Written Emotional Expression Produces Health Benefits in Fibromyalgia Patients

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Objective: Written expression of traumatic experiences, an intervention found to have health benefits in rheumatoid arthritis, asthma, and breast cancer, was tested in a randomized, controlled trial with female fibromyalgia patients. It was hypothesized that relative to controls, patients engaging in the writing intervention would experience improved status on psychological well-being and physical health variables. **Methods:** Patients ($N = 92$) were randomized into a trauma writing group, a control writing group, or usual care control group. The two writing groups wrote in the laboratory for 20 minutes on 3 days at 1-week intervals. Psychological well-being, pain, and fatigue were the primary outcome variables. Assessments were made at pretreatment, posttreatment, 4-month follow-up, and 10-month follow-up. **Results:** The trauma writing group experienced significant reductions in pain (effect size [ES] = 0.49) and fatigue (ES = 0.62) and better psychological well-being (ES = 0.47) at the 4-month follow-up relative to the control groups. Benefits were not maintained at the 10-month follow-up. **Conclusion:** Fibromyalgia patients experienced short-term benefits in psychological and health variables through emotional expression of personal traumatic experiences. **Key words:** fibromyalgia, self disclosure, pain, well-being, randomized clinical trial.

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ED = written emotional disclosure; **RA** = rheumatoid arthritis; **QOL** = Quality of Life Scale; **STAI-S** = state version, State-Trait Anxiety Inventory; **BDI** = Beck Depression Inventory; **MOS** = Medical Outcome Study; **CLINHAQ** = Clinical Health Assessment Questionnaire; **FIQ** = Fibromyalgia Impact Questionnaire; **VAS** = visual analogue scale; **NW** = neutral writing group; **UC** = usual-care control group; **ANOVA** = analysis of variance; **ES** = effect size.

INTRODUCTION

Fibromyalgia has proven to be a particularly tenacious illness to treat effectively, and its underlying pathology remains uncertain. Recent evidence points to a central sensitization process as contributing to the chronic pain in these patients (1–3). This encourages efforts to identify interventions that can downregulate the sensitization process. Fibromyalgia is often diagnosed in patients with other functional somatic syndromes (eg, irritable bowel syndrome, chronic fatigue syndrome, temporomandibular disorder) (4–6), all of which are associated with psychiatric comorbidity (7–10). Clinical trials of antidepressants, particularly dual-action, are yielding encouraging results for reducing pain and disability in fibromyalgia patients (11). Cognitive-behavioral treatment has demonstrated moderate efficacy (12,13). Physical reconditioning and exercise interventions have also shown efficacy (12,14). Thus, interventions that target biological and psychological mechanisms have proven to be most promising in this population.

Written emotional disclosure (ED) is a brief psychological intervention that has yielded health benefits in a variety of populations. It was initially tested in college students; those randomly assigned to disclose their deepest thoughts and feelings about a personal trauma experienced significant reductions in visits to the health center and self-reported symptoms in subsequent months compared with students instructed to write about neutral topics (15–19). Investigations to identify the physiological mediators of health effects revealed a salutary immune response after the intervention (20–22). A meta-analysis of ED studies revealed treatment effect sizes (d) of 0.42 for reported health and 0.68 for physiological and immunological measures. In addition to biomedical outcomes, psychological well-being has also shown improvement ($d = 0.66$) (23).

The finding of positive health effects among healthy individuals led to investigations of ED among individuals with medical illness. The first investigations studied patients with rheumatoid arthritis (RA) and yielded significant changes in physical functioning (24) and physician-rated disease severity (25). The effectiveness of ED has since been documented in patients with asthma (25), cancer (26–28), posttraumatic stress symptoms (29), high users of medical services (30), and patients undergoing bladder resection (31). Interestingly, in the vast majority of studies, the only effect observed immediately posttreatment is an increase in negative mood. It is not until 3 to 4 months later that the improvements in psychological well-being and health variables are observed. Most studies have not followed participants for more than 3 to 6 months; thus, the long-term effects of the intervention are not known.

Surveys have documented high rates of abuse, trauma, and injury among fibromyalgia patients (32). A comparison of fibromyalgia and RA patients found double the rate of sexual or physical abuse in fibromyalgia patients (62%) as in arthritis patients (34%) (33). An interview study comparing fibromyalgia and RA patients found even higher rates of lifetime abuse, 92% and 67% respectively (34). Studies of physical trauma have found an increased incidence of fibromyalgia in the 6 months subsequent to the trauma (35,36). Research has documented an increased incidence of a variety of functional somatic syndromes among victims of abuse and trauma (37–41).

The high rates of trauma observed in fibromyalgia patients suggest that an intervention targeting the cognitive and emotional processing of past traumas might be particularly effective for this patient population. This study examined the

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efficacy of ED in a randomized controlled trial of fibromyalgia patients. It was hypothesized that patients in the ED condition would experience improvement in psychological and health status variables in comparison with patients in a neutral writing condition. Of particular interest were two symptoms, pain and fatigue, that are central to the experience of fibromyalgia. Because there was no previous experience with disclosure interventions for fibromyalgia patients and it was unknown whether the neutral writing condition would produce a placebo response, it seemed prudent to add a usual-care control group. Based on previous research, the treatment effect was not expected to be evident until the 4-month follow-up assessment, and it was unknown whether it would persist through the 10-month follow-up.

