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Writing content predicts benefit from written expressive disclosure: Evidence for repeated exposure and self-affirmation

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Expressive disclosure regarding a stressful event improves psychological and physical health, yet predictors of these effects are not well established. The current study assessed exposure, narrative structure, affect word use, self-affirmation and discovery of meaning as predictors of anxiety, depressive and physical symptoms following expressive writing. Participants (N = 50) wrote on four occasions about a stressful event and completed self-report measures before writing and three months later. Essays were coded for stressor exposure (level of detail and whether participants remained on topic), narrative structure, self-affirmation and discovery of meaning. Linguistic Inquiry and Word Count software was used to quantify positive and negative affect word use. Controlling for baseline anxiety, more self-affirmation and detail about the event predicted lower anxiety symptoms, and more negative affect words (very high use) and more discovery of meaning predicted higher anxiety symptoms three months after writing. Findings highlight the importance of self-affirmation and exposure as predictors of benefit from expressive writing.

Keywords: Expressive writing; Anxiety; Self-affirmation; Exposure; Stress and coping.

Written expressive disclosure about a stressful event significantly improves both physical and psychological health (Frattaroli, 2006). Researchers have advanced several hypotheses regarding how expressive writing achieves its effects. Empirical evidence suggests that positive outcomes of expressive writing and other expressive procedures are related to repeated exposure to stressful or traumatic memories (Lepore & Smyth, 2003; Low, Stanton, & Danoff-Burg, 2006), creation of a narrative around one's stressful event (Danoff-Burg, Mosher, Seawell, & Agee, 2010; Smyth, True, & Souto, 2001), expression and labelling of emotions (e.g., Lieberman, Inagaki, Tabibnia, & Crockett, 2011), affirmation of important domains of the self (e.g., Creswell et al., 2005, 2007; Gilbert, Pinel, Wilson, Blumberg, & Wheatley, 1998) and discovery of meaning related to the

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negative event (Danoff-Burg, Agee, Romanoff, Kremer, & Strosberg, 2006; Graham, Lobel, Glass, & Lokshina, 2008; Stanton et al., 2002; Westling, Garcia, & Mann, 2007). Although each of these links has been tested separately, few researchers have tested multiple associations simultaneously to examine relative predictive utility. The goal of the current study is to test stressor exposure, narrative structure, affect labelling, self-affirmation and discovery of meaning simultaneously within one sample as concurrent predictors of psychological and physical improvement following expressive writing. Predictors range from those that are more concrete and relate to the process of writing about a stressful event (e.g., repeated exposure to the stressful experience, narrative structure) to more abstract constructs that indicate and affirm growth and self-discovery resulting from the event (self-affirmation, discovery of meaning). Each construct is described below and summarised in Figure 1.

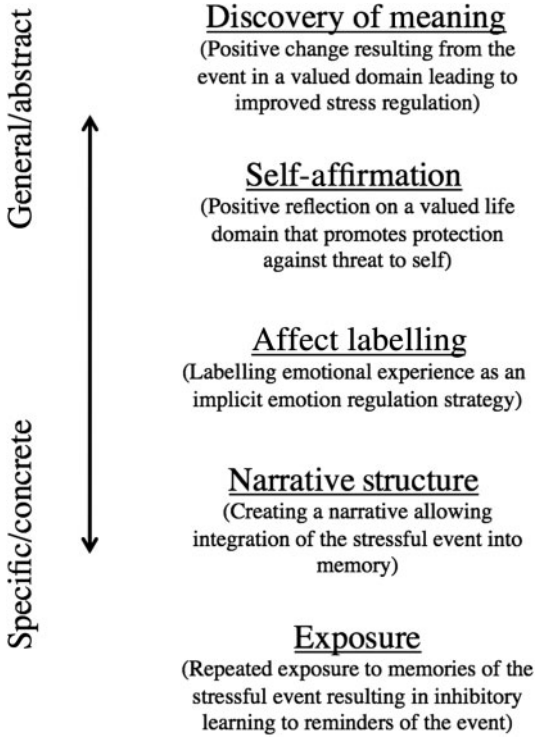

Figure 1. *Five hypothesised predictors of benefit from expressive writing.*

Repeated exposure to stressful memories

Aspects of expressive writing may resemble exposure therapy, a highly effective treatment for post-traumatic stress disorder (PTSD; Powers, Halpern, Ferenschak, Gillihan, & Foa, 2010). During exposure, a patient with PTSD is asked to recount the traumatic experience repeatedly in great detail verbally or in writing. The goal is to create new inhibitory learning pathways in which fear is no longer associated with reminders and memories of the event (Craske et al., 2008). The benefits of expressive writing may be explained by its similarity to exposure therapy (Lepore & Smyth, 2003). In exposure, repeated recounting of the same memory is important for producing the greatest fear reduction (Foa & Rothbaum, 1998), and the vividness of the imagery relates directly to the emotional response evoked by the image (Holmes & Mathews, 2010; Lang, 1979). Consistent with these observations, Sloan, Marx, and Epstein (2005) found that participants with PTSD symptoms assigned to write about the same traumatic event over three writing sessions evidenced greater improvement in physical health and PTSD symptoms than those who wrote about three different events. However, other studies demonstrate that neither the extent to which participants stayed on topic in their writing nor the similarity of writing content on different writing occasions were related to health improvements (Campbell & Pennebaker, 2003; Pennebaker & Francis, 1996). If repeated exposure to emotional memories is a mechanism through which expressive writing works, the extent to which a participant stays focused on the stressful event, as well as the level of detail with which the event is recalled, should be related to improvement following expressive writing.

Narrative structure

Forming a narrative may play a role in achieving benefit from expressive writing. Traumatic

memories tend to be disorganised compared to other memories, and interventions that organise memory may be particularly effective at reducing negative effects of a trauma (Foa & Riggs, 1993). By creating a narrative of a traumatic event, the experience can be summarised, stored and assimilated into memory, thereby reducing distress associated with the event. Smyth and colleagues (2001) experimentally manipulated the type of narrative structure with some participants engaging in narrative writing (events leading up to event, what happened and consequences) and others engaging in fragmented writing (list/bullet points of events leading up to event, what happened and consequences). The narrative writing group had less illness-related activity restriction than the fragmented group, but reported more event-related avoidant thinking (Smyth et al., 2001). In addition, Danoff-Burg and colleagues (2010) examined the association between narrative structure when writing about a stressful event and mental and physical health outcomes; more narrative structure was associated with fewer depressive symptoms and with less perceived stress following writing (but not with physical health outcomes).

Affect labelling

Affect labelling, or "putting feelings into words", is the verbal labelling of emotional stimuli or one's reaction to them (Lieberman, 2011). When participants are asked to label the content of distressing images, they report lower distress than when they simply look at distressing images (Lieberman et al., 2011). This effect can be attributed to activation of an area of the prefrontal cortex called the right ventrolateral prefrontal cortex, which reduces activity in the amygdala, an area associated with emotional processing (Gorno-Tempini et al., 2001; Hariri, Mattay, Tessitore, Fera, & Weinberger, 2003; Lieberman et al., 2007). Given these findings, affect labelling has been posited as a mechanism for the benefit of expressive writing. Using Linguistic Inquiry and Word Count (LIWC), a program that quantifies essay content, Pennebaker reanalysed data from six expressive writing studies to examine the effect of negative and positive emotion word use on health outcomes (Pennebaker & Chung, 2007). More positive emotion word use was associated with greater improvement in health. Negative emotion word use had a curvilinear relationship with health change after writing, with participants who used moderate numbers of negative emotion words evincing the greatest improvement in health outcomes. Low and colleagues (2006) found that in a sample of cancer patients who engaged in expressive writing, greater negative emotion word use was associated with fewer physical symptoms following writing. These findings provide some evidence that both negative and positive emotion word use relate to health improvements following expressive writing.

Self-affirmation

Self-affirmation is a process by which one engages in a positive reflection on a valued self-domain (Creswell et al., 2007), including reflection on personal traits, the self-concept and values. Self-affirmation theory (Steele, 1988) posits that self-affirmation can be used to enhance the integrity of the self and buffer negative feelings in the face of a threat to one's self concept (for a review, see Cohen & Sherman, 2014). Consistent with this hypothesis, Creswell et al. (2007) found that in breast cancer patients, self-affirmation (but not discovery of meaning) during expressive writing was associated with improvement in physical symptoms over three months and with lower state distress immediately following the writing sessions. Moreover, Sherman, Bunyan, Creswell, and Jaremka (2009) found that college students with an upcoming midterm exam who were assigned to a self-affirmation expressive writing condition had less sympathetic nervous system activation during the exam than those assigned to a control writing condition.

Discovery of meaning

Discovery of meaning has been conceptualised as a greater appreciation for life and increased

awareness of life's fragility (Bower, Kemeny, Taylor, & Fahey, 2003). Although the empirical literature is relatively small (Park, 2010), a number of empirical studies have demonstrated links between discovery of meaning during expressive writing about a stressful event and improved physical and psychological health outcomes, including fewer medical visits among cancer patients (Stanton et al., 2002), better medication adherence among HIV infected women (Westling et al., 2007), reduced fatigue in patients with rheumatoid arthritis (Danoff-Burg et al., 2006) and reduced depression in chronic pain patients (Graham et al., 2008).

Current study

The current study assessed five hypothesised predictors of the benefit of expressive writing ranging from relatively concrete to more abstract predictors: exposure, narrative structure, affect labelling, self-affirmation and discovery of meaning. Previous findings regarding negative affect labelling led us to test its curvilinear relationship with each of the outcomes. Due to mixed findings regarding each predictor's utility and limited previous research comparing multiple theoretical mechanisms of expressive writing within one model, we did not hypothesise that any one predictor would be more powerful than another. Data were from a recent randomised controlled trial (Niles, Haltom, Mulvenna, Lieberman, & Stanton, 2014; Tsai et al., in press), in which we examined the effect of writing about a stressful event on anxiety, depressive symptoms and physical symptoms in a sample of healthy participants. Rather than significant main effects of the writing condition on physical or psychological symptoms, a significant moderating effect of dispositional emotional expressivity indicated that participants who tended to express emotions reported lower levels of anxiety following expressive writing than those who were less emotionally expressive. In fact, participants low in emotional expression reported an *increase* in anxiety after writing. The essays from Niles et al. (2014) were coded for each of the proposed predictors. In addition, we tested how much the content of participants' writing changed over the course of the four writing sessions and whether the change over the four sessions predicted improvement in the outcomes.

METHOD

Participants

In response to course announcements and flyers, University of California, Los Angeles (UCLA) students and adults from the community (n = 537) called research staff to learn about the study and undergo eligibility screening. Eligibility criteria were: 1. between 18 and 40 years of age; 2. fluent in English; 3. no psychiatric disorder as indicated by participants' self-report of a doctor's diagnosis, hospitalisation or current treatment; 4. no serious physical illness as indicated by self-report of a doctor's diagnosis; and 5. having experienced a stressful event within the past five years that they rated as 5 or greater in stressfulness on a 7-point Likert scale (1 = not at all stressful; 7 = extremely stressful). Participants also completed functional magnetic resonance imaging as part of the study (results not included in the current report) and therefore were required to be scanner eligible (i.e., metal-free, right-handed, not claustrophobic, not pregnant). [For a diagram of participant flow through the study, see Niles et al. (2014).]

A total of 116 participants were randomly assigned to the expressive writing (n = 59) and control (n = 57) conditions. For the current study, only those in the expressive writing condition were included in analyses. Of the 59 who were assigned to the expressive writing condition, nine participants were excluded from analyses. Three participants did not identify a specific stressful event, but wrote more generally about stress, and one participant wrote about an event that occurred during the writing sessions. One participant requested that his essays be destroyed, two participants dropped out of the study and therefore were missing data at Time 2 and one participant Time 1 data were inadvertently deleted. Data from 50 participants were analysed (26 women). Participants were an average of 21.2 years old (SD =

3.5, range = 18–35) and were Asian (32%), White (42%), Black (12%) and Latino (14%).

Procedure

UCLA students and community members were recruited via flyers posted in several university locations and announcements made during introductory level psychology classes. Experimenters were graduate students, postdoctoral fellows or full-time employed research coordinators who were unaware of participants' study condition assignments. Those who were eligible and interested were scheduled for a baseline session during which they provided written informed consent and completed questionnaires administered electronically (Time 1). Participants then engaged in four 20-minute writing sessions, scheduled at the participants' convenience at least three days apart and occurring within eight weeks.

During the initial writing session, participants were assigned to one of two writing conditions (expressive writing or control) and completed the first 20-minute writing task. At each of the four writing sessions, participants listened to an audio-recording of the instructions, and completed the task in a private laboratory room. Participants placed their completed essays in an envelope and returned it to the experimenter. The two writing tasks involved: 1. describing their deepest thoughts and feelings regarding the "most stressful or traumatic experience during the past five years" (expressive writing) or 2. describing how they spent their time without expressing emotions or opinions (control).

Three months after the final writing session, participants completed the follow-up questionnaires via the Internet (Time 2). Participants were compensated up to $130. For further details regarding study procedures, see Niles et al. (2014).

Dependent measures

Depressive symptoms

Three measures of depressive symptoms were administered, and a composite measure was created to improve reliability. Correlations between depression measures at Time 1 ranged from .62 to .78 and at Time 2, from .74 to .83. To create the composite measure, scores in the scales were standardised and the three measures were averaged at baseline and follow-up.

The 7-item Depression subscale of the *Depression, Anxiety and Stress Scale – 21* (Antony, Bieling, Cox, Enns, & Swinson, 1998) assesses symptoms of dysphoric mood such as sadness and worthlessness. Subscale items were distinct from those on the Anxiety and Stress subscales and items have acceptable to excellent internal consistency and concurrent validity (Antony et al., 1998). In the current sample, αs were .84 (Time 1) and .88 (Time 2). The *Beck Depression Inventory 1A* (BDI-1A; Beck & Steer, 1984) is a 21-item measure that assesses symptoms of depression such as hopelessness, feelings of guilt, weight loss and anhedonia. For Institutional Review Board purposes, the suicidality item was removed. Participants rated the severity of depressive symptoms from 0 to 4 in the past week. The BDI-1A has clinical utility and sound psychometric properties in psychiatric and non-clinical samples (Beck, Steer, & Carbin, 1988; Steer, Beck, Garrison, & Lester, 1988). The BDI-1A is strongly correlated with the BDI-2 both in terms of number of symptoms endorsed (r = .93) and total score (r = .94; Beck, Steer, Ball, & Ranieri, 1996). In the current sample, αs were .83 (Time 1) and .90 (Time 2). On the 20-item *Center for Epidemiologic Studies Depression Scale* (Radloff, 1977), participants rate the frequency of symptoms associated with depression in the past week from rarely or none of the time (less than 1 day) to most or all of the time (5–7 days). The scale has high internal consistency and adequate test-retest reliability (Radloff, 1977), and is reliable in young adult populations (Radloff, 1991). In the current sample, αs were .88 (Time 1) and .90 (Time 2).

Physical symptoms

The 54-item *Pennebaker Inventory of Limbic Languidness* (PILL; Pennebaker, 1982) assesses a number of common physical symptoms. Participants

indicate how often they have experienced each of the symptoms on a five-point Likert scale (1 = never or almost never, 2 = less than 3 or 4 times per year, 3 = every month or so, 4 = every week or so, 5 = more than once every week). Scores are summed across all 54 items. Internal consistency and reliability are excellent (α = .91 and 2-month test-retest correlation = .83). In the current sample, αs were .94 (Time 1) and .95 (Time 2).

Anxiety symptoms

Three measures of anxiety symptoms were administered, and to improve reliability, a composite measure was created using the same method as for the depression composite. Correlations between anxiety scales at Time 1 ranged from .65 to .73 and at Time 2, from .65 to .80.

The 7-item Anxiety subscale of the *Depression, Anxiety and Stress Scale* (Antony et al., 1998) assesses symptoms of physical arousal, panic attacks and fear such as trembling or faintness. In the current sample, αs were .78 (Time 1) and .78 (Time 2). The Anxiety and Somatisation subscales from the *Brief Symptom Inventory* (Derogatis & Melisaratos, 1983), a global measure of psychological symptoms, were used to assess anxiety symptoms. Participants rate the extent to which they were distressed or bothered by each symptom in the past 30 days. Sample items from the Somatisation subscale include "faintness or dizziness" and "pains in the heart or chest", and sample Anxiety items include "nervousness or shakiness inside", and "being suddenly scared for no reason". Although the Somatisation subscale assesses physical symptoms, it has previously been used as a measure of anxiety (Roy-Byrne et al., 2010), and in our sample, correlated more strongly with the Brief Symptom Inventory Anxiety subscale (r = .74) and Depression, Anxiety and Stress Anxiety subscale (r = .68) than with the PILL, our measure of physical symptoms (r = .37). The scales demonstrate good internal consistency and reliability (Derogatis, 1993). In the current sample, αs for the Anxiety subscale were .80 (Time 1) and .81 (Time 2) and for the Somatisation subscale were .82 (Time 1) and .88 (Time 2).

Essay coding

Two hundred essays (50 participants with four essays each) were read and coded according to a detailed manual with operational definitions and examples of the constructs as well as in-depth instructions for coding. The manual was adapted from Creswell et al. (2007) and edited to capture common themes specific to the essays for the current study.

Coders included one graduate student, who revised the coding manual for the current study, and two research assistants. Coders first read and coded three sample essays and discussed discrepancies to familiarise themselves with the coding manual. Coders then coded approximately five essays each week independently, then met together for two hours to discuss codes and come to a consensus when there were discrepancies. Prior to meeting each week, coders entered their ratings into a spreadsheet, which was used to determine reliability between coders. Discovery of meaning and self-affirmation were coded separately to reduce coder burden. Two coders (one research assistant and the graduate student) read all essays, completed the global ratings and coded discovery of meaning (see below for descriptions). The same research assistant and a second research assistant then read the essays a second time to code self-affirmation.

Global ratings (exposure and narrative structure)

Coders used Likert scales to provide global ratings of level of detail, the extent to which writers stayed on topic, and the narrative structure of the essays (see Table 1 for operational definitions). Level of detail and extent to which they remained on topic were coded separately for each of the four essays for each participant, then averaged across the four essays to create an overall rating. Average inter-item correlations between sessions (detail r = .20 and on topic r = .47) were low to moderate, and we also examined change across sessions on these variables. Given that participants were aware that they had four sessions to write and tended to use the entire four sessions to tell the story of the event and its impact rather than treating each session as a separate retelling of the event, narrative structure was

Table 1. *Operational definitions of global and category codes*

Global rating	*Operational definition*	*Likert scale*
Level of detail	With how much detail does the writer recount the stressful or traumatic incident?	0 = none, 2 = little, 4 = some, 6 = much, 8 = a great deal
On topic	To what extent does this essay remain on the stressful topic initially presented?	0 = not at all, 2 = very little, 4 = somewhat, 6 = much, 8 = to a great extent
Narrative structure	To what extent do the four essays show the organisational characteristics of a story, most notably a clear beginning, middle and end?	0 = not at all, 2 = very little, 4 = somewhat, 6 = much, 8 = to a great extent
Category	*Operational definition*	*Examples*
Self-affirmation	A positive reflection on a valued self-domain. A self-affirmation includes reflection on personal traits, the self-concept and values.	1. My mom and I have been the best of friends ever since I was in preschool. 2. School started and I really like and enjoy my classes.
Discovery of meaning	A positive shift in values, priorities or perspectives or feeling that the stressful experience has resulted in some positive change.	1. One of the good things coming out of this endless experience is the improvement of my relationship with my dad. 2. It gave me a deeper sense of empathy for people who are victimised by elements of our society that I never before understood.

coded across all four essays. To determine inter-rater reliability, intraclass correlation coefficients were calculated between the two coders. For level of detail, intraclass correlation coefficient (ICC) = .74, $p < .001$, for on topic, ICC = .87, $p < .001$ and for narrative structure, ICC = .58, $p < .001$.

Self-affirmation and discovery of meaning

The manual for coding essays for self-affirmation and discovery of meaning was adapted from Creswell et al. (2007). Operational definitions of the categories and examples are included in Table 1. Coders identified "text units" that were consistent with each category. A "text unit" was one or more consecutive sentences that fell into the given category. The smallest unit that could be coded was a sentence. Frequency counts of coded categories summed across a participant's four essays were used in the final analyses. To determine inter-rater reliability, for each five lines of text, coders indicated whether a category was present (1) or absent (0). Kappa estimates can be affected by "prevalence", or the frequency of yes ratings relative to no ratings. When one rating occurs much more frequently than the other (as is the case in the current study), prevalence-adjusted bias-adjusted kappa (PABAK) can be calculated (Byrt, Bishop, & Carlin, 1993). In the current study, the ratio of yes to no ratings was .04 (62/1525) for self-affirmation and .05 (68/1443) for discovery of meaning. PABAK is comparable to Kappa in that it ranges from 0 to 1, but is adjusted for prevalence. For self-affirmation, PABAK was .89, and for discovery of meaning, PABAK was .93.[1]

Consistent with Creswell et al. (2007), self-affirmation and discovery of meaning were not required to be independent, meaning a sentence could be coded into both categories if appropriate. This approach provides a more accurate measurement of each category. However, a clear distinction was made between the two categories such that discovery of meaning was a positive change that occurred as a direct result of the event, while self-affirmation was an affirmation of an important domain that was independent of the stressful event.

[1] Kappa for self-affirmation was .54 and for discovery of meaning was .68.

To facilitate coding, based on a preliminary reading of the essays to identify common themes, self-affirmation and discovery of meaning were further subdivided into categories. Discovery of meaning statements were coded into one of six categories including personal growth, improved relationships, greater concern for others, improved career or education, seeing the world in a more positive light and other (i.e., could not be captured in another category). Self-affirmation statements were similarly coded into one of six categories including relationships, religion, spirituality or faith, concern for others, career or education, global personal traits and other. Consistent with Creswell et al. (2007), self-affirmation statements about the past or future were not included.

Affect labelling

Number of positive and negative emotion words were identified using the LIWC program (Francis & Pennebaker, 1993). LIWC calculates the percentage of total words written that were either positive affect words (e.g., love) or negative affect words (e.g., hurt).

Objective stressfulness

Because the stressfulness of the event may influence the effect of writing, objective stressfulness was coded using a protocol similar to that of the UCLA Life Stress Interview (Hammen, Marks, Mayol, & DeMayo, 1985).[2] A research assistant read each participant's four essays, then summarised the event in an audio recording, including details about impact of the event on the participant's life, and excluding information about the participant's emotional reaction to the event. Two research assistants then listened to each recorded event, and coded the stressfulness of the event on a 1–5 scale. Coders discussed any discrepant codes and came to a consensus. For stressfulness, 1 was no or minimal impact, and 5 was severe or catastrophic impact. Severity ratings were based on the number of life domains affected by the event (e.g., social, work/school, family) as well as how severely the domain was affected. The two coders' ratings were highly correlated (ICC = .73). Final scores ranged from 1.5 to 4.5 (M = 2.8, SD = .7).

Statistical analyses

Data were examined for outliers (>3 SD from the mean) on dependent measures (anxiety, depression, PILL) as well as for coded categories. Three outliers were identified for anxiety and one outlier for depression. Outliers were replaced with the next highest value based on the Winsor method (Guttman, 1973). Achieved power calculated post-hoc using G*Power was .76 for a medium effect size (R^2 = .13) and .93 for a large effect size (R^2 = .26).

To test whether writing content predicted outcome, data were analysed using hierarchical multiple regression in Stata 12. For anxiety and depressive symptoms, residuals were non-normally distributed indicating that an assumption of the general linear model was violated. Therefore, Poisson regression with robust standard errors was used for models examining anxiety and depression as dependent variables, and linear regression for models including the PILL. Variables were entered into the model starting with the most specific/concrete and ending with the most general/abstract (Figure 1), and were grouped according to how they were measured. In step 1, we included covariates (anxiety at Time 1, total words used and objective stressfulness of the event). In step 2, we added the global ratings (detail, on topic and narrative structure). In step 3, we included the affect labelling variables (LIWC positive emotion, negative emotion), and we also examined the quadratic effect of negative emotion due to evidence from previous research for a quadratic relationship between negative emotion word use and benefit from expressive writing (Pennebaker & Chung, 2007). We mean centred the negative emotion variable to facilitate interpretation of the linear effect. In step 4, we added self-affirmation and discovery of meaning.

To test the change in writing content over time, data were analysed using multilevel modelling

[2] The term objective is based on established terminology used in previous research (Hammen et al., 1985).

(MLM) in Stata 12, which accounts for the nesting of time-points within participants. We assessed changes in detail, on topic, affective word use, self-affirmation and discovery of meaning. Narrative structure was not included in analyses because it was coded across the four essays rather than separately for each essay. Poisson MLM was used for variables with high positive skew and count variables (discovery of meaning, self-affirmation, detail, on topic). Linear MLM was used for normally distributed variables (positive and negative affect word use). The independent variable was writing session (1–4) and the dependent variable was the coded category (detail, on topic, positive affective word use, negative affective word use, self-affirmation and discovery of meaning). All models included random effects of intercept and slope, and the level 2 variance/covariance structure was unstructured.

To test whether change in writing content was related to the effect of expressive writing on anxiety, depression, and physical symptoms, best linear unbiased predictions of the random effect of slope (change over time) were obtained and added to the fixed effect of time to obtain an estimate of the change in writing content over time for each participant. The slope estimates were then used in regression models to predict anxiety, depression and physical symptoms following completion of writing controlling for baseline levels of the dependent variables. In each model, the association between the slope of the content variable and each of the three outcomes (anxiety, depression and physical symptoms) was examined for significance.

RESULTS

Descriptive statistics and correlations

Descriptive statistics and correlations are displayed in Tables 2 and 3. Data for on topic and narrative structure were negatively skewed with the majority of participants staying on topic and describing their stressful events in a narrative form. The level of detail was negatively skewed with the majority of participants including relatively little detail in their writing. The majority of participants included at least one self-affirming or discovery of meaning statement, with approximately half the sample providing two or more of each type of statement. Positive and negative emotion words, total word count and objective stressfulness were normally distributed.

Table 2. *Descriptive statistics for predictors and control variables*

	Mean (SD)	*Range*
Predictors		
Exposure		
Detail[a]	2.0 (1.2)	0–5.25
On topic[a]	5.8 (1.8)	1–8
Narrative structure[a]	4.8 (2.1)	0–8
Affect labelling		
Positive emotion[b]	3.0 (.8)	1.1–4.7
Negative emotion[b]	3.2 (1.0)	1.2–5.4
Discovery of meaning (%)		0–9
0	28	–
1–2	36	–
3–4	16	–
≥5	20	–
Self-affirmation (%)		0–10
0	18	–
1–2	32	–
3–4	22	–
≥5	28	–
Control variables		
Word count sum	2082 (443)	1172–3145
Objective stressfulness[c]	2.8 (.7)	1.5–4.5

[a]Possible values range from 0 to 8.
[b]Mean percentage of total words in essays.
[c]Possible values range from 1 to 5.

As shown in Table 3, level of detail, the extent to which the participants remained on topic and narrative structure all were significantly positively correlated (*r*s = .50–.61).[3] The number of self-affirmation and discovery of meaning statements were also significantly positively correlated. Positive emotion word use was marginally significantly correlated with self-affirmation. As for correlations between predictors and baseline dependent measures, anxiety was significantly positively correlated

[3] Despite high correlations between these variables, we chose not to create a composite due to theoretical distinctions between them.

Table 3. *Correlations between predictor, control and baseline dependent variables*

	1. Detail	*2. Topic*	*3. Narrative structure*	*4. Positive emotion*	*5. Negative emotion*	*6. Discovery of meaning*	*7. Self-affirmation*	*8. Word count*	*9. Objective stress*	*10. Anxiety*	*11. Depression*
1. Detail	–										
2. On topic	.50***	–									
3. Narrative structure	.50***	.61***	–								
4. Positive emotion	−.26	−.22	−.17	–							
5. Negative emotion	−.11	−.03	−.19	−.12	-						
6. Discovery of meaning	−.07	.05	.06	.24	−.11	–					
7. Self-affirmation	−.16	−.13	−.09	.24	−.01	.45***	–				
8. Word count	.16	.04	−.04	.00	−.18	.17	.17	-			
9. Objective stress	.20	.18	−.06	−.09	−.05	−.03	−.16	.15	–		
10. Anxiety	.01	−.06	.06	.28*	.17	−.18	.13	−.23	−.12	–	
11. Depression	.01	.16	.05	.14	.30*	−.27*	−.19	−.25	.04	.63***	–
12. Physical symptoms	−.26	−.11	−.10	.28*	−.10	.21	.37**	−.07	−.15	.45	.30

$^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

Table 4. *Effect of exposure, narrative structure, self-affirmation, discovery of meaning and affect labelling on anxiety at 3-month follow-up controlling for baseline anxiety, word count, objective stressfulness of the event and independence of the event*

	Model 1	*Model 2*	*Model 3*	*Model 4*
	Beta (95% confidence interval)			
Block 1				
Constant	−.75 (−2.9, 1.4)	−1.14 (−3.5, 1.2)	−.95 (−3.5, 1.7)	−.95 (−3.2, 1.3)
Anxiety time 1	.60*** (.25, .94)	.65*** (.36, .94)	1.03*** (.35, 1.0)	1.03*** (.72, 1.3)
Word count	.00 (.00, .00)	.00 (.00, .00)	.00 (.00, .00)	.00 (.00, .00)
Stressfulness	.11 (−.29, .50)	.20 (−.17, .57)	.11 (−.13, .68)	.11 (−.26, .47)
Block 2				
Exposure				
Detail		−.37* (−.68, −.06)	−.34** (−.76, −.13)	−.34** (−.58, −.09)
On topic		−.05 (−.25, .14)	−.07 (−.22, .09)	−.07 (−.19, .06)
Narrative structure		.11 (−.10, .32)	.13 (−.06, .35)	.13 (−.02, .27)
Block 3				
Affect labelling				
Positive emotions			.04 (−.22, .30)	−.19 (−.51, .13)
Negative emotions (linear term)			.26 (.04, .48)*	.33 (.16, .50)***
Negative emotions^2 (quadratic term)			.19* (.04, .35)	.16* (.02, .30)
Block 4				
Self-affirmation				−.20*** (−.28, −.12)
Discovery of meaning				.21*** (.11, .31)
ΔR^2		.09	.13***	.21***
Adjusted R^2	.13*	.17*	.27**	.50***

Note: R^2 and ΔR^2 values were determined from a linear regression model as an indicator of effect size, and coefficients for models 1, 2 and 3 were determined from a Poisson regression model due to positive skew of the dependent variable. No comparable approximations of R^2 effect sizes currently exist for Poisson regression.

*$p < .05$; **$p < .01$; ***$p < .001$.

with positive emotion word use, depression was positively correlated with negative emotion word use and negatively correlated with discovery of meaning and physical symptoms were positively correlated with positive emotion word use and self-affirmation. Due to high correlations among predictors, multicollinearity was assessed; Variance Inflation Factors were all below the cut-off of 5 (range = 1.19–2.04).

Do hypothesised predictors relate to anxiety, depressive symptoms or physical symptoms?

Anxiety

Indicators of exposure, narrative structure, affect labelling, discovery of meaning and self-affirmation were examined as predictors of anxiety at Time 2 using hierarchical Poisson regression. Results are displayed in Table 4.

Block 1 was significant χ^2 (3, N = 50) = 13.66, p = .003. In block 1, anxiety at Time 1 significantly predicted anxiety at Time 2 (b = .60, p = .001). Word count and event stressfulness did not significantly predict anxiety at Time 2 (ps > .599). Block 2 was marginally significant χ^2 (3, N = 50) = 6.54, p = .087. In block 2, level of detail significantly predicted anxiety at Time 2 over and above all covariates (b = −.37, p = .018), such that participants who went into more detail when writing about their stressful event reported less anxiety at Time 2. Narrative structure and on topic did not significantly predict anxiety at

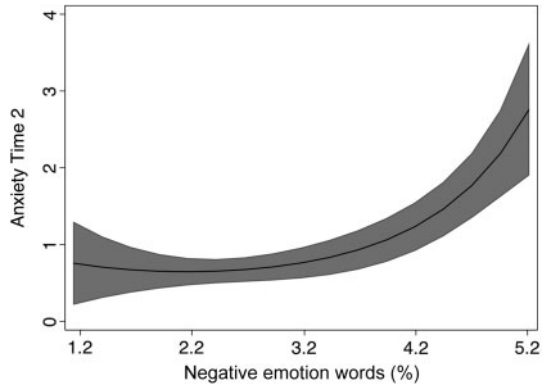

Figure 2. *Quadratic relationship between negative emotion words and anxiety at Time 2.*

Time 2 (*p*s > .302). Block 3 was significant χ^2 (3, N = 50) = 31.82, p < .001. In Block 3, the quadratic term for percentage of negative words used significantly predicted anxiety at Time 2 (b = .19, p = .016).[4] Number of negative emotion words was not strongly related to anxiety for participants from 2 standard deviations below the mean to 1 standard deviation above the mean. However, at very high levels of negative emotion word use (above 1 standard deviation from the mean), using more negative emotion words was strongly related to higher anxiety (see Figure 2). Number of positive emotion words did not significantly predict anxiety at Time 2 (p = .763). Block 4 was significant χ^2 (2, N = 50) = 29.94, p < .001. In block 4, self-affirmation (b = .20, p < .001) and discovery of meaning (b = .21, CI = .11 to .31, p < .001) significantly predicted anxiety at Time 2.[5] Participants who used more self-affirmation statements and fewer discovery of meaning statements had lower levels of anxiety at Time 2.

Depressive and physical symptoms

For depressive and physical symptoms as the dependent variables, none of the proposed predictors related to symptoms at Time 2 (*p*s > .294).

Does the content of participants' writing change over the four writing sessions?

Using MLM, we tested whether the extent to which participants engaged in exposure, affect labelling, self-affirmation and discovery of meaning changed over the four writing sessions. Participants were more likely to discover meaning (*slope* = 1.14, CI = .68 to 1.60, p < .001) and express positive emotions (*slope* = .38, CI = .25 to .50, p < .001) at later writing sessions than at earlier writing sessions. Participants were less likely to go into detail about their stressful event (*slope* = −.75, CI = −.97 to −.53, p < .001) at later writing sessions than at earlier writing sessions. The extent to which participants stayed on topic, use of negative emotion words and frequency of self-affirmation statements did not change significantly over the four writing sessions (*p*s > .065).

Does change in writing content predict improvement in anxiety, depressive symptoms or physical symptoms?

We tested whether the change (slope) in writing content over the four writing sessions predicted anxiety, depressive and physical symptoms at Time 2. The dependent variable at Time 1 was controlled in all models, and slopes were tested in separate models. The change in writing content for level of detail (*p*s > .125), on topic (*p*s > .405), positive (*p*s > .719) and negative (*p*s > .072) emotion word use, self-affirmation (*p*s > .339) and discovery of meaning (*p*s > .475) were unrelated to anxiety, depressive symptoms and physical symptoms at Time 2.

DISCUSSION

The current study was the first to examine simultaneously five hypothesised predictors underlying the

[4] We tested baseline depressive symptoms and negative affect separately as covariates, and the quadratic effect of negative word use on anxiety remained significant in the model.

[5] Following a reviewer's suggestion, we tested simplified models including all covariates and only one hypothesised predictor at a time. For anxiety, significant associations were found for detail (b = *-.29, p = .012*), self-affirmation (b = *-.11, p = .033*), discovery of meaning (marginal; b = *.09*, p = *.058*) and negative emotion word use (b = *.33*, p = *.024*). No other significant relationships were found between individual predictors and the outcomes (*ps > .102*).

effect of expressive writing on physical and psychological health. Predictors were exposure, narrative structure, affect labelling, self-affirmation and discovery of meaning. We first tested whether prevalence of each variable, averaged across the four writing sessions, predicted improvement in outcome. More frequent self-affirmation statements and greater level of detail in describing the event (an indicator of exposure) predicted fewer anxiety symptoms after writing. More frequent discovery of meaning statements and use of negative emotion words (at the highest levels) were related to more anxiety symptoms. The number of positive emotion words was not related to anxiety at 3-month follow-up. Second, we tested whether the content of writing changed over time, and whether changes in writing content predicted outcome. Discovery of meaning and positive emotion word use increased over the four writing sessions, and level of detail decreased but the slopes were not related to outcome.

Examined as a mediator of expressive writing in one previous study (Creswell et al., 2007), self-affirmation fully mediated the effect of expressive writing on reduced physical symptoms. Replication of this finding with respect to anxiety symptoms in the current study lends support to self-affirmation as an important potential mechanism for the benefit of expressive writing, and adds to a growing body of literature supporting self-affirmation as a useful strategy for buffering stress (Burton & King, 2004; Creswell et al., 2005; King, 2001; Lange, Richard, Gest, Vries, & Lodder, 1998). Self-affirmation was not associated with improvement in physical symptoms, however. This difference may be explained by differences between the samples. The Creswell et al. study included patients with cancer who had recently undergone treatment, whereas the current sample included healthy young subjects who reported generally low levels of physical symptoms. Low levels of symptoms at baseline may have limited the potential for improvement following the writing intervention.

Consistent with the idea that a detailed account of the event may evoke more vivid imagery, result in greater arousal and ultimately produce greater reduction in anxiety (Holmes & Mathews, 2010; Lang, 1979), we found an association between the amount of detail and participants' self-reported anxiety after writing. Although both remaining on topic and level of detail were facets of exposure, consistent with previous research in which essays were content analysed (Campbell & Pennebaker, 2003; Landauer, Foltz, & Laham, 1998), remaining on topic did not significantly predict improvement in any dependent variable. Only one experimental study has shown that writing about the same topic leads to better outcomes than writing about different topics (Sloan et al., 2005), and in the current study, most participants stayed on topic across all four writing sessions. Perhaps the instruction to write about one stressful event is sufficient to encourage participants to stay on topic, and small variations in writing topic are not sufficient to dampen the benefits of writing.

Participants who used more discovery of meaning statements reported higher levels of anxiety at the 3-month follow-up. Although some studies show an association between frequency of discovery of meaning during expressive writing and health improvement (Danoff-Burg et al., 2006; Graham et al., 2008; Stanton et al., 2002; Westling et al., 2007), others have failed to find this association (Creswell et al., 2007). Perhaps in the current study use of discovery of meaning statements was an indication of unresolved goal discrepancies, meaning that such statements reflected a comparison of participants' current situation with an unachieved standard of resolution surrounding the stressful event (Watkins, 2008).

Negative affect word use was also associated with increased anxiety at three months. Although affect labelling has been shown to reduce activity in the amygdala (Gorno-Tempini et al., 2001; Hariri, Bookheimer, & Mazziotta, 2000; Hariri et al., 2003; Lieberman et al., 2007) and subjective experiences of distress when looking at emotionally evocative images (Lieberman et al., 2011), the current findings do not support the extension of affect labelling's effects to expressive writing. However, it is important to note that participants were not randomly assigned to use varying levels of negative affective words, and that the association was curvilinear, with only those who used very

high numbers of negative affect words showing higher anxiety. Our findings are consistent with those of Pennebaker and Chung (2007) who found that very low and very high negative affective word use was associated with less benefit from writing while moderate negative affect word use predicted greater benefit. Although the current study did not replicate the previous finding for very low negative affect word use, we did replicate the curvilinear relationship for very high negative affective word use. As posited by Pennebaker and Chung, perhaps participants who overuse negative affect words are generally higher in negative affect and use the writing exercise as a ruminative process that inhibits achievement of closure through writing. In fact, participants with higher depressive symptoms at baseline used more negative affect words in their writing. However, when baseline depressive symptoms were added as a covariate in the model, the quadratic effect of negative affect words remained, indicating that the overlap with depression is not sufficient to explain the association between greater negative affect word use and higher anxiety at follow-up.

The current study has a number of limitations. First, we did not manipulate the constructs assessed in participants' writing and therefore cannot speak to causal relationships between the predictors and anxiety. Experimental manipulation of level of detail and self-affirmation will further elucidate key factors in expressive writing's positive effects. Second, the purported theoretical mechanisms of expressive writing are complex, and in operationally defining these constructs for coding purposes, we likely missed some of this complexity. We did, however, adhere to methods previously used in the literature, and despite having to simplify the constructs, did find that some indicators had predictive utility. Third, the coded categories for narrative structure and self-affirmation demonstrated moderate inter-coder reliability. Although correction for prevalence using the PABAK coefficient improved the reliability estimate for self-affirmation, it is important to note that these factors may be difficult to define operationally in expressive writing. It is notable, however, that the same definition for self-affirmation as used by Creswell and colleagues (2007) produced similar results in the current sample, albeit on a different outcome. Fourth, although the sample size was relatively large for an expressive writing study, due to concerns about overfitting the model, we chose not to examine interactions between predictors. Although this is the first study to test five predictors simultaneously in one model, it is possible that inclusion of interactions between predictors would produce different results.

In conclusion, the current study is the first to test five predictors of improvement following expressive writing simultaneously in one sample. Participants who used more self-affirmation statements and who wrote in more detail about a stressful event showed the greatest improvement in anxiety. Future studies could employ an experimental design to determine whether randomly assigning participants to use detail and self-affirming statements enhances the positive effects of expressive writing. In addition, testing whether these effects replicate within clinical populations (e.g., PTSD, cancer) may help researchers and clinicians improve existing treatments that include a writing component. These findings add to the expanding literature on predictors of expressive writing, and provide evidence that *how* participants write affects how much they can benefit from writing.

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