years) were randomly assigned to expressive writing ($n = 508$), factual control writing ($n = 507$), or no writing ($n = 277$). Using intention to treat, generalized linear mixed models demonstrated that 6-months postintervention, veterans who wrote expressively experienced greater reductions in physical complaints, anger, and distress compared with veterans who wrote factually ($ds = 0.13$ to 0.20; $ps < .05$) and greater reductions in PTSD symptoms, distress, anger, physical complaints, and reintegration difficulty compared with veterans who did not write at all ($ds = 0.22$ to 0.35; $ps \leq .001$). Veterans who wrote expressively also experienced greater improvement in social support compared to those who did not write ($d = 0.17$). Relative to both control conditions, expressive writing did not lead to improved life satisfaction. Secondary analyses also found beneficial effects of expressive writing on clinically significant distress, PTSD screening, and employment status. Online expressive writing holds promise for improving health and functioning among veterans experiencing reintegration difficulty, albeit with small effect sizes.

More than 2.5 million U.S. service members have served in the Afghanistan and Iraq wars, of whom over 1.8 million have left active duty. Although most such veterans do not experience lingering mental health or adjustment problems (Bonanno et al., 2012; Institute of Medicine [IOM], 2010), a sizable minority do (Dursa, Reinhard, Barth, & Schneiderman, 2014; Sayer et al., 2010). For example, in a national random sample of Afghanistan and Iraq war veterans, at least 25% reported moderate to severe difficulty in multiple domains of functioning and community involvement, such as getting along with others and getting or maintaining a job (Sayer et al., 2010). These problems were more prevalent in veterans with probable posttraumatic stress disorder (PTSD), but not absent in those without it. Furthermore, despite enormous strides in addressing veterans' postdeployment problems, approximately half of veterans with mental health

problems do not receive mental health services (IOM, 2010; Seal et al., 2010). Veterans who experience persistent reintegration difficulties, including mental health symptoms and problems functioning, need more accessible and nonstigmatizing interventions.

To meet this need, we tested a brief intervention known as expressive writing (Pennebaker, 2013). In expressive writing, people write about their deepest thoughts and feelings concerning a significant life event for up to 20 minutes a day on 3–4 consecutive days. A meta-analysis of 146 experiments confirmed that, compared to factual writing, expressive writing confers benefits across numerous outcomes in samples coping with past trauma, stressors, and major life transitions (Frattaroli, 2006). Psychological benefits included reduced distress, depression, anger, and anxiety, and improved life satisfaction. Physical health benefits included positive changes in illness behaviors, immune function, and physical symptoms. Improvements in social, academic, and occupational functioning have also been reported. Unfortunately, little research has extended expressive writing to veterans. One study examined its effects on marital adjustment in military couples and found that when soldiers, but not spouses, wrote expressively, the couple's marital satisfaction increased over the following month (Baddeley & Pennebaker, 2011).Whether expressive writing can improve symptoms and functioning among veterans with readjustment difficulties is unknown.

Compared to resource-intensive psychotherapies, expressive writing's effects tend to be small (average Cohen's $d = 0.15$; Frattaroli, 2006). Veterans with mental health and other reintegration problems, however, often do not receive mental health services. Consequently, the actual realized impact of psychotherapy on impaired veterans is likely small. Measures of effect size should be evaluated in the context of the costs and potential population benefits (Rutledge & Loh, 2004). For example, the prophylactic use of aspirin to prevent heart attacks in those with, or at risk of, cardiovascular disease has a small effect, but is inexpensive and acceptable to patients (Leucht, Hierl, Kissling, Dold, & Davis, 2012). Because it is easily implemented and accessed, expressive writing's total population effect could be larger than that of more potent, but less utilized, interventions.

In the present study, we compared expressive writing to both factual writing and no writing (treatment-as-usual). To our knowledge, we are the first to include both control types. To maximize accessibility, we implemented expressive writing online. Our primary hypothesis was that online expressive writing would be more effective than either control condition in reducing symptoms of PTSD, distress, anger, physical complaints, and reintegration difficulty, and in improving perceived social support and life satisfaction over 6 months. We also examined expressive writing's effect on clinically significant distress, PTSD screening, and employment status. Because of women's increasing participation in the U.S. military, we looked at whether expressive writing's effects differed by gender.

Method

Participants and Procedure

The Minneapolis VA Healthcare System and University of Minnesota Institutional Review Boards and U.S. Army Medical Research and Materiel Command Human Research Protection Office approved the study. We used a repeated measures randomized block design with gender as the blocking factor. Participants were randomized to either four sessions of online expressive writing, four sessions of online factual writing, or no-writing treatment at all at a ratio of 2:2:1. We assessed self-reported outcomes at baseline, and then 3 and 6 months later.

Veterans of the Afghanistan or Iraq wars who reported *a little*, *some*, *a lot*, or *extreme difficulty* "readjusting back into civilian life" were eligible for inclusion. Sayer (2008) previously showed that veterans reporting at least a little difficulty to this question had poorer mental health and more functional difficulties than other veterans. Veterans also needed Internet access, e-mail, and a telephone number to be eligible. Because individuals with severe depression do not benefit from expressive writing (Baum & Rude, 2013), we excluded those who had a score ≥ 20 on the Patient Health Questionnaire-Eight-item Depression Scale (Kroenke et al., 2009).

Between July 2011 and June 2012, we mailed eligibility questionnaires and $5 incentives to a gender-blocked, random sample of 15,686 veterans identified through the roster of all U.S. Afghanistan and Iraq war veterans. Of the 8,207 (52.3%) respondents, 3,645 (44.4%) met study inclusion criteria, and of these, 1,292 (35.4%) enrolled (Figure 1).

Eligible veterans enrolled in the study through our website, which directed them to an online consent form. We informed all potential participants that the study would help us learn "if writing in a certain way is more helpful than waiting things out." As participants consented, they were randomized into the study arms by assigning the first unused position of an automated web-based randomization table within each gender. Statisticians and investigators were blind to assignment.

Participants scheduled study sessions online according to protocol. All participants scheduled baseline, 3-month, and 6-month follow-up assessments; those in the expressive and factual writing conditions also scheduled four writing sessions after the baseline assessment (see below). We used e-mail and phone reminders to prompt participants to complete scheduled sessions. Participants received $20, $25, and $30 gift certificates, respectively, for an online retailer for completing the assessments. Follow-up data collection ended April 2013.

Participants in the expressive and factual writing arms received the same instruction to write online for 20 minutes each day on 4 separate days in a quiet space where they could be alone. They could schedule their writing sessions over 10 days following baseline, but most completed them on consecutive days (median number of days between sessions = 1). The study website included a clock that counted down from 20 minutes once participants began writing. Participants were instructed to
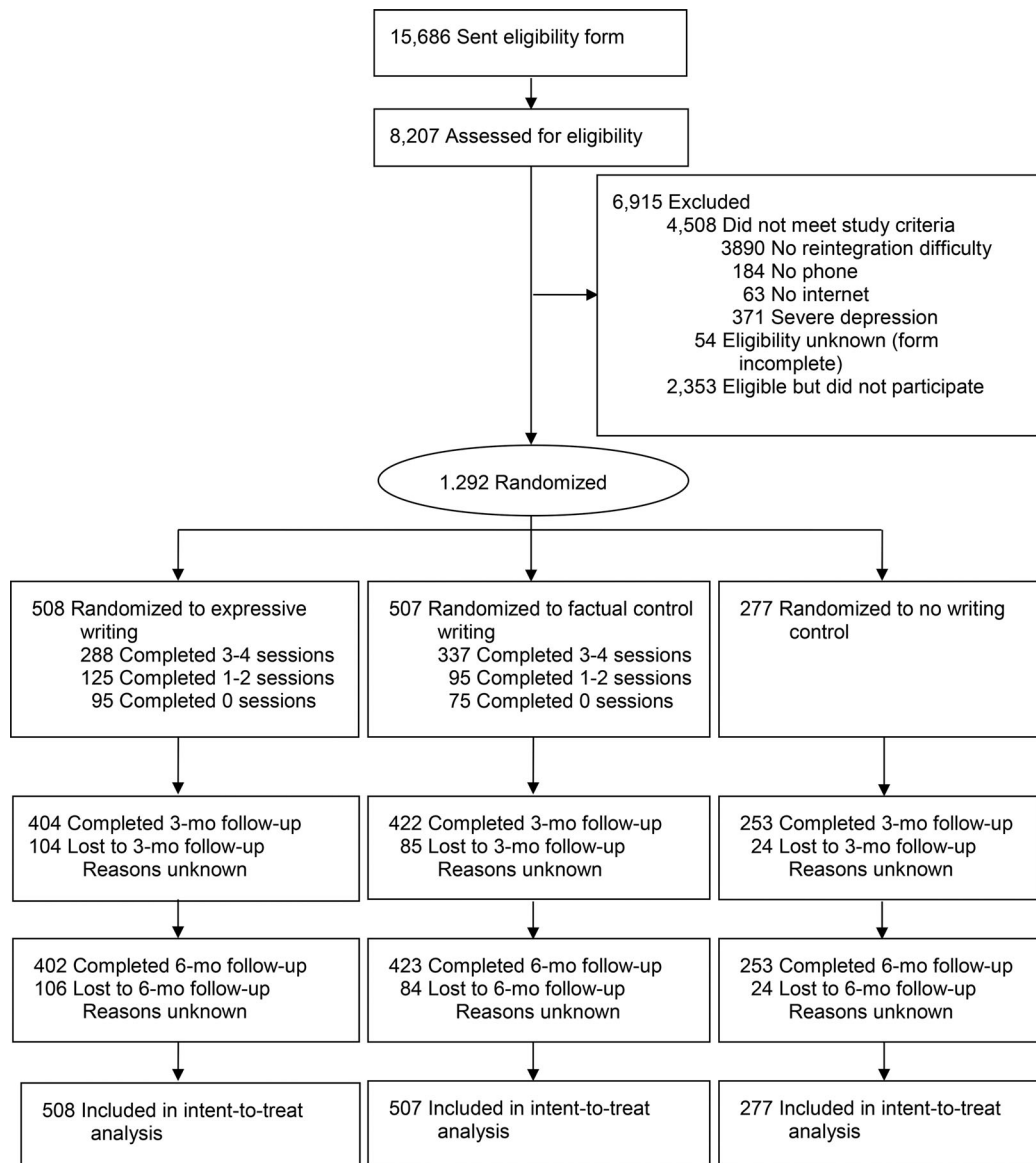
Figure 1. Flow of participants through the trial.

not worry about spelling, grammar, or repetition (Pennebaker, 2013). Instructions explained that the researchers would read participants' content and follow-up only if participants wrote about plans to harm themselves or someone else; otherwise, participants would not receive feedback and their writing would remain confidential.

The writing instructions for the expressive writing arm were highly similar to those used in a study of expressive writing for military couples (Baddeley & Pennebaker, 2011). Participants were instructed to explore their deepest thoughts and feelings about their transition to civilian life, including current challenges and reasons for these challenges.

Generally, prior expressive writing studies have asked participants in the control writing group to write about super-

ficial topics, e.g., daily activities. To increase the plausibility and relevance of the control factual writing condition, we instructed participants to write factually about veterans' information needs. The topics were as follows: Day 1, VA services or benefits; Day 2, the types of information the military and the VA should give to service members and veterans about services and benefits; Day 3, the types of information the general public should have about veterans returning from Afghanistan or Iraq; and Day 4, how the VA should use online technology to help veterans.

Individuals in the no-writing treatment as usual condition completed assessments only; they did not receive any writing instructions, nor did they receive instructions to do anything else.

Measures

Past-month PTSD symptom severity was assessed using the 17-item PTSD Checklist- Military Version (PCL-M; Weathers, Litz, Herman, Huska, & Keane, 1995). PCL-M scores range from 17 to 85 and have excellent psychometric properties (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996). At baseline, Cronbach's α was .95 in our sample. PCL scores ≥ 34 (Bliese et al., 2008) was designated as probable PTSD, and was included as a secondary outcome.

Distress was measured using the 18-item Brief Symptom Inventory (BSI-18; Deragotis, 2000), a psychometrically sound measure that yields a Global Severity Index (GSI). Participants indicated the degree to which each symptom caused them distress in the past 2 weeks on a 5-point scale (0 = *not at all* to 4 = *extremely*). Total scores, which were formed by averaging scores across items, ranged from 0 to 4, with higher scores indicating greater distress. The *T*-scores for the GSI were based on separate community norms for women and men. Cronbach's α in our sample was .93 at baseline. Clinically significant distress was defined by *T*-scores ≥ 63 (Deragotis, 2000) and was included as a secondary outcome.

To measure anger we used the 5-item hostility subscale from the 53-item BSI, which has well-established psychometric properties (Derogatis, 1993). Response format and scoring rules were the same as those employed for the BSI-18. The *T*-scores were based on separate community norms for men and women. Cronbach's α in our sample was .77 at baseline.

Physical complaints over the past 2 weeks were assessed with a modified Pennebaker Inventory of Limbic Languidness (PILL; Pennebaker, 1982) that removed items redundant with the BSI-18. Modified PILL scores represent the number of physical symptoms rated as moderately distressing or higher (range = 0–51). Our sample's Cronbach's α was .95 at baseline.

We used the 16-item Military to Civilian Questionnaire (M2C-Q) to assess past-month reintegration difficulty (Sayer et al., 2011). The M2C-Q assesses difficulty in social relations, productivity, community participation, perceived meaning in life, and self-care and leisure activities. Total scores range from 0 to 4; higher scores indicate greater reintegration difficulty. Cronbach's α in our sample was .92 at baseline.

Perceived social support over the past month was assessed with the 15-item Post-Deployment Social Support Scale from the Deployment Risk and Resilience Inventory (DRRI; Vogt, Proctor, King, King, & Vasterling, 2008). Total scores range from 15 to 75, with higher scores indicating more social support. Cronbach's α in our sample was .85 at baseline.

We assessed global life satisfaction over the past month with the 5-item Satisfaction With Life Scale (SWLS; Diener, Emmons, Larsen, & Griffin, 1985). Scores range from 5 to 35 and higher scores indicate greater life satisfaction. Cronbach's α in our sample was .92 at baseline.

At baseline, we assessed demographic characteristics, military history (e.g., branch, component, rank, time since deployment), trauma exposures, and medical utilization. We assessed lifetime trauma exposures using the trauma screening questions from the Posttraumatic Stress Diagnostic Scale (Foa, 1995) and combat exposure using the DRRI Combat Experience Scale (CES; Vogt et al., 2008).We asked those who indicated on the CES that they were injured or wounded in combat the first two questions from the Brief Traumatic Brain Injury Screen (Schwab et al., 2007). At the 3- and 6-month follow-up, we reassessed demographic variables that might have changed. Employment status was a secondary outcome.

To evaluate writing instruction adherence, we examined the number of completed writing sessions and indicators of emotional experience. Before and after each writing session, participants randomized to expressive and factual writing completed the Positive and Negative Affect Schedule (PANAS); a brief questionnaire consisting of 10 positive and 10 negative emotion words (Watson, Clark, & Tellegen, 1988). The PANAS is one of the most widely used scales to assess emotion and has high internal consistency reliability as well as test-retest reliability. After each writing session, participants rated their writing experience in terms of how personal it was and how much emotion they revealed (Sheese, Brown, & Graziano, 2004). To assess use of negative emotion words, we used Linguistic Inquiry and Word Count (LIWC; Pennebaker, Booth, & Francis, 2007), a computer program that analyzes text using word categories. LIWC has acceptable convergent and discriminant validity for the identification of emotional expression in text (Bantum & Owen, 2009). Based on prior studies (Baum & Rude, 2013; Mosher et al., 2012), we expected those randomized to expressive writing to experience a larger increase in negative emotion as measured on the PANAS, report that their essays were more personal and revealed more emotion, and use more negative emotion words than those in factual writing.

At 6-month follow-up, participants rated whether they believed the study had positive or negative long-lasting effects, was personally valuable or meaningful, and whether they would participate again (Sheese et al., 2004). We also reviewed each essay for indicators of risk to self or others, and monitored for adverse events.

Data Analysis

Power calculations based on small effects for the primary outcomes ($ds \leq 0.15$ for the expressive vs. factual writing comparison) indicated that 288 participants per arm was sufficient to achieve .96 power at α = .05. We used 2:2:1 allocation, however, and nearly doubled the sizes of the writing groups to allow sufficient power to detect two-way interactions.

Preliminary analyses examined participants' comparability across conditions. We used Random Forest for missing item imputation as implemented in missForest in the R system (Stekhoven & Bühlmann, 2012). Less than 1%, 16.5%, and 16.7% of the data were missing at baseline, 3-month, and 6-month follow-up, respectively. Random Forest, a nonparametric method of recursive partition adopted from machine learning, was used because it is the preferred method when there are

a large number of covariates of different types (e.g., categorical and ordinal scaled variables) and possible multicollinearity (Strobl, Malley, & Tutz, 2009).

We analyzed all outcomes with generalized linear mixed models (GLMMs) using intention-to-treat. Before constructing final models, we examined the distribution of each outcome and chose the distribution with the smaller fit statistics. For continuous measures, we used gamma or lognormal distributions with log link and an unstructured working correlation matrix. For binary outcomes, we used the binomial distribution with the logit link.

We modeled change from baseline by including baseline measures as adjusting covariates and treated the 3- and 6-month follow-up measures as outcomes. All models initially included any covariates that were not balanced across arms at baseline, gender, condition, time, condition × time and condition × gender as independent variables. Our primary interest was in the condition effect (i.e., whether change from baseline varied by condition). We removed nonsignificant interactions for parsimony. We also tested whether effects remained when we adjusted for baseline mental health treatment status. We used the glimmix procedure in SAS 9.2.

To examine effect sizes, we obtained the inversed-linked (exponentiated) least square contrast estimates, their standard errors, and the corresponding t values from the final fitted GLMMs and used the computational methods specified by Cortina and Nouri (1999).

Results

Randomization successfully balanced participants' characteristics across conditions, except that a smaller proportion of those randomized to factual writing were receiving VA disability benefits for military-related mental health conditions than those randomized to no writing (Table 1). We therefore included this variable as a covariate in all GLMMs. Twenty-nine percent ($n = 381$) of the sample reported receiving mental health treatment in the 3 months prior to the study.

Expressive writers completed an average of 2.54 ($SD = 1.63$) and factual writers an average of 2.84 ($SD = 1.55$), $t(1013) = 3.04$, $p = .002$, writing sessions. As expected, expressive writers demonstrated greater postsession increases in negative emotions and said their writing was more personal and that they revealed more emotions than factual writers ($ps < .001$). Consistent with this, expressive writers' first, second, and fourth essays contained higher proportions of negative emotion words compared to factual writers ($ps < .001$). In the third session, when factual writers discussed the types of information the general public should have about war veterans, the proportion of negative emotion words was similar between conditions.

Due to the skewness of their distributions, we present medians and interquartile ranges for our seven primary outcomes in Table 2. Table 3 presents condition and time effects from the

GLMMs with nonsignificant interaction terms removed. There were no gender or gender × condition effects for any outcome. There was a condition effect (indicating between-group differences in change from baseline over the 6-month follow-up) for PTSD, anger, distress, reintegration difficulty, and physical complaints, but not for social support or life satisfaction. The condition × time interaction was significant for distress only, $F(2, 802.5) = 3.96$, $p = .019$, indicating that the effect for distress was greater at the 6-month compared with the 3-month follow-up (see Table 4). Including baseline mental health treatment in our models did not significantly alter any effect (data not shown).

Table 4 presents GLMM-based estimates comparing expressive to factual and no-writing conditions. We compared estimated means for distress at 3- and 6-month follow-up separately because condition × time was significant. Compared with factual writing, expressive writing was associated with greater reductions in physical symptoms and anger and, by the 6-month follow-up, greater reductions in distress. Compared with no writing, expressive writing was associated with greater reductions in symptoms of PTSD, distress, anger, physical complaints, and reintegration difficulty and with greater improvement in social support.

We present secondary outcomes in Table 5. GLMMs demonstrated significant condition effects (i.e., between-group differences in change from baseline) for all secondary outcomes ($ps < .05$). At follow up, the adjusted odds (AOR) of clinically significant distress were not significantly different comparing the expressive to the factual writing condition, AOR = 0.79, 95% CI [0.61, 1.04], $p = .095$; but significantly lower in the expressive than the no-writing condition, AOR = 0.60, 95% CI [0.44, 0.81], $p = .001$. At follow-up, the adjusted odds of meeting screening criteria for PTSD were lower in the expressive than the factual, AOR = 0.73, 95% CI [0.57, 0.95], $p = .017$; and the no-writing conditions, AOR = 0.63, 95% CI [0.46, 0.85], $p = .003$. Last, the adjusted odds of employment over the 6-month follow-up were higher in the expressive than in the factual, AOR = 1.86, 95% CI [1.25, 2.76], $p = .002$; and no-writing conditions, AOR = 2.07, 95% CI [1.31, 3.26], $p = .002$. The only significant time effect showed that the adjusted odds of employment increased from 3- to 6-month follow-up. The only significant gender effect showed the adjusted odds of clinically significant distress were lower in women than in men.

At 6 months, writers from both groups (66.3% to 67.3%) were more likely to believe the study had positive long-lasting effects than nonwriters (57.4%, $p = .013$). The proportion who believed that the study had negative long-lasting effects was small and similar across conditions (1.8% to 4.1%). The proportion rating the study as personally valuable was substantial and did not differ across groups (76.1%, 75.2%, and 70.0% in expressive, factual, and no writing, respectively). Regardless of condition, most (93.5% to 95.0%) said that they would participate in a similar study again. There were no serious adverse events.

Table 1
Participant Characteristics at Baseline by Writing Condition

Variable	Expressive (n = 508)		Factual (n = 507)		None (n = 277)	
	n or M	% or SD	n or M	% or SD	n or M	% or SD
Age, years	36.85	10.01	37.11	9.90	36.47	9.10
Male	304	59.8	309	61.0	171	61.73
Race						
White	321	63.2	330	65.1	178	64.3
Black	83	16.3	76	15.0	29	10.5
Asian	12	2.4	12	2.4	14	5.1
Native American	7	1.4	11	2.2	4	1.4
Multiracial	25	4.9	19	3.8	9	3.3
Not reported	60	11.8	59	11.6	43	15.5
Hispanic ethnicity	67	13.2	72	14.2	49	17.7
Marital Status						
Never married/single	103	20.3	106	20.9	58	20.9
Married/partnered	304	59.8	313	61.7	175	63.2
Divorced/separated	99	19.5	86	17.0	43	15.5
Widowed	2	0.4	2	0.4	1	0.3
One or more children	350	68.9	334	65.9	174	62.8
Education						
High school diploma	43	8.5	46	9.1	19	6.9
Some college	221	43.5	194	38.3	121	43.7
College diploma	162	31.9	184	36.3	95	34.3
Advanced degree	70	13.8	73	14.4	36	13.0
Other	12	2.4	10	2.0	6	2.2
Student in past 3 months	185	36.4	192	37.9	88	31.8
Employed in past 3 months	384	75.6	368	72.6	194	70.0
Income						
$10,000 or less	31	6.1	26	5.1	14	5.1
$10,001–$20,000	45	8.9	54	10.7	33	12.0
$20,001–$40,000	122	24.0	109	21.5	55	19.9
$40,001–$60,000	103	20.3	99	19.5	53	19.1
More than $60,000	166	32.7	174	34.3	92	33.2
Prefer not to answer	41	8.1	45	8.9	30	10.8
VA health care user	316	62.2	327	64.5	191	69.0
VA service connection for mental health condition[a]	110	21.7$_{ab}$	86	17.0$_a$	70	25.4$_b$
VA service connection for physical health condition	236	46.6	239	47.1	150	54.2
Any mental health clinic visits in past 3 months	148	29.1	144	28.4	89	32.1
Any physical health clinic visits in past 3 months	265	52.2	298	58.8	152	54.9
Years since deployment	5.99	2.5	6.04	2.5	6.26	2.3
Service branch						
Army	304	60.0	283	55.8	146	53.1
Marines	48	9.5	53	10.5	36	13.1
Navy	74	14.6	82	16.2	58	21.1
Air Force	81	16.0	89	17.6	35	12.7
Rank						
Enlisted	423	83.4	436	86.0	239	86.9

(*Continued*)

Table 1
Continued

Variable	Expressive (*n* = 508)		Factual (*n* = 507)		None (*n* = 277)	
	n or *M*	% or *SD*	*n* or *M*	% or *SD*	*n* or *M*	% or *SD*
Warrant officer	5	1.0	6	1.2	4	1.5
Officer	79	15.6	65	12.8	32	11.6
Military component						
Active duty	291	57.4	285	56.2	164	59.6
Reserves/National Guard	192	37.9	205	40.4	100	36.4
Other	24	4.7	17	3.4	11	4.0
Lifetime trauma exposure	3.80	2.16	3.94	2.23	3.69	2.14
Combat exposure	4.95	4.10	4.66	3.97	4.85	3.92
Any combat-related injury	58	11.4	45	8.9	27	9.8
Positive TBI screen	45	8.9	35	6.9	24	8.7
Positive PTSD screen	280	55.1	276	54.4	163	58.8
PTSD symptoms	39.07	16.48	38.80	16.17	40.41	15.49
Distress	59.22	10.56	59.44	10.54	60.89	10.23
Anger	63.06	11.56	63.77	11.58	64.48	11.24
Physical complaints	10.96	9.89	10.73	9.71	11.64	9.52
Reintegration difficulty	1.33	0.91	1.38	0.90	1.47	0.93
Social support	53.50	10.89	54.09	10.81	52.49	10.45
Life satisfaction	21.00	7.23	21.07	7.92	20.17	7.71

Note. *N* = 1,292. PTSD = posttraumatic stress disorder; TBI = traumatic brain injury; VA = Department of Veterans Affairs.
[a]Values with different subscripts differ at *p* = .01.

Discussion

Our primary hypothesis was partially supported. Writing expressively about the transition to civilian life was more effective than writing factually about veterans' issues in reducing physical complaints, anger, and psychological distress, but not more effective than factual writing in reducing PTSD symptoms, reintegration difficulty, social support, or life satisfaction. Expressive writing was more effective than no writing in reducing PTSD symptoms, anger, distress, reintegration problems, and

Table 2
Medians and IQRs for Primary Outcomes by Writing Condition at Baseline, and 3-, 6-Month Follow-Up

Variable		Expressive (*n* = 508)			Factual (*n* = 507)			None (*n* = 277)		
		Baseline	3-Month follow-up	6-Month follow-up	Baseline	3-Month follow-up	6-Month follow-up	Baseline	3-Month follow-up	6-Month follow-up
PTSD	*Mdn*	36	27	26	35	29	30	39	34	32
	IQR	25.5, 50	24, 43	17, 43	25, 51	24, 45	19, 46	28, 51	24, 46	23, 46
Distress	*Mdn*	60	52	52	60	55	55	62	59	59
	IQR	51.5, 67	47, 63	36, 63	52, 67	47, 63	42, 63	54, 68	48, 66	48, 66
Anger	*Mdn*	64	57	57	65	60	59	65	62	62
	IQR	57, 71	40, 67	40, 67	57, 73	40, 57	40, 69	57, 73	51, 71	51, 70
Physical complaints	*Mdn*	9	4	3	8	5	5	9	8	6
	IQR	3, 16	2, 12	2, 11	3, 16	2, 13	2, 12	4, 16	2, 14	2, 14
Reintegration difficulty	*Mdn*	1.17	0.78	0.75	1.25	0.88	0.88	1.33	1.15	1.06
	IQR	0.56, 2.06	0.13, 1.75	0, 1.09	0.67, 2	0.13, 1.19	0.06, 1.81	0.69, 2.19	0.44, 2.06	0.44, 0.87
Social support	*Mdn*	54	57	58	55	56	58	53	55	56
	IQR	46, 62	48, 69	49, 71	47, 62	48, 68	49, 69	45, 60	47, 64	47, 63
Life satisfaction	*Mdn*	22	25	26	22	25	25	21	23	22
	IQR	15, 27	17, 26	18, 31	17, 27	18, 27	17, 31	14, 27	15, 27	17, 29

Note. Mdn = median; IQR = interquartile range.

Table 3

Generalized Linear Mixed Models Examining the Effect of Condition, Time, and Gender on Primary Outcomes

Variable	Condition		Time		Gender	
	F	*df*	*F*	*df*	*F*	*df*
PTSD symptoms	5.34**	2, 758.9	58.09***	1, 1237	0.00	1, 1268
Distress	12.51***	2, 794.7	94.87***	1, 1214	1.06	1, 1247
Anger	10.54***	2, 785.5	4.66*	1, 1182	0.50	1, 1200
Physical complaints	10.59***	2, 1286.0	2.02	1, 1291	0.45	1, 1286
Reintegration difficulty	4.62*	2, 759.5	5.57*	1, 1226	0.27	1, 1272
Social support	2.44	2, 760.2	20.96***	1, 1283	0.38	1, 1271
Life satisfaction	1.33	2, 1292.0	17.81***	1, 1292	2.19	1, 1292

Note. We used the γ distribution for the measure of reintegration difficulty; the lognormal distribution was used for all other measures. Baseline scores were included as covariates. The gender × condition interaction was removed because it was not significant. For all outcomes except distress, the condition × time interaction was removed because it was not significant. PTSD = posttraumatic stress disorder.
*$p < .05$. **$p < .01$. ***$p < .001$.

physical complaints, and more effective than no writing in improving social support. It was not more effective than no writing in improving life satisfaction. Effects remained when we added baseline mental health treatment to the models. Consistent with Frattaroli's 2006 meta-analysis, the magnitude of the between-group differences was small and expressive writing was equally effective for female and male veterans.

Findings based on our secondary outcomes fit this general pattern. Expressive writing was associated with small, but significantly reduced odds of screening positive for PTSD relative to both control conditions and of clinically significant distress relative to no-writing treatment as usual. Importantly, and consistent with some prior research (Spera, Buhrfeind, & Pennebaker, 1994), expressive writing was also associated with improved odds of employment relative to both control conditions. Although these findings underscore the potential tangible benefits of expressive writing, they require replication.

Frattaroli's (2006) meta-analysis concluded that expressive writing effects may diminish over time. We found, however, that expressive writing effects did not decrease from the 3- to the 6-month follow-up. In fact, for distress, expressive writing effects actually increased. Contrary to expectations, expressive writing did not improve life satisfaction compared with either control condition. Life satisfaction may be less malleable than our other outcomes.

Overall, there were fewer than expected differences between expressive and factual writing, and effect sizes comparing expressive to factual writing were smaller than those comparing expressive writing to the no-writing treatment as usual control condition. It may be that the veteran-specific topics included in the factual writing condition evoked sufficient emotion or cognitive processing to improve certain outcomes. This may have been particularly true for the third factual writing session, where participants wrote about what the public should know

Table 4

Pairwise Comparisons Between Expressive Versus Factual Writing and Expressive Versus No Writing

Variable	Expressive (*n* = 508) vs. Factual (*n* = 507)			Expressive (*n* = 508) vs. None (*n* = 277)		
	Estimate	*SE*	*d*	Estimate	*SE*	*d*
PTSD symptoms	−0.009	0.005	0.12	−0.018**	0.006	0.24
Distress at 3 months	−0.039	0.022	0.11	−0.097***	0.024	0.31
Distress at 6 months	−0.095*	0.039	0.15	−0.186***	0.039	0.35
Anger	−0.079*	0.039	0.13	−0.185***	0.041	0.34
Physical complaints	−0.082**	0.026	0.20	−0.129***	0.029	0.33
Reintegration difficulty	−0.019	0.019	0.06	−0.063**	0.021	0.22
Social support	0.003	0.003	0.06	0.006*	0.003	0.17
Life satisfaction	0.004	0.005	0.04	0.011	0.007	0.12

Note. We used the gamma distribution with log link for the measure of reintegration difficulty; we used the lognormal distribution with log link for all other measures. Pairwise comparisons based on estimated means from generalized linear mixed models. PTSD = posttraumatic stress disorder.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 5

Secondary Outcomes by Writing Condition at Baseline, and 3-, 6-Month Follow-Up

	Expressive (n = 508)						Factual (n = 507)						None (n = 277)					
	Baseline		3-Month		6-Month		Baseline		3-Month		6-Month		Baseline		3-month		6-month	
Outcome	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
CSD	217	42.7	134	26.3	133	26.2	197	38.9	143	28.2	139	27.4	123	44.4	107	38.6	89	32.1
+ PTSD screen	269	53.0	191	37.6	180	35.4	261	51.5	199	39.3	206	40.6	156	56.3	130	47.0	118	42.6
Employment	384	75.6	401	78.9	408	80.3	368	72.6	362	71.4	373	73.6	194	70.0	188	67.9	196	70.8

Note. CSD = Clinically significant distressed defined by T-scores $\geq$ 63 on the Brief Symptom Inventory-18 Global Severity Index. Positive PTSD screen was defined as $\geq$ 34 on the PTSD Check List. PTSD = posttraumatic stress disorder.

about veterans returning from war. Thus, factual writing about meaningful topics may also confer beneficial effects. Alternatively, this may be accounted for by placebo effects associated with writing.

Our study demonstrated that expressive writing can be delivered safely over the Internet without clinician involvement, enhancing the intervention's accessibility. Prior research indicates that U.S. Afghanistan and Iraq war veterans would like to receive help for reintegration problems over the Internet (Sayer et al., 2010). Although between-group effect sizes were small, online expressive writing has the potential to reach individuals who perceive reintegration difficulty, but might not otherwise get help because of logistical or access barriers. Even though online expressive writing is not a substitute for face-to-face cognitive–behavioral treatments for diagnosable mental health disorders, such as PTSD, it could serve as an adjunct to psychotherapy.

That we included a large, diverse sample of U.S. veterans and measured a range of patient-reported outcomes increased the generalizability of our findings (Tunis, Stryer, & Clancy, 2003). Findings, however, generalize only to Afghanistan and Iraq war veterans with at least a little self-reported reintegration difficulty, which was half of the random sample of Afghanistan and Iraq war veterans we assessed for study eligibility. Additionally, we do not know whether individuals who do not have access to the Internet or a phone might have responded differently to expressive writing because we excluded them from our study. Another limitation is that a significant proportion of participants, particularly those in the expressive writing condition, completed fewer than four writing sessions. This is not surprising given the well-known problems of treatment nonadherence and high rate of dropout in Internet studies (Christensen & MacKinnon, 2006). The activation of negative emotion may have contributed to a reduced number of expressive compared with factual writing sessions. Unfortunately, we do not know why some participants did not complete all sessions.

Taken together, findings indicate that online expressive writing, a simple, resource-efficient intervention that can be implemented online without clinician involvement, may be a promising strategy for improving symptoms and functioning among combat veterans who experience reintegration difficulty. Attrition and small effect sizes should be considered in light of this intervention's low cost and accessibility. A better understanding of the mechanisms by which writing confers health benefits, which are currently poorly understood, may lead to strategies to magnify the beneficial effects of writing.

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