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METHODS

Patients

Recruitment of female fibromyalgia patients was conducted through notices in local newspapers and an academic hospital and by contacting patients in our laboratory database who had requested to be informed of research participation opportunities. The trial was advertised as a stress management writing program. Exclusion criteria were age younger than 21 years, no formal diagnosis of fibromyalgia by a physician, major psychiatric disorder, current substance abuse, previous experience with systematic journaling, lack of transportation to the research laboratory for baseline health assessments and writing sessions, or inability to read English and to write for at least 20 minutes. Patients' physicians provided confirmation of fibromyalgia diagnosis after written consent of each participant. Of 297 women who inquired, 54 (18%) were ineligible, and 129 (43%) were eligible but not interested or unavailable for scheduled laboratory visits. Thus, 114 (47%) of 243 eligible patients participated (Figure 1).

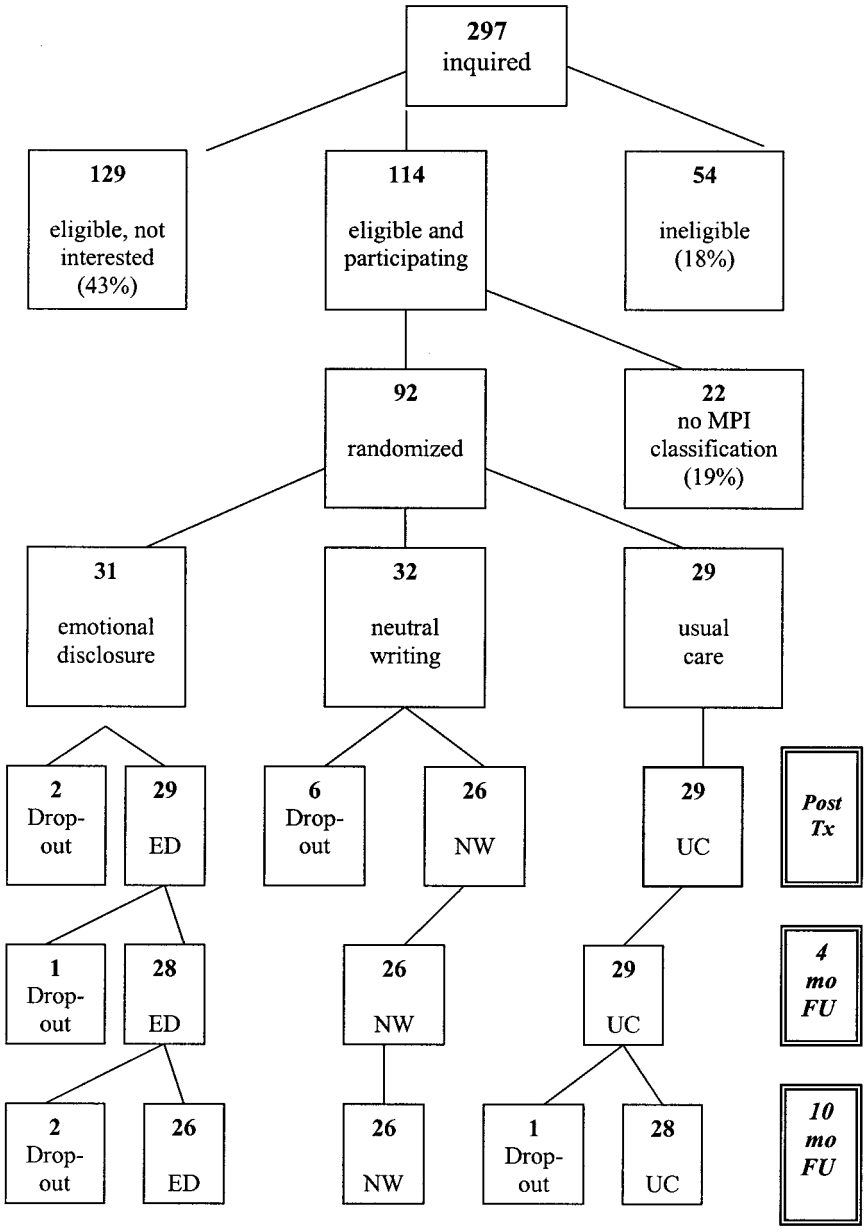

Figure 1. Flow chart of patient recruitment and attrition.

Measures

Psychological Well-Being

The Quality of Life Scale (QOL) is a 16-item instrument designed to measure quality of life across a broad array of life domains in patients with chronic illness. The instrument has been shown to be reliable and content-valid. Among medical patients, internal consistency was above 0.85, and 6-week test-retest reliability was 0.76 (42).

The state version of the State-Trait Anxiety Scale (STAI-S) is a 20-item, self-report instrument that assesses anxiety at the moment. Internal reliability is greater than 0.90 in several adult samples, it correlates well with other measures of anxiety, and it is responsive to changes in anxiety state (43).

The Beck Depression Inventory-II (BDI) is a 21-item self-report measure incorporating cognitive, affective, and somatic aspects of depressed mood (44). Internal consistency is 0.86 for psychiatric samples and 0.81 for non-psychiatric samples, and the BDI has demonstrated validity in distinguishing levels of depressed mood and being sensitive to treatment change (45).

Pain

The Multidimensional Pain Inventory (MPI) is a 61-item self-report inventory for use in chronic pain populations that generates 13 empirically-derived scale scores, including pain severity, perception of how pain interferes with daily life activities, appraisals of the support received from significant others, and perception of how significant others respond to their displays of pain. Internal consistency of scale items ranges from 0.70 to 0.90, and test-retest stability of the scales ranges from 0.62 to 0.91 (46). A taxonomy of three adaptational styles of coping with pain has been derived and replicated across a variety of chronic pain groups (47–51).

The McGill Pain Questionnaire is a widely-used self-report pain questionnaire assessing several domains of pain experience: intensity, sensory, and affective. Test-retest reliability within 7 days is 0.70 (52). The McGill Pain Questionnaire has been shown to differentiate among distinct pain syndromes (53,54), and a review of factor analytic investigations has found support for the affective and sensory dimensions (55). Reliability and validity have been documented across several studies.

Fatigue

The energy/fatigue 4-item subscale of the Medical Outcome Survey (MOS) Short-Form General Health Survey was used. Internal consistency for the scale is 0.78, and it has been shown to differentiate fatigue levels between patient and nonpatient groups (56). Three additional items assessing tiredness on awakening, tiredness during the day, and quality of sleep were rated over the past week on 4-point scales.

Other Health Variables

The Fibromyalgia Impact Questionnaire (FIQ) is an adaptation of the Health Assessment Questionnaire and the Arthritis Impact Measurement Scales. Items assessing physical functioning and stiffness were used in this study. One-week test-retest reliability for physical functioning is 0.95, and validity is comparable with the scales on which it is based and is satisfactory (57). Four additional subscales from the MOS Short-Form General Health Survey were selected: overall health, social functioning, health distress, and cognitive dysfunction. Three items from the Clinical Health Assessment Questionnaire (CLINHAQ) were used to assess gastrointestinal, headache, and fatigue symptoms on a 100-point visual analogue scale (VAS).

Design

Study participants were randomized into one of three conditions: emotional disclosure writing condition (ED), neutral writing condition (NW), and usual-care condition (UC). Randomization was achieved through a computer-generated random distribution of sequential numbers into three groups. This group assignment list was kept by the first author, who was not involved in patient recruitment or eligibility determination. When a patient was determined to be eligible, the first author consulted the assignment list and informed the research staff of the patient's group assignment. The NW condition controlled for any placebo effects associated with coming to the laboratory and engaging in a credible treatment activity. The UC condition controlled for the natural course of the illness and provided a basis on which to determine whether the NW condition exhibited any effect beyond UC. MPI patient classification was used to stratify patient assignment to the experimental groups such that equal numbers of patients in the three pain classifications were randomly assigned to each experimental condition to allow investigation of relative attrition and treatment response (not reported in this article). Assessments were conducted before randomization, posttreatment, at 4-month follow-up, and at 10-month follow-up. Data collection began in October 2001, and follow-up was completed in September 2003.

Procedure

Interested patients were provided with detailed information about the trial and screened for eligibility during an initial telephone interview. Participants were scheduled for pretreatment assessment in the laboratory, at which time informed consent and permission to contact their physician to confirm their diagnosis of fibromyalgia were obtained and assessment instruments were completed. On completion of their pretreatment visit, patients were informed that they would be contacted within the next couple of days regarding their group assignments and dates for their next laboratory visits. The MPI was scored, classification was determined, assignment to condition was made, and patients were telephoned and informed of assignment to a writing condition or usual care. Patients who could not be classified into one of the three MPI adaptational groups ($N = 22$), ie, scoring indicated hybrid or anomalous patterns, were not randomized into the study design. Patients assigned to the ED or NW conditions were scheduled for three visits to the laboratory in approximately 1-week intervals. On arrival at the laboratory, patients were escorted into a private office, a research staff member read aloud the writing assignment for that session, and patients were left alone with a written copy of the instructions for 20 minutes to complete their writing. The research staff alerted the patient 20 minutes later that the session was complete and collected the writing. Posttreatment and follow-up assessments were conducted by mail. Patients were paid $40 for participation. The research protocol was approved by the Stony Brook University Research Compliance office.

Written Emotional Disclosure Condition

The written emotional disclosure condition (ED) instructions, a variation on those used in previous studies (25,58), focused on factual retelling of an important current or past traumatic event along with emotional expression and cognitive reappraisal. The instructions indicated that grammar and spelling were unimportant and that the writing should involve deep thoughts and feelings about the event. The instructions for session 2 encouraged patients to consider the trauma in a comprehensive, integrated way, to consider relating it to effects it may have had on their beliefs and life view, and to write in a story format with a beginning, middle, and end. Session 3 instructions suggested that patients reflect on any new insights they might have gained from the two previous writing sessions and to write about these insights, changes in how they think or feel about the event now, and things they could do differently in the future. Patients were provided with the pager telephone number of an on-call clinician who could be contacted between writing sessions in case of emotional upset caused by the writing.

Neutral Writing Condition

The neutral writing condition (NW) instructions, identical to those used in previous studies (25,58), directed the patient to write without concern about spelling or grammar about day-to-day activities in relation to the time invested. Session 1 asked for a description of plans for the past week; session 2 focused on the previous 24 hours; session 3 focused on the upcoming week. It was emphasized that only facts should be written, not any emotions associated with them.

Analytic Strategy

Given the large number of measurements, Type I error was managed by creating composite measures of three constructs: pain, fatigue, and psychological well-being. Composites were constructed by standardizing construct item or scale scores, using pretreatment means and SDs across all patients.

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These standardized scores were transposed, if needed, such that a higher score depicted more distress and were then averaged. Thus, the pretreatment composite *z*-scores indicated where that patient scored in relation to all patients at pretreatment. The posttreatment and follow-up *z*-scores indicated where that patient scored relative to all patients at pretreatment. The Pain Composite was composed of the McGill scores: sensory, affective, VAS severity, and present pain intensity (average intercorrelation across scales = 0.62). The Fatigue Composite was composed of the items tired on awakening, tired during the day, and quality of sleep, the MOS 4-item energy scale, and the CLINHAQ fatigue item (average intercorrelation = 0.48). The Psychological Well-being Composite was composed of the BDI, STAI-S, and QOL (average intercorrelation = 0.68).

The primary hypothesis stated that the ED condition would experience greater improvement from pretreatment to the 4-month follow-up than the NW and UC control conditions. Before testing this hypothesis, we determined that the two control conditions could be combined, because planned comparisons of these two groups with respect to the change from pretreatment to 4-month follow-up on all outcome variables were not different (see Results). We next tested the primary hypothesis by comparing the change from pretreatment to 4-month follow-up in the ED condition versus the control conditions. For those outcome variables that displayed a significant treatment effect, additional planned comparisons were conducted to determine whether the treatment effect was evident immediately at posttreatment (pre to post) and whether it was maintained at the 10-month follow-up (pre to 10-month).

Multilevel modeling (SAS, Version 8.2, PROC MIXED) was used to estimate a repeated-measures analysis of variance (ANOVA) model that allowed for unbalanced (incomplete) data. Unlike traditional repeated-measures ANOVA, in which subjects who are missing any assessment are entirely excluded from the analysis, this procedure uses all available data and thereby maximizes statistical power. The model that was estimated treated the four assessments (pretreatment, posttreatment, 4-month follow-up, and 10-month follow-up) as repeated measures, group (ED versus the combined control group) as the primary factor, and employment status as a covariate, because the groups differed on percent employed (see Results). As in most clinical trials, the focus was on the group by time interaction effect. However, rather than test the less-powered full 3 *df* hypothesis, we decided, a priori, to test specific 1 *df* contrasts in a hierarchical fashion. Specifically, we first tested our primary hypothesis concerning the treatment effect at 4-month follow-up. Only when this was statistically significant did we proceed to examine whether the treatment effect was already present at posttreatment and whether it was maintained through the 10-month follow-up. The SAS syntax for this code is available from the authors.

In the case of significant treatment effects, we also present estimates of the treatment effect size (ES), defined as the group difference in average change divided by the SD of pretreatment scores on the variable (59). We also report Cohen's *d*, a statistic commonly reported in meta-analyses that characterizes differential group effects relative to the SD of change scores. As described in Cohen, the statistical power of the study depends on *d*, but the cross-sectional SD (rather than the SD of the change scores) provides a more interpretable metric for evaluating the magnitude of treatment effect. An analysis of statistical power indicated that with $N = 30$ in the ED group and $N = 60$ in the (combined) control groups and $\alpha = 0.05$ (2-tailed), the study would have 83% power to detect a difference of 0.66 SDs of change scores ($d = 0.66$). Given that *d* depends on the effect size and the correlation between premeasurement and subsequent measurements, it follows that if the correlation is 0.50/0.60/0.70, then the study will have 83% power to detect effect sizes of 0.66/0.60/0.52.

RESULTS

Baseline Characteristics

Ninety-two patients were randomly assigned: ED ($N = 31$), NW ($N = 32$), and UC ($N = 29$). The average patient was 50 years old, white, married or living with a partner, middle-class, with some college education, and reported onset of fibromyalgia symptoms approximately 9 years ago. Demographic characteristics by experimental condition are displayed in Table 1. The differences among the conditions were small and not statistically significant (all $p > .20$), except that fewer ED patients were employed ($\chi^2[2, N = 92] = 5.31$; $p = .07$).

Pretreatment data for each experimental condition are displayed in Table 2. One-way ANOVAs were computed, and the only measure on which the groups differed significantly was the MOS social functioning item ($F[2,77] = 3.24$; $p = .05$). In addition, there was a trend for group differences on the quality of sleep item ($F[2,87] = 2.91$; $p = .06$). Post hoc comparisons using Tukey's HSD method found that the ED group reported greater limitation of social functioning compared with the UC group ($p = .04$) and had poorer quality of sleep than the NW group ($p = .05$).

TABLE 1. Demographic Characteristics by Experimental Condition (M, SD, or Percent)

	Emotional Disclosure, $N = 31$	Neutral Writing, $N = 32$	Usual Care, $N = 29$
Age	51.6 (11.5)	48.2 (12.3)	49.4 (11.4)
Years with symptoms	10.4 (8.4)	7.5 (6.0)	8.1 (5.4)
Years since diagnosis	5.5 (5.0)	4.6 (3.9)	4.7 (4.2)
Education (%)			
High school graduate	23	41	28
1–4 Years college	61	44	55
Graduate education	16	16	17
Race (white, %)	87	94	93
Employed (%)*	36	63	59
Disabled (%)	23	23	17
Income (%)			
<$20,000	21	20	18
$20,000-$49,999	28	23	32
>$50,000	52	57	50
Living with partner (%)	71	78	66

*$p = .07$.

TABLE 2. Means and SDs of Clinical Outcome Variables at Pretreatment by Experimental Condition

Clinical Outcome Variables	Emotional Disclosure, $N = 31$	Neutral Writing, $N = 32$	Usual Care, $N = 29$
Psychological well-being			
Psychological composite*	0.18 (1.2)	−0.12(0.9)	−0.10 (0.9)
QOL	56.3 (13.5)	52.3 (12.4)	50.6 (13.5)
BDI	21.2 (13.4)	18.8 (10.3)	19.9 (8.9)
STAI-S	43.1 (14.1)	39.8 (11.2)	40.7 (12.1)
Pain			
Pain composite*	0.13 (1.0)	−0.05(1.1)	−0.14 (1.0)
McGill—sensory	19.2 (5.5)	17.5 (6.9)	18.0 (6.6)
McGill—affective	5.3 (3.1)	4.7 (2.9)	5.0 (2.8)
McGill—VAS	6.2 (1.8)	6.0 (2.2)	6.3 (1.9)
McGill—intensity	3.1 (0.9)	3.0 (0.9)	2.7 (0.9)
Fatigue			
Fatigue composite*	0.00 (1.0)	−0.09(1.0)	0.07 (0.9)
Quality of sleep***	8.2 (2.1)	6.9 (2.4)	7.7 (2.0)
Tired waking	8.2 (2.1)	8.0 (2.4)	8.7 (1.6)
Tired day	7.1 (2.2)	7.6 (2.3)	7.4 (2.4)
MOS—energy	76.7 (15.4)	73.5 (18.4)	76.2 (19.4)
CLINHAQ—fatigue	7.3 (1.9)	7.1 (2.4)	7.8 (1.9)
Other measures			
FIQ—physical functioning	4.5 (2.4)	5.2 (2.2)	5.1 (2.2)
FIQ—stiffness	8.0 (1.9)	7.9 (2.6)	7.8 (2.6)
MOS—overall health	58.9 (26.3)	64.0 (21.9)	54.3 (24.2)
MOS—social functioning**	53.8 (25.8)	41.9 (26.5)	34.8 (27.8)
MOS—health distress	52.1 (28.9)	45.2 (25.0)	45.3 (24.6)
MOS—cognitive dysfunction	49.8 (17.8)	42.2 (22.6)	46.4 (19.5)
CLINHAQ—stomach	4.2 (2.8)	4.3 (2.9)	4.9 (3.0)
CLINHAQ—headache	4.4 (2.9)	4.5 (3.4)	3.4 (3.1)

All measures are scaled such that higher numbers indicate greater distress; *z-scores; **$p = .05$; ***$p = .06$.

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Attrition

Eight participants who were randomized into the protocol did not reach posttreatment (ED = 2, NW = 6), one did not complete the 4-month follow-up (ED), and three more did not complete the 10-month follow-up (ED = 2, UC = 1). Thus, 12 of 92 patients (13%) did not complete the full protocol. There were no significant differences in rates of dropout by experimental condition. Because hypothesis testing focused on pretreatment to 4-month follow-up data, we compared demographic and clinical outcome variables on the 9 patients who did not reach the 4-month follow-up with the 83 patients who did complete. Only demographic variables were relevant to attrition. Dropouts had lower levels of education ($\chi^2[2, N = 92] = 6.3$; $p = .04$), were more likely to be receiving disability (57% vs. 18%; Fisher's exact; $p = .03$), were older (60 vs. 49 years; $t[14.1] = -4.9$; $p < .001$), were less likely to be employed (45% vs. 78%; Fisher's exact; $p = .08$), and were less likely to be married (44% vs. 75%; Fisher's exact; $p = .11$). There were no significant differences between dropouts and completers on the clinical outcome variables measured at pretreatment.

Of the 31 ED participants, 29 (94%) completed all three writing sessions, one dropped out before the first writing assignment, and another completed one session. Of the 32 NW participants, 25 (78%) completed all three writing sessions, five dropped out before the first writing assignment, one dropped out after one writing session, and one completed two writing sessions and remained the in study.

Manipulation Check of Writing Conditions

A manipulation check of the two writing conditions to confirm that the instructions for each condition resulted in systematic differences in the writing experience was conducted through linguistic analysis of the essays written by participants. The writing instructions explicitly directed participants in the ED condition to express emotion, whereas in the NW condition, they were instructed to focus on facts, excluding any emotionality. Using the Linguistic Inquiry and Word Count program (60), we compared the numbers of positive and negative emotion words in the patients' written essays. The ED group's writing had a significantly higher percent of positive emotion words (M = 2.4%) compared with the NW group (M = 1.2%; $t[55] = 6.03$; $p < .001$). Likewise, the percent of negative emotion words varied systematically by experimental group. The ED group used a mean of 2.4% negative emotion words, compared with 0.3% in the NW group ($t[37.5] = 11.56$; $p < .001$). The content of the ED essays included death of a loved one ($N = 10$), family health problem ($N = 7$), physical or mental abuse ($N = 4$), personal health ($N = 4$), divorce ($N = 3$), and miscellaneous traumas ($N = 3$).

TABLE 3. Mean Change Scores (Least Square Means: 4-Month Follow-up Minus Pretreatment) and SEs by Experimental Condition

Clinical Outcome Variables	Range of Scale	Emotional Disclosure, $n \sim 28$	Neutral Writing + Usual Care, $n \sim 55$	Planned comparison p value
Psychological well-being				
Psychological composite*		−0.8 (0.16)	0.4 (0.11)	**.009**
BDI	0 to 63	−5.8 (1.7)	−1.1 (1.2)	.01
STAI-S	20 to 80	3.7 (2.4)	7.0 (1.7)	.14
QOL	16 to 112	0.6 (2.1)	7.0 (1.5)	.007
Pain				
Pain composite*		−0.6 (0.19)	0.1 (0.14)	**<.001**
McGill—sensory	0 to 33	−3.4 (1.0)	−0.4 (0.7)	.009
McGill—affective	0 to 12	−0.6 (0.5)	−0.2 (0.4)	.51
McGill—VAS	0 to 10	−1.0 (0.4)	0.1 (0.3)	.03
McGill—intensity	0 to 5	−0.6 (0.2)	0.1 (0.2)	.004
Fatigue				
Fatigue composite*		−0.9 (0.22)	−0.3 (0.16)	**.016**
Quality of sleep	0 to 10	−1.8 (0.5)	−0.1 (0.3)	.001
Tired waking	0 to 10	−1.3 (0.5)	−0.5 (0.4)	.13
Tired day	0 to 10	−0.7 (0.6)	−0.4 (0.4)	.52
MOS—energy	0 to 100	−13.7 (4.4)	−3.7 (3.1)	.05
CLINHAQ—fatigue	0 to 10	−1.2 (0.4)	−0.7 (0.3)	.18
Other measures				
FIQ—physical functioning	0 to 10	−0.7 (0.3)	−0.3 (0.2)	.28
FIQ—stiffness	0 to 10	−1.2 (0.5)	−0.5 (0.4)	.15
MOS—overall health	0 to 100	1.4 (3.6)	−2.1 (2.6)	.43
MOS—social functioning	0 to 100	−9.9 (6.1)	4.1 (4.3)	.06
MOS—health distress	0 to 100	−7.9 (4.4)	−8.2 (3.0)	.91
MOS—cognitive dysfunction	0 to 100	−2.9 (4.0)	1.7 (2.9)	.21
CLINHAQ—stomach	0 to 10	−0.3 (0.6)	0.3 (0.4)	.35
CLINHAQ—headache	0 to 10	−0.8 (0.6)	0.3 (0.4)	.13

While the multilevel modeling analyzed data from all 92 Ss, the estimated change depends primarily on those with both pre- and 4-month follow-up data (N reported in this table); all measures are presented such that negative change scores indicate improvement; *z-scores.

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Combining Control Groups

Comparisons of the two control groups were conducted on the three composite measures and remaining individual outcome measures using planned comparisons of pretreatment to 4-month follow-up change. No significant differences were found which allowed the groups to be combined into a single control group (NW + UC) for the purpose of testing the primary hypothesis.

Hypothesis Testing

Change in psychological well-being was examined with a planned comparison of change from pretreatment to 4-month follow-up for the ED group versus the NW + UC group (Table 3). A significant difference was found ($t[238] = -2.63$; $p = .009$; ES = 0.47; $d = 0.54$) as a result of a worsening for NW + UC and a slight improvement for ED. Change from pretreatment to posttreatment was not different for the groups ($t[238] = -0.86$; $p = .39$), and it was not different from pretreatment to the 10-month follow-up ($t[238] = -0.35$; $p = .73$). Analysis of the effects for each measure making up the composite found that both QOL ($t[238] = 2.71$; $p = .007$) and BDI ($t[236] = -2.59$; $p = .01$) but not STAI-S contributed to the effect observed for the psychological well-being composite measure. Whereas 57% of the ED and 50% of the NW + UC patients were classified as having moderate to severe depressive symptoms (BDI ≥ 17) at pretreatment, at the 4-month follow-up, only 32% of the ED group did, whereas the NW + UC group remained at 50%.

A significant treatment effect was also found for the pain composite measure ($t[238] = -3.48$; $p < .001$; ES = 0.49; $d = 0.45$) for the planned comparison of pretreatment to 4-month follow-up. Pain in the ED group dropped by 0.54 SDs, whereas the NW + UC group's pain increased by 0.11 SDs. The effect was not evident at posttreatment ($t[238] = -1.27$; $p = .21$), and the effect was lost at the 10-month follow-up ($t[244] = -1.01$; $p = .31$). Analysis of the component measures found that three of the four McGill pain scales contributed to the effect: sensory ($t[233] = -2.64$; $p = .009$), severity ($t[228] = -2.18$; $p = .03$), intensity ($t[229] = -2.95$; $p = .004$), affective ($t[233] = -0.66$; $p = .51$) .

A significant treatment effect was also found for the fatigue composite measure ($t[236] = -2.43$; $p = .016$; ES = 0.62; $d = 0.50$) for the planned comparison of pretreatment to 4-month follow-up. Change from pretreatment to posttreatment was not different for the groups ($t[236] = -1.48$; $p = .14$), and it was not different from pretreatment to the 10-month follow-up ($t[236] = -1.14$; $p = .26$). Examination of the 5 items/scales comprising the composite found that each followed the pattern of the composite, but only changes from pretreatment to 4-month follow-up in MOS energy ($t[238] =$

2.02; $p = .05$) and the quality of sleep item ($t[232] = -3.22$; $p = .001$) were significant.

None of the remaining MOS, FIQ, or CLINHAQ measures reached significance at the 0.05 level.

DISCUSSION

This study was designed to test whether the efficacy of written emotional disclosure observed in several other medical conditions generalizes to fibromyalgia. Based on previous research, we hypothesized that psychological well-being would show the strongest treatment effect and that other health variables would show more moderate effects. The two cardinal symptoms of fibromyalgia are pain and fatigue. The analyses were designed as planned comparisons of pretreatment to 4-month follow-up change, because the preponderance of research findings have observed a delayed treatment effect, ie, positive treatment effects not evident at posttreatment, but only several months later. If a treatment effect was evident at the 4-month follow-up, we examined whether there was evidence of its onset at posttreatment, and whether the effect persisted to the 10-month follow-up.

The hypotheses were supported for the three primary outcome measures: psychological well-being, fatigue, and pain. For both pain and fatigue, those patients who wrote about traumatic experiences experienced substantial reductions, whereas the control groups either did not or improved only slightly. None of the effects were evident at posttreatment. The effect sizes (d) for change from pretreatment to 4-month follow-up were as large or larger than those reported in other trials of ED (pain = 0.45, fatigue = 0.50). However, 6 months later, at the 10-month follow-up, results were disappointing in that none of the measures showed sustained improvement. Turning to psychological well-being, the moderate-sized treatment effect ($d = 0.54$) is somewhat smaller than expected and is explained by the worsening of the control groups from pretreatment to the 4-month follow-up, whereas the slight improvement in the ED group was largely carried by the reduction in depression but not anxiety or quality of life. Whereas other studies have used milder constructs, such as positive mood and adjustment to college, as measures of psychological well-being, this study used two clinical variables, depression and anxiety, plus quality of life. These clinical measures may be more difficult to affect. Nevertheless, it is noteworthy that our effect sizes are comparable with those observed in both pharmaceutical and nonpharmaceutical clinical trials for fibromyalgia (12).

Our rationale for using composite measures of outcome variables, whenever possible, was based on the desire to control Type I error by reducing the number of individual analyses computed. In retrospect, this strategy may have had other benefits. It is generally noted that measures have less error variance as the number of observations on which they are based increases, and decreased error variance enhances the power to detect change and group differences. Thus, it is conceivable that for some of the outcome measures used, especially those based on single or few items, increased error variance may have led to insufficient power to detect actual changes in true scores (Type II error). In fact, of the 12 measures contributing to the three composites, only 7 (58%) yielded a significant treatment effect standing alone. Because there were no studies in the literature on the efficacy of written emotional disclosure in fibromyalgia patients, we cast the net widely in selecting outcome variables. So as not to burden patients with assessment overload, we welcomed the use of some single items (eg, VAS) and brief scales. However, this decision may have resulted in underpowered tests of treatment effects on the constructs that could not be combined into composite measures.

This study used two control groups: a time-management writing condition that paralleled the emotional disclosure group in all ways except for the writing topic and a usual care group that did not come into the laboratory for writing. Both groups were equivalent on outcome variables and were combined. Because many placebo treatments produce a salutary effect, it is interesting that the time-management condition in this study did not. Thus, one must question whether participants viewed the time-management condition as a credible treatment intervention. Although we conducted a manipulation check to verify that the content of the essays differed in the two writing conditions, we did not ask participants to rate the value or credibility of the intervention. Interestingly, when we surveyed the emotional disclosure literature, we found that few studies evaluated the credibility of control groups. In the four that did (61–64), three reported that the control condition was equally meaningful or valuable compared with the emotional disclosure condition (including one that used time management (64)). Anecdotally, we can report that it was common for participants in the time management condition to note spontaneously that they felt it was a helpful exercise to examine their use of time. Nevertheless, a limitation of the study is the absence of ratings of the credibility of the placebo control.

These results demonstrate that fibromyalgia should join the growing list of illnesses whose symptoms can be reduced through a brief, self-directed program of writing about traumatic experiences in the laboratory. Achieving these results in an illness such as fibromyalgia, which has been very resistant to treatment, is particularly encouraging and is suggestive of the potency of the intervention. This study also replicates the sleeper effect of this intervention—that is, a delay of several months before the positive treatment effect is observed. Only the fatigue composite began improving as early as posttreatment, whereas for both pain and psychological well-being, improvement was not evident until 4 months posttreatment. This study did not incorporate assessment of psychological and biological mediational processes throughout the follow-up period in order to identify how and when the outcome variables were being influenced. Explanation of mediational processes for expressed emotional interventions and the reason for the delayed effect are crucial areas for future research.

With few exceptions, most of the expressed emotion trials in medical settings have used follow-up periods of 3 to 4

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months (24,25,28), with a few extending to 6 months (22,26). The exceptions include a study with breast cancer patients that assessed patients at 4 and 7 months posttreatment and observed largely null findings (65). Schoutrop (29) and Lange et al. (66) studied individuals referred by physicians for posttraumatic stress symptoms or unresolved grief and found sustained benefit at a 2-year follow-up for the psychological variables avoidance and intrusions. Although our study demonstrated the success of the intervention at the 4-month follow-up, it also showed that the effect was short-lived, as evidenced by patients returning to pretreatment levels at the 10-month follow-up. This regression to pretreatment levels in longer-term follow-up in fibromyalgia clinical trials is not unique to emotional disclosure. Other forms of treatment, such as physical exercise and cognitive behavioral therapy, have also suffered from a lack of sustained benefits (67,68), although some patients do achieve longer-term improvement (13,69–71). This clearly dampens enthusiasm for applying emotional disclosure interventions in medically ill populations, because transitory health benefits do not make a meaningful contribution. It also raises interesting questions for current theories explaining the basis of the intervention. If disinhibition, habituation through exposure, or cognitive reappraisal is thought to underlie the effect (72,73), one would expect that these psychological changes would be sustained at least in reference to the traumas addressed in the patient's writing. Why would there be a reversal of these changes, or why would the sustained psychological changes no longer generate the salutary benefits? It is possible that new stresses and traumas were introduced during the 10-month follow-up period that account for the worsened health status. It may also be that sustained benefits can be achieved only with sustained emotional disclosure. We believe that the field has advanced sufficiently that short-term follow-ups are no longer adequate, especially when efficacy in medical populations is being studied. Once we have established that the effect can be achieved in the short-term, we must investigate the persistence of the effect. This could instigate efforts to elaborate the intervention through booster sessions or other means such that the intervention could make a more meaningful contribution to the long-term health and well-being of patients.

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REFERENCES

1. Granot M, Buskila D, Granovsky Y, Sprecher E, Neumann L, Yarnitsky D. Simultaneous recording of late and ultra-late pain evoked potentials in fibromyalgia. Clin Neurophysiol 2001;112:1881–7.
2. Staud R, Cannon RC, Mauderli AP, Robinson ME, Price DD, Vierck CJ Jr. Temporal summation of pain from mechanical stimulation of muscle tissue in normal controls and subjects with fibromyalgia syndrome. Pain 2003;102:87–95.
3. Bennett RM. The rational management of fibromyalgia patients. Rheum Dis Clin North Am 2002;28:181–99.
4. Nimnuan C, Rabe-Hesketh S, Wessely S, Hotopf M. How many functional somatic syndromes? J Psychosom Res 2001;51:549–57.
5. Wessely S, Nimnuan C, Sharpe M. Functional somatic syndromes: one or many? Lancet 1999;354:936–9.
6. Aaron LA, Buchwald D. Chronic diffuse musculoskeletal pain, fibromyalgia and co-morbid unexplained clinical conditions: Bailliere's best practice and research. Clin Rheumatol 2003;17:563–74.
7. Walker EA, Keegan D, Gardner G, Sullivan M, Katon WJ, Bernstein D. Psychological factors in fibromyalgia compared with rheumatoid arthritis, I: psychiatric diagnoses and functional disability. Psychosom Med 1997;59:565–71.
8. Aaron L, Buchwald D. A review of the evidence for overlap among unexplained clinical conditions. Ann Intern Med 2001;134:868–81.
9. Morriss RK, Ahmed M, Wearden AJ, Mullis R, Strickland P, Appleby L, Campbell IT, Pearson D. