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Does Expressive Writing Reduce Health Care Utilization? A Meta-Analysis of Randomized Trials

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This meta-analysis examined whether writing about stressful experiences affects health care utilization (HCU) compared with writing on neutral topics or no-writing control groups. Randomized controlled trials of 30 independent samples representing 2,294 participants were located that contained sufficient information to calculate effect sizes. After omitting one study as an outlier, the effects were combined within 3 homogeneous groups: healthy samples (13 studies), samples with preexisting medical conditions (6 studies), and samples prescreened for psychological criteria (10 studies). Combined effect sizes, Hedges's *g* (95% confidence interval), with random effects estimation were 0.16 (0.02, 0.31), 0.21 (−0.02, 0.43), and 0.06 (−0.12, 0.24), respectively. Writing about stressful experiences reduces HCU in healthy samples but not in samples defined by medical diagnoses or exposure to stress or other psychological factors. The significance of these effects for individuals' health is unknown.

Keywords: writing, written expression, health care utilization, meta-analysis, health

Research on the effects of written emotional expression has increased dramatically in recent years. Most influential has been the experimental protocol developed by Pennebaker and Beall (1986), in which participants are randomly assigned either to a condition in which they write about stressful/upsetting experiences or to a neutral-writing control group, typically for 20 min for 3 or 4 days. The most commonly reported longer term effect of this simple and inexpensive intervention has been reduced health care utilization (HCU), often framed as a proxy for better health. The more than 40 studies in this literature vary greatly in the nature of the samples examined, methodological and reporting quality, operationalization of HCU, and statistical significance of findings. Quantitative synthesis, therefore, may aid meaningful evaluation of this evidence. Accordingly, this meta-analytic review seeks to determine whether, and for whom, writing about stressful experiences affects HCU and to briefly discuss the type of future research that might clarify the mechanisms underlying any observed effects.

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The Meaning of Health Care Utilization

Many researchers and reviewers in this area of research have made the problematic assumption that lower frequency of health care visits is a proxy for better health. However, going to the doctor less frequently when a genuine need exists is not a good outcome and may in fact be related to poorer health. In many areas of health services research, increased HCU is viewed as a positive outcome (e.g., working with underserved populations; retaining patients with chronic, relapsing illnesses in treatment and continuing care). Because one cannot make assumptions about the health implications of increasing or decreasing HCU for a specific individual, the effect of writing interventions on HCU should not be considered identical to their effect on actual health outcomes, such as the frequency of respiratory infections or objective physiological markers of disease.

Even so, the decision to go to the doctor has many cognitive, emotional, social, medical, and environmental determinants as well as personal, economic, and societal consequences, making it an important and interesting outcome in psychological science. This review focuses exclusively on the effects of written expression of stressful experiences on HCU, because HCU is important independent of its link to health status and because so many studies in the written expression literature have used it as a major outcome. Determining whether expressive writing interventions affect HCU is an important first step in clarifying this literature, even if at this time, it may not be possible to infer the mechanisms underlying the effects or their relationship to actual health status.

Other Quantitative Reviews

An early quantitative review of written emotional expression studies by Smyth (1998) estimated overall effect sizes (Cohen's *d*) for each of the 13 studies then available based on as many as five varying outcomes per study. All of these studies were conducted with generally healthy samples. Averaging many substantively

different effects within studies is problematic from both a statistical and an interpretive standpoint (Hedges & Olkin, 1985). To partially address these problems in further analyses, pooled effect sizes were estimated within each of five outcome groups (reported health, psychological well-being, physiological functioning, general functioning, and health behaviors). Reported health, the outcome most closely related to the aims of the present study, included 12 effects from nine studies with one or more of three different outcome variables: health center visits ($n = 8$), self-reported symptoms ($n = 3$), and upper respiratory illness ($n = 1$), yielding a pooled effect size of $d = 0.42$, $p < .001$. Even though over 75 experimental studies of written emotional expression on various outcomes have been completed since Smyth's review was conducted, researchers often rely on it as a basis for power calculations or procedural choices.

Another recently published meta-analysis of written emotional disclosure on the health outcomes of medical or psychiatrically defined samples (Frisina, Borod, & Lepore, 2004) also regarded reductions in HCU as synonymous with better health, resulting in the aforementioned interpretive difficulties. They did, however, report that six of the nine studies in their review examined an HCU outcome, with an average Cohen's *d* of .145. Unfortunately, it is unclear from the review what the specific point estimates were for each study or how this average was calculated.

Partially addressing the limitations of other quantitative reviews, Meads, Lyons, and Carroll (2003) recently completed a systematic review of written emotional disclosure studies on all observed outcomes. These reviewers estimated the effects of writing interventions on HCU apart from measures of health status. Furthermore, these reviewers recognized that many medical, psychological, social, and financial factors affect HCU. Therefore, they combined effects only within homogeneous groups of healthy samples, samples with preexisting medical problems, and samples screened for psychological diagnosis or stress. They did not combine effects of self-reported HCU and HCU data obtained from records. This strategy allowed the reviewers to make claims about exactly the outcomes the intervention affected and for whom. Although their analyses are somewhat more nuanced, Meads et al. (2003) concluded the following: "Objectively measured health center visits showed no significant differences between intervention and control (WMD [weighted mean difference] – 0.06, 95% CI [confidence interval] – 0.26 to + 0.13, random effects). Self-reported health center visits showed a similar result" (p. 1).

The present review builds on Meads et al. (2003) in several ways: First, this review updates the previous synthesis with 10 recently conducted and "fugitive" studies (i.e., those reported in dissertations or conference proceedings as well as in-press and in-review reports). This approach is more inclusive than Meads et al.'s review. Second, because self-reported HCU and HCU data gathered from records are conceptually identical and highly correlated, these effects are not separated in the present analyses, increasing overall power to detect intervention effects. However, the source of the HCU data (self-report vs. derived from records) is examined as a potential moderator of effect magnitude. Third, Meads et al. compared treatment and control conditions on the weighted mean difference of health care visits at follow-up, unadjusted for baseline group differences. This approach generally assumes that randomization has effectively minimized baseline differences, which is often untrue in small-sample studies. In fact, substantial baseline differences are known to exist in several studies in this literature. In the present study, when possible, following the advice of the Cochrane Collaboration (2004), effect sizes were calculated with the mean change score in the health care visits. This strategy, elaborated in the Method section, not only minimizes bias resulting from nuisance baseline differences but also partially ameliorates the extremely skewed nature of HCU distributions observed in most samples. Fourth, in order to include all possible studies in the meta-analysis, substantial efforts were made to gather additional information from study authors to calculate effect sizes.

Goals

The major goals of this review are fourfold: (a) to estimate the magnitude of the effects of expressive writing compared with control conditions on HCU within studies having similar sample characteristics; (b) to explore study and sample characteristics that might explain variability in effect magnitude (i.e., moderator variables); (c) to briefly discuss alternative mechanisms through which writing and HCU may be linked; and (d) to outline a research agenda toward further understanding how written expression affects HCU. Focusing the analyses on HCU allowed evaluation of the specific hypothesis that writing about stressful experiences affects HCU. However, it should be emphasized that these analyses cannot be generalized to the effects of this intervention on other outcomes.

Method

Search Procedure

English-language studies were located from four sources. First, the computerized databases Medline (Ovid), PsycINFO (Ovid), UMI Proquest Digital Dissertations, and Education Resources Information Center (ERIC) were searched with combinations of the following keywords: "writing," "written," "emotion," "disclosure," "trauma," "health," and "health care." Second, conference proceedings (2000 to 2004) were searched for the American Psychological Association, the Society of Behavioral Medicine, and the American Psychosomatic Society. Most of the articles published on this topic have in been in journals related to these organizations. Third, the reference sections of reviews, theoretical articles, and empirical studies of the written emotional disclosure intervention were examined to identify additional studies. Finally, many of the authors of articles located through the first three methods were contacted in order to identify studies that may have eluded detection (e.g., unpublished or in-press studies). All search strategies were updated and complete by December 2004.

Selection and Inclusion Criteria

The following criteria were used to screen each study for inclusion: (a) The study was a randomized experiment comparing a stress- or trauma-based writing task with a neutral-writing or no-writing comparison group (manipulations that included both written and oral emotional expression were excluded); (b) the study contained a measure of outpatient HCU, such as number of doctor or clinic visits (not self-reported symptoms, sick days, or hospital visits) measured at least 4 weeks post-intervention; and (c) the study provided an estimate of the treatment effect size or data that permitted calculation of the standardized mean difference (Hedges's *g*) either in the report or through supplemental information obtained from the authors.

Variable Coding

The following variables were extracted from each study on the basis of assumptions about what characteristics might moderate effect sizes as well as guidelines provided by Stock (1994). Methodological and reporting characteristics included the percentage of participants randomized that were retained for HCU follow-up, method of randomization stated, presence of single or double blind conditions (yes vs. no), explicit missing data strategy mentioned (yes vs. no), and whether the study was published in a peer-reviewed journal (yes vs. no). Intervention variables included the number of writing sessions, total minutes of writing, the spacing of the writing sessions (consecutive days vs. nonconsecutive days), location of writing (home vs. lab vs. combination), content of writing (most upsetting experience vs. other instructions), and comparison group task (neutral writing vs. no writing). Sample characteristics included percentage of female participants, college student sample (yes vs. no), and clinical description (preexisting medical condition vs. psychological criteria vs. healthy samples). Outcome measurement characteristics included the use of self-report HCU data versus HCU data from records and length of time until follow-up assessment.

Determination of Effect Sizes

The research literature on expressive writing is characterized by poor reporting of basic statistics, such as means and standard deviations. Because many studies included small numbers of participants, it was common for baseline differences to exist on recent HCU. One recommended strategy for reducing the influence of nuisance baseline differences is to compare the effects of intervention and control conditions on pre-intervention and post-intervention change scores (Cochrane Collaboration, 2004). An advantage of giving preference to change scores is that they are more normally distributed than are typical HCU data that are notoriously skewed, especially in healthy samples. Use of follow-up scores adjusted for baseline scores has the same desirable impact. Therefore, a hierarchy of data was established for calculating the estimates of effect size. From most to least preferred, the following quantities were located to calculate effect sizes: (a) means and standard deviations of changes in HCU, (b) means and standard deviations of health care visits at follow-up adjusted for baseline values of the outcome, (b) means and standard deviations of raw health care visits at follow-up. These data sources give very similar effect size estimates when randomization has worked. This strategy, as well as the appropriateness of combining the effects produced from these different metrics, is supported by the Cochrane Collaboration (2004).

Cohen's *d* (Cohen, 1988), the usual measure of the standardized mean difference, is known to be biased in small samples (Hedges & Olkin, 1985). Therefore, Hedges's *g,* an unbiased adjustment to Cohen's *d*, was used. Hedges's $g = [1 - (3/4N - 9)] \times$ Cohen's *d,* where *N* is the total sample size. Hedges's *g* and Cohen's *d* become closer as *n* increases. The means used to calculate the effect sizes in each study are presented in the last columns of Tables 1, 2, and 3, presented below. Effect sizes were calculated so that positive numbers indicate reductions in HCU for the treatment group relative to the control group, and negative numbers indicate reductions in HCU for the control group relative to the treatment group.

Many studies contained several variants of the stress/trauma writing instructions, such as instructing separate groups to write on feelings (but not thoughts), thoughts (but not feelings), or both thoughts and feelings related to upsetting experiences. For the purposes of this synthesis, the group that most closely approximated unrestricted writing about an upsetting experience was compared with the control condition. For example, given the choices above, the mixed thoughts and feelings group would be selected because it is least restrictive. If a study contained experimental groups in addition to the comparison groups of interest, these groups were ignored for the purposes of the analysis. Furthermore, many studies in this literature had multiple follow-up assessments. The data from the longest follow-up were used to calculate effect sizes and time to follow-up was explored as a moderator of effect size variability. An approach that used the follow-up closest to the median follow-up (13 weeks) yielded very similar results.

Results

Overall, 93 experimental writing studies were located, 42 of which evaluated an HCU outcome. Of these 42 studies, 12 were excluded: 8 because of insufficient information available to calculate an effect size (Donnelly, 1990; Kirk, 1999; Klapow et al., 2001; Levey-Thors, 2000; Murray, Lamnin, & Carver, 1989; Pennebaker & Beall, 1986; Sheffield, Duncan, Thomson, & Johal, 2002; Swanbon, 2000, 2) because of nonrandom assignment to experimental conditions (Hughes, 1994; Solano, Donati, Pecci, Persichetti, & Colaci, 2003), and 2 because oral emotional expression was mixed with written expression (Gidron et al., 2002; Gidron, Peri, Connolly, & Shalev, 1996). Efforts were made to contact the authors of the eight studies to obtain basic statistics needed to calculate effect sizes. In some cases the data were simply unavailable, whereas in other cases the authors did not respond or could not be located. Information regarding the screening flow is presented in Figure 1. More information regarding the excluded studies is available from the author, including effect sizes for the two nonrandomized trials and the written–oral combination studies.

After calculating effect sizes for the remaining studies, a test of heterogeneity of 30 effect sizes was conducted. This test was significant, $Q(29) = 52.4$, $p < .005$, indicating that the effects were not drawn from the same population of effects and should not be combined. The most statistically and clinically meaningful partition of these studies involved three groups: (a) studies of healthy samples, (b) studies of samples with preexisting medical conditions (medical samples), and (c) studies of samples prescreened for stress, trauma, or other psychological factors such as high somatization (psychological samples).

Summary information on the studies, including sample characteristics, intervention details, and effect size estimates, are presented in Table 1 for healthy samples, Table 2 for medical samples, and Table 3 for psychological samples. Table 4 presents summaries of study characteristics by group. Where within-group variability on these characteristics existed, the effects of these potential moderators on effect size magnitude were examined. Because of the relatively small number of studies within each group, the moderator analyses are somewhat underpowered and should be considered exploratory and interpreted with the recognition that Type II errors may exist.

Studies of Healthy People

Thirty-six studies examined the effects of the written expression intervention in healthy samples, typically undergraduate psychology students. Of these studies, 21 contained an HCU outcome, but only 14 of these used random assignment to experimental groups and contained enough information to calculate effect sizes. The characteristics of the 14 studies, as well as the estimated effect sizes and group means used in their calculation, are presented in Table 1. One of the 14 studies (King & Miner, 2000) produced an effect size that was many times larger than the rest of the studies in this group (Hedges's $g = 4.36$ at 3 months and 1.42 at 5

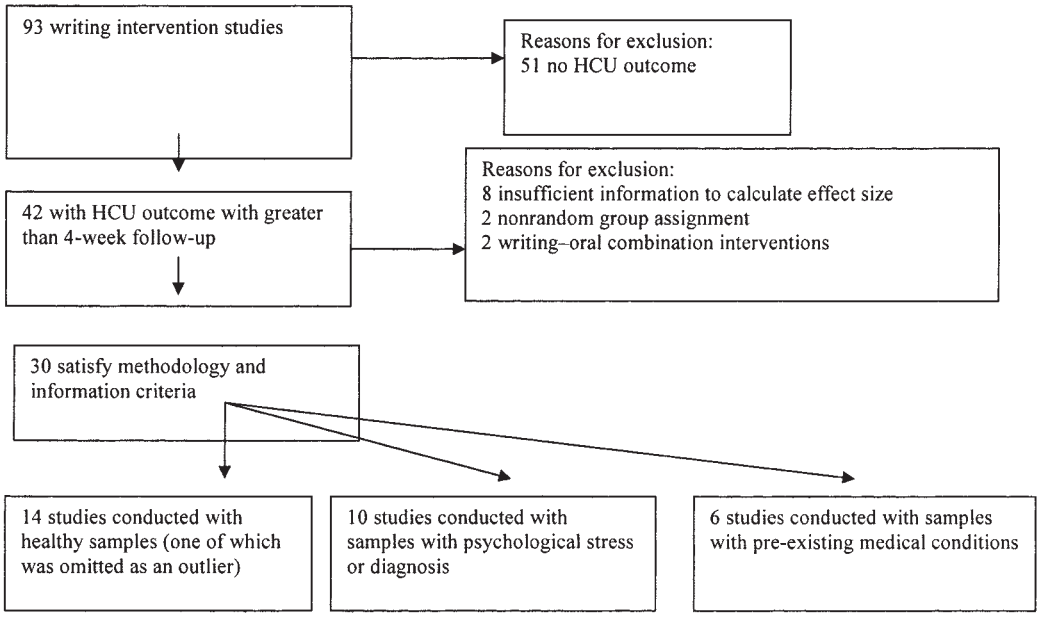

Figure 1. Trial profile. HCU = health care utilization.

months), with no obvious procedural or sampling characteristics that might explain such an effect. Therefore, as recommended when one study is a substantial outlier and creates significant heterogeneity within a group of studies that is otherwise conceptually and statistically homogeneous (Eagly & Wood, 1994), it was excluded from the estimate of the overall effect. Table 4 contains a summary of study characteristics of the remaining 13 studies as well as the results of the meta-analysis representing 1,391 completers. With a random effects model, the combined effect size was $g = 0.16$, 95% CI = 0.02 to 0.31, indicating that writing about stressful experiences significantly reduces HCU in healthy samples. Furthermore, the test of heterogeneity of these effects was nonsignificant, $Q(12) = 17.52$, *ns.* Calculations showed that 10 unaccounted-for null studies would reduce the combined effect size estimate to nonsignificance ("fail-safe *n*").

In examining potential moderators of effect size magnitude within the group of 13 studies of healthy samples, greater numbers of completers and the condition of writing outside the lab (in a place chosen by the participant) were associated with lower effect size estimates, $b = -.0005$, $p = .04$, and $b = -.25$, $p = .03$, respectively. These findings are heavily influenced by the one large study (Sheese, Brown, & Graziano, 2004) that used non-lab writing and had a slightly negative *g*. For the other 12 studies, the combined effect size was $g = 0.21$, 95% CI = 0.06 to 0.36.

Studies of Medical Samples

Twenty-five studies were identified that examined the effects of the written expression in samples with specific preexisting medical conditions. Among these, 7 contained an HCU outcome, of which 6 used randomization to experimental conditions. The characteristics and effect sizes of these 6 studies, representing 304 completers, are presented in Table 2. The test of heterogeneity of these effects is nonsignificant, $Q(5) = 3.49$, *ns.* With a random effects model, the combined effect size was $g = 0.21$, 95% CI = −0.03 to 0.43, indicating that writing about stressful experiences does not significantly reduce HCU in medical samples. None of the coded study characteristics moderated the effect size estimate (see Table 4), although the power to detect significant moderators was low given that there were just six studies in this group.

Studies of Psychological Samples

Thirty-one studies examined the effects of written expression in samples with psychological stress or diagnosis. Samples were included in this group if participants were selected on the basis of having experienced a stressful experience (e.g., death of loved one, romantic betrayal), having had a specific psychiatric diagnosis (e.g., posttraumatic stress disorder), or having experienced high levels of somatic symptoms without being defined by a specific medical diagnosis. Of the 31 studies, 12 had an HCU outcome, of which 11 contained enough information to calculate an effect size, but one of these studies combined writing and orally expression emotion (Gidron et al., 2002). The characteristics and effect sizes of the remaining 10 studies, representing 538 completers, are presented in Table 3. Using a random effects model, the combined effect size was $g = 0.06$, 95% CI = −0.12 to 0.24, meaning that writing about stressful experiences did not significantly reduce HCU in psychological samples. The test of heterogeneity of these effects was nonsignificant, $Q(9) = 10.87$, *ns.*

In examining potential moderators of effect size magnitude within the group of 10 studies, only greater number of sessions was significantly associated with lower effect size estimates ($b = -0.14$, $p = .04$). The single study with just one writing session (Greenberg, Wortman, & Stone, 1996) had the next-to-largest effect in this group ($g = 0.41$), whereas the study with the most writing sessions ($n = 7$; Stroebe, Stroebe, Schut, Zech, & van den Bout, 2002) had the smallest effect size ($g = -0.47$). This result should be considered tentative because of the small number of studies driving it and the attendant inequality of outcome variance

Table 1
Studies of 14 Healthy Samples Comparing the Effects of Stress/Trauma Writing to Neutral Writing on Health Care Utilization (HCU)

Study	Sample description, gender composition, and follow-up (FU) rate[a]	Writing session duration, spacing and no. sessions, and sample sizes[b]	HCU outcome and follow-up length	Hedges's *g* effect size, 95% confidence interval (CI), and method calculated[c]
Cameron & Nicholls (1998)	80 undergraduates 73% female 91% retained at FU	20-min sessions 3 consecutive weeks $n_t = 41$, $n_c = 39$	Self-reported HCVs 4 weeks	g = 0.39 95% CI = −0.06, 0.83 CS means: $M_t = -0.38$, $M_c = 0.13$
Crow (2000)	52 employed adults 58% female 46% retained at FU	20-min sessions 3 consecutive days $n_t = 23$, $n_c = 19$	HCVs from records 8 weeks	$g = -0.22$ 95% CI = −0.83, 0.39 CS means: $M_t = 0.21$, $M_c = -0.04$
Danoff-Burg et al. (2004)	92 undergraduates 49% female 100% retained at FU	30-min session 1 session $n_t = 48$, $n_c = 44$	HCVs from records 4 weeks	$g = 0.09$ 95% CI −0.32, 0.50 FU means: $M_t = 0.25$, $M_c = 0.30$
Greenberg & Stone (1992)	49 undergraduates 60% female 82% retained at FU	20-min sessions 3 consecutive days $n_t = 33$, $n_c = 16$	HCVs from records 8 weeks	$g = -0.06$ 95% CI −0.66, 0.53 CS means: $M_t = -0.07$, $M_c = 0.00$
King & Miner (2000)	61 undergraduates 70% female 72% retained at FU	20-min sessions 3 consecutive days $n_t = 38$, $n_c = 23$	HCVs from records 20 weeks	$g = 1.42$ 95% CI = 0.84, 2.00 Adjusted FU means: $M_t = -0.22$, $M_c = 0.55$
King (2001)	38 undergraduates 85% female 89% retained at FU	20-min sessions 4 consecutive days $n_t = 16$, $n_c = 22$	HCVs from records 20 weeks	$g = 0.41$ 95% CI = −0.24, 1.06 Adjusted FU means: $M_t = 0.05$, $M_c = 0.29$
Kloss & Lisman (2002)	87 undergraduates 50% female 60% retained at FU	20-min sessions 3 consecutive days $n_t = 47$, $n_c = 40$	HCVs from records 9 weeks	$g = -0.01$ 95% CI = −0.56, 0.53 CS means: $M_t = -0.50$, $M_c = -0.52$
Marlo & Wagner (1999)	106 undergraduates 66% female 90% retained at FU	20-min sessions 4 days over 2 weeks $n_t = 56$, $n_c = 50$	Self-reported HCVs 4 weeks	$g = 0.37$ 95% CI = −0.02, 0.75 FU means: $M_t = 1.27$, $M_c = 2.06$
Mosher et al. (2004)	69 undergraduates 62% female 83% retained at FU	20-min sessions 2 days over 1 week $n_t = 37$, $n_c = 32$	Self-reported HCVs 4 weeks	$g = -0.13$ 95% CI = −0.65, 0.39 CS means: $M_t = 0.13$, $M_c = 0.01$
Pennebaker et al. (1988)	50 undergraduates 72% female 100% retained at FU	20-min sessions 4 consecutive days $n_t = 25$, $n_c = 25$	HCVs from records 6 weeks	$g = 0.66$ 95% CI = −0.07, 1.24 CS means: $M_t = -0.12$, $M_c = 0.13$
Pennebaker et al. (1990)	130 undergraduates 52% female 95% retained at FU	20-min sessions 3 consecutive days $n_t = 83$, $n_c = 47$	HCVs from records 8 weeks	$g = 0.36$ 95% CI = −0.04, 0.72 Reported[d]
Pennebaker & Francis (1996)	72 undergraduates 61% female 80% retained at FU	20-min sessions 3 consecutive days $n_t = 35$, $n_c = 37$	HCVs from records 8 weeks	$g = 0.51$ 95% CI = −0.04, 0.98 Reported[d]
Sheese et al. (2004)	534 undergrads 56% female 98% retained at FU	20-min sessions 3 days/weeks[e] $n_t = 320$, $n_c = 214$	Self-reported HCVs 5 weeks	$g = -0.03$ 95% CI = −0.20, 0.17 FU means: $M_t = 0.04$, $M_c = 0.04$
Vas (2002)	100 undergraduates 78% female 51% retained at FU	20-min sessions 4 consecutive days $n_t = 50$, $n_c = 50$	HCVs from records 2 semesters 30 weeks	$g = -0.06$ 95% CI = −0.60, 0.49 FU means: $M_t = 1.10$, $M_c = 0.97$

Note. t = treatment group; c = control group; HCV = health center visit; CS = change score.
[a] Sample size represents the number initially randomized to groups of interest, excluding those in other (e.g., positive writing) groups. Percentage of female participants was calculated with total sample (all groups), as gender by group percentages were unavailable.
[b] Groups other than those writing about stress/traumatic themes and neutral-writing control groups were ignored in this review. Sample sizes in this column refer to the number randomized to these groups.
[c] Additional details regarding the effect size calculations for each study are available from the author.
[d] Group means were not available. Cohen's *d* for 2-month change score in health visits per month was reported in Pennebaker and Francis (1996).
[e] The treatment group that wrote on consecutive days was combined with the group that wrote during consecutive weeks and was compared with the control group that wrote on consecutive days.

across the range of the predictor. However, the suggestion is that in psychological samples, more writing sessions produce greater HCU in the treatment group compared with the control group.

Discussion

Because all of the studies included in this review were randomized controlled trials, it is reasonable to conclude that writing about stressful experiences caused a reduction of HCU, relative to neutral writing, in samples of healthy people. However, in studies of people with preexisting medical conditions and studies of psychologically stressed or diagnosed people, significant effects were not found. Potential reasons why the intervention reduced HCU in some samples and not in others are explored after comparing these results with those reported by Meads et al. (2003) and discussing important interpretive caveats.

Table 2
Studies of 6 Medically-Defined Samples Comparing the Effects of Stress/Trauma Writing and Neutral Writing on Health Care Utilization (HCU)

Study	Sample description, gender composition, and follow-up (FU) rate[a]	Writing session duration, spacing and no. sessions, and sample sizes[b]	HCU outcome and follow-up length	Hedges's *g* effect size, 95% confidence interval (CI), and method calculated[c]
Gillis et al. (2004)	72 adults with fibromyalgia 97% female 99% retained at FU	20-min sessions 4 consecutive days $n_t = 38$, $n_c = 34$	Self-reported HCVs 12 weeks	$g = 0.29$ 95% CI = −0.19, 0.76 CS means: $M_t = -0.42$, $M_c = 0.33$
Harris (2004)	78 adults with asthma 57% female 97% retained at FU	20-min sessions 3 consecutive weeks $n_t = 42$, $n_c = 36$	Self-reported HCVs 8 weeks	$g = 0.07$ 95% CI = −0.40, 0.54 CS means: $M_t = -0.07$, $M_c = 0.01$
Rosenberg et al. (2002)	30 prostate cancer patients 0% female 100% retained at FU	20- to 30-min sessions 4 consecutive days $n_t = 16$, $n_c = 14$	NMCUES 12 weeks	$g = 0.33$ 95% CI = −0.42, 1.09 CS means: $M_t = -2.40$, $M_c = 0.90$
Siegel et al. (2003)	65 patients with IBS 79% female 81% retained at FU	20-min sessions 4 days over 2 weeks $n_t = 26$, $n_c = 27$[d]	HCVs from records 52 weeks	$g = -0.11$ 95% CI = −0.66, 0.44 CS means: $M_t = -0.80$, $M_c = -2.08$
Stanton et al. (2002)	42 breast cancer patients 100% female 95% retained at FU	20-min sessions 4 days over 3 weeks $n_t = 21$, $n_c = 18$	Self-reported HCVs[e] 12 weeks	$g = 0.62$ 95% CI = −0.02, 1.27 Adjusted FU means: $M_t = 3.83$, $M_c = 8.28$
Taylor et al. (2003)	70 cystic fibrosis patients ?% female 56% HCU follow-up[f]	20-min sessions 3 days over 1 week $n_t = 18$, $n_c = 21$[g]	Outpatient visits from records 12 weeks	$g = 0.25$ 95% CI = −0.38, 0.88 CS means: $M_t = 0.10$, $M_c = 0.70$

Note. t = treatment group; c = control group; HCV = health center visit; CS = change score; NMCUES = National Medical Care Utilization and Expenditure Survey; IBS = irritable bowel syndrome.
[a] Sample size represents the number initially randomized to groups of interest, excluding those in other (e.g., positive writing) groups. Percentage of female participants was calculated with total sample (all groups), as gender by group percentages were unavailable.
[b] Groups other than those writing about stress/traumatic themes and neutral-writing control groups were ignored in this review. Sample sizes in this column refer to the number randomized to these groups.
[c] Additional details regarding the effect size calculations for each study are available from the author.
[d] These are the number who completed the study in each group; the number randomized to each group was unavailable.
[e] Self-reported medical appointments for cancer-related morbidities and other reasons combined.
[f] Of the 70 patients enrolled, 14 failed to complete and 17 additional patients were excluded because of high or low HCU.
[g] These are the numbers of patients who completed the study in each group. The number randomized to each group was unavailable.

Comparison With Meads et al.'s (2003) Review

The comparable results from Meads et al.'s (2003) review are similar to those of the present meta-analysis. Evaluating eight studies involving healthy samples (five objective HCU, one subjective HCU), Mead et al. reported a small but significant reduction in HCU in the treatment groups compared with the control groups. No significant effect was found for studies of psychologically stressed samples in either objective HCU (four studies) or subjective HCU (five studies). Although a significant reduction in subjective HCU was found for the treatment groups of the two studies of medical samples, the opposite effect was found in the one study that used objective HCU data. Overall, the results of the two reviews are similar, except that the present review may have more power to detect effects, given the larger number of studies used and the combining of results of studies that used objective and subjective HCU data.

What Do These Effects Mean?

The current review has established that for some people, writing about stressful experiences reduces HCU. Further, this review provides estimates of the size of those effects. Unfortunately, it is difficult to assign significance to these effects on the basis of their magnitude alone. Small effects on important outcomes (such as mortality), especially if easily and inexpensively obtained, are extremely noteworthy. Conversely, large magnitude effects on trivial outcomes may not justify the expenditure of even modest effort or cost. Because information about the people whose HCU was affected is unavailable, specifically, whether more or less HCU is a desirable outcome for each person, it is difficult to assign a descriptor (e.g., "big," "good") to the combined effect size estimates. Even if concerns are limited to cost, short-term reductions in HCU, resulting in cost savings, may lead to more expensive HCU in the long term.

Control group reactivity? Another issue that hampers the clear interpretation of these results is that some of the larger effects were produced by increases in HCU by the neutral-writing control groups (*e.g.*, King, 2001; Kovac & Range, 2000). Examination of the group means of change scores and adjusted follow-up scores reveal the various patterns of response for the studies (see the last column of Tables 1–3). Although the control group response could accurately reflect the seasonal trend of the nonstudy population and therefore suggest a buffering effect of the intervention when the treatment groups' HCU does not change, this pattern of results is also consistent with HCU reactivity to the neutral-writing task. Future research could determine which of these mechanisms is

Table 3
Studies of 10 Stressed or Psychologically Defined Samples Comparing the Effects of Stress/Trauma Writing and Neutral Writing on Health Care Utilization (HCU)

Study	Sample description, gender composition, and follow-up (FU) rate[a]	Writing session duration, spacing and no. sessions, and samples sizes[b]	HCU outcome and follow-up length	Hedges's *g* effect size, 95% confidence interval (CI), and method calculated[c]
Batten et al. (2002)	64 women with SA hx. 100% female 92% retained at FU	20-minute sessions 4 consecutive days t = 34, c = 30	Self-reported HCVs 12 weeks	$g = -0.05$ 95% CI = −0.57, 0.47 FU means: $M_t = 0.71$, $M_c = 0.65$
Deters & Range (2003)	57 undergraduates with trauma hx. ?% female 98% retained at FU	15-minute sessions 4 days over 2 weeks t = 30, c = 27	Self-reported HCVs 7 weeks	$g = -0.14$ 95% CI = −0.68, 0.40 CS means: $M_t = -0.65$, $M_c = -0.96$)
Greenberg, Wortman, & Stone (1996)	64 undergraduates with trauma hx. 100% female 90% retained at FU	30-minute session 1 session t = 33, c = 31	HCVs from records 4 weeks	$g = 0.41$ 95% CI = −0.09, 0.92 Adjusted FU means: $M_t = 0.03$, $M_c = 0.22$
Kovac & Range (2000)	42 undergraduates who had someone close commit suicide 80% female 71% retained at FU	15-minute sessions 4 days over 2 weeks t = 20, c = 22	Self-reported HCVs 8 weeks	$g = 0.51$ 95% CI = −0.25, 1.27 CS means: $M_t = 0.00$, $M_c = 1.16$
Kovac & Range (2002)	78 undergraduates with hx. of suicidal thoughts 73% female 81% retained at FU	20-min sessions 4 days over 2 weeks $n_t = 40$, $n_c = 38$	Self-reported HCVs 6 weeks	$g = 0.26$ 95% CI = −0.25, 0.76 CS means: $M_t = 0.27$, $M_c = 0.77$
Lumley et al. (1999)	74 undergraduates high in somatic symptoms 70% female 97% retained at FU	15 to 20-min sessions 4 consecutive days $n_t = 37$, $n_c = 37$	HCVs from records 12 weeks	$g = -0.33$ 95% CI (−.80, .15) CS means: $M_t = 0.42$, $M_c = 0.34$
Range et al. (2000)	64 undergraduates bereaved by the death of someone close 80% female 69% retained at FU	15-min sessions 4 days over 2 weeks $n_t = 34$, $n_c = 30$	Self-reported HCVs 6 weeks	$g = 0.06$ 95% CI = −0.55, 0.67 CS means: $M_t = .20$, $M_c = .29$
Richards et al. (2000)	68 prison inmates with psychiatric diagnoses 0% female 93% retained at FU	20-min sessions 3 consecutive days $n_t = 39$, $n_c = 29$	HCVs from records 6 weeks	$g = 0.32$ 95% CI = −0.18, 0.83 CS means: $M_t = -1.01$, $M_c = -0.16$
Stroebe et al. (2002)	59 adults bereaved by death of partner 55% female 45% retained at FU	10 to 30-min sessions 7 consecutive days $n_t = 29$, $n_c = 30$	HCVs from records 52 weeks	$g = -0.47$ 95% CI = −1.32, 0.37 CS means: $M_t = -0.70$, $M_c = -1.90$
Zentner (2000)	59 undergraduates following romantic breakup 64% female 100% retained at FU	20-min sessions 3 consecutive days $n_t = 35$, $n_c = 24$	HCVs from records 26 weeks	$g = -0.04$ 95% CI = −0.57, 0.49 CS means: $M_t = 0.20$, $M_c = 0.17$

Note. SA = sexual abuse; hx = history; t = treatment group; c = control group; HCV = health center visit; CS = change score.
[a] Sample size represents the number of participants initially randomized to groups of interest, excluding those in other (e.g., positive writing) groups. Percentage of female participants was calculated with total sample (all groups), as gender by group percentages were unavailable.
[b] Groups other than those writing about stress/traumatic themes and neutral-writing control groups were ignored in this review. Samples sizes in this column refer to the number randomized to these groups.
[c] Additional details regarding the effect size calculations for each study are available from the author.

operating by including a no-writing control group and/or by monitoring trends in HCU for the population of interest during the study period.

Clinically, it is most important to identify people for whom stress- or trauma-based writing might be contraindicated. Within the group of 10 psychologically defined samples, it is worth noting that 3 of 4 of the largest positive effects were produced primarily by increases in control group HCU. These samples were composed of female undergraduates with a history of suicidal thoughts (Kovac & Range, 2002) or trauma (Greenberg et al., 1996) or who had someone close to them commit suicide (Kovac & Range, 2002). Although it is possible that the stress- or trauma-based writing buffered the treatment group from the seasonal increases in HCU experienced by the untreated population (and reflected in the control group), it is important to consider the possibility that the control group writing task produced the observed increases in HCU while the treatment group task may have been inert. If the control group task caused an undesirable increase in HCU, then it may be contraindicated for these samples.

Table 4
Study Sample Characteristics: Descriptive Statistics and Tests of Moderation

Study characteristic	Healthy samples (n = 13)	Medical samples (n = 6)	Psychological samples (n = 10)
Combined effect size	0.16	0.21	0.06
Combined effect size 95% CI	0.02, 0.31	−0.02, 0.43	−0.12, 0.24
Mean (*SD*) weeks to FU	9.1 (7.6)	18.0 (16.7)	13.9 (14.8)
Mean (*SD*) no. of completers	107 (131)[a]	51 (18)	54 (15)
Mean (*SD*) no. of sessions	3.1 (0.9)	3.7 (0.5)	3.8 (1.5)[a]
Mean (*SD*) minutes writing	59.2 (19.3)	73.3 (10.3)	68.0 (28.2)
Mean proportion (*SD*) retained for FU	.82 (.18)	.88 (.17)	.83 (.17)
Mean proportion (*SD*) female participants	.63 (.11)	.67 (.41)	.69 (.30)
Studies published	69.2%	66.6%	90.0%
Sessions on consecutive days	76.9%	33.3%	60.0%
Writing outside the lab	7.7%[a]	50.0%	0.0%
No-writing control group	0.0%	33.3%	10.0%
College student samples	92.3%	0.0%	70.0%
HCU from records vs. self-report	69.2%	50.0%	50.0%

Note. CI = confidence interval; FU = follow-up; HCU = health care utilization. Within each group of studies, each potential moderator that contained non-zero variability was entered into a separate regression model predicting effect size magnitude. Beta coefficients for the significant moderator analyses are presented in the text. Summaries for the following study characteristics are not presented but are available from the author: method of randomization defined (yes vs. no), blindness to treatment condition (yes vs. no); explicit missing data strategy mentioned (yes vs. no), content of writing (most upsetting experience vs. other instructions). None of these features of methodological quality were significant moderators.
[a] Within this sample of studies, more of this characteristic was significantly ($p < .05$) associated with lower effect size estimates.

Distribution of HCU change. Another factor that tempers confidence in interpreting these results is the typically skewed nature of HCU data and the problems that this can cause for estimating and interpreting effect sizes. When data are highly skewed and contain many zeros, it is important to use analytic strategies that do not assume normal distributions (see Delucchi & Bostrom, 2004, for alternatives to t and F tests). Most of the studies in this literature ignored this issue. Hedges's g was chosen as the measure of effect size in this meta-analysis because it is unbiased and because techniques exist to combine gs obtained from independent studies to estimate an overall effect. However, Hedges's g and Cohen's d also share the assumptions of the t test. One of the limitations of this meta-analysis is that, although the problem has not been ignored, it is virtually impossible to avoid. Calculation of more appropriate nonparametric estimates of effect size requires access to the individual-level pre-intervention and post-intervention data. Furthermore, the machinery to combine nonparametric effect size estimates is not well developed.

At issue is whether the observed effects are caused by a general trend in the sample or by a response from a few outliers. As an illustrative example, imagine the following scenario: In a study of healthy college students over 3 months, a treatment group (n = 50) and control group (n = 50) each have a Poisson distribution with a mean (*SD*) number of health care visits at a baseline of 1.00 (1.00). Under this distribution, roughly 60% will have no visits or one visit, and a few will have four to five visits. Modeling this scenario through simulations, one can verify that if each of the roughly three people in the treatment group with more than three baseline visits reduced their frequency of visits to three visits in the follow-up period, and the remaining (approximately) 97 people had no change in HCU, the effect size will be approximately 0.10 to 0.30. Note that the same effect could be observed with a comparable increase in HCU in the control group.

Again, small effect sizes in highly desirable outcomes may be important regardless of whether they are produced by broad-based improvements or changes in a few outliers. A Hedges's g of 0.16 could mean either that everyone in the treatment group experienced less HCU or that very few high utilizers in the treatment group reduced their HCU (or that similar patterns of increased HCU existed in the control group). Knowing more about the desirability and distribution of these changes in HCU will allow researchers to determine, in a targeted way, for whom this intervention may be indicated or contraindicated. Clearly, more descriptive statistics regarding the patterns of HCU and HCU change are needed to fully understand the meaning of the studies in this literature or, by proxy, the effects estimated in this synthesis.

Group Differences

Why was a significant effect found in healthy samples but not in medical or psychologically defined samples? The aforementioned interpretive challenges make possible explanations for this result highly speculative. That said, HCU tends to be greater and more normally distributed in medical and psychological samples than in healthy samples and therefore may be less influenced by change in a few individuals. In healthy samples, the intervention may reduce HCU by satisfying the nonmedical needs of healthy high utilizers (e.g., a venue for expressing concerns and emotional topics) that they previously sought to meet in the health care setting. If this is the underlying mechanism through which HCU is reduced in healthy samples, then apparently the intervention lacks the potency to act on clinical samples or affect their more stable distributions. In medical samples, HCU is probably more driven by actual medical need than the extra-medical gains and, therefore, may be less influenced by the psychological intervention. In psychological samples, the tendency to meet extra-medical needs in the health care setting may be too great to satisfy with this intervention. It is worth noting however that the point estimate for the combined effect size in the medical studies is the largest of the three groups, even though it was not significantly different from zero. In other words, the lack of a significant finding may be due to lack of power rather than lack of potency.

Future Research

To summarize, the main obstacles to interpreting the effects found in this meta-analysis are the following: (a) It is not known whether changes in HCU are desirable or how these changes are associated with actual health; (b) it is somewhat unclear how much the observed effects are due to decreases in treatment group HCU

(or treatment group buffering from seasonal increases) versus HCU reactivity to the control group task; and (c) it is not known whether the effects were caused by a few outliers in otherwise unresponsive samples. Suggestions for future research directly target these issues.

One suggestion for future research is to test the intervention in samples for which the meaning of changes in HCU can be assumed, such as people who have been precategorized as over- or underusers of health care. Especially given the one promising study examining the effect of expressive writing on generally healthy overusers of primary care (e.g., Gidron et al., 2002), targeting future studies on samples for whom HCU reductions are unequivocally desirable appears sensible. Another approach is to assess actual health outcomes in addition to HCU and then to examine the relationship between changes in HCU and changes in health. If, for example, decreases in HCU are mediated by improvements in health, then one could be more confident that the observed reductions in HCU were desirable. In contrast, one might find that decreases in HCU may mediate declines in health outcomes. Previous studies that measured both health variables and HCU over several assessments may be able to check these possibilities with preexisting data. Future research in this area also needs to account for possible HCU reactivity to the control group task, by adding a no-writing comparison group, and also must address the typically skewed nature of HCU data, through the use of transformations or nonparametric analytic strategies.

As suggested, in order to dramatically improve our knowledge regarding the meaning and underlying mechanisms of the effects observed in this meta-analysis, researchers can posit and test models through which HCU, health, and writing about stressful experienced may be linked in specific samples. Several reviews regarding the mechanisms through which expressive writing may improve actual health are available (e.g., Sloan & Marx, 2004; Smyth & Greenberg, 2000); however, the possibility that changes in HCU may be associated with poorer health or may be unrelated to health is very rarely entertained.

For example, one could posit that the stress of the writing task may make participants somewhat less likely to go to a doctor, even if the need arises. Avoidant copers might become more avoidant once provoked by the stress-writing task. Another explanation for the observed effect is based on the fact that people use the health care system to get psychological needs met. For example, meaningful interpersonal contact and empathic listening by a counselor was found in one study to reduce emergency room use among heavy users of ER services (Redelmeier, Molin, & Tibshirani, 1995). Although it is possible that such contact improved the health of these overusers, it is much more likely that their social/psychological needs were met elsewhere, thus reducing their inappropriate use of the emergency room. Similarly, the writing task may satisfy some psychological needs of overusers of health care, thereby reducing subsequent HCU as a means to satisfy these needs.

By carefully specifying and testing causal models, researchers might learn how writing decreases HCU for healthy samples but not for medical or psychologically defined samples. Until that time, however, researchers can only speculate about this potentially important effect. On the one hand, if the observed reductions in HCU are shown to be desirable, that is, produced either by improvement in health or by reducing unnecessary HCU, then the writing intervention may be shown to be a simple, accessible, and inexpensive means to achieve these important ends. On the other hand, if the observed reductions in HCU are shown to be the result of decreases in medically important health care or control group reactivity to the neutral writing task, then the intervention may be contraindicated. In either case, the effects found in this study need better, empirically supported explanation before their clinical implications are clear.

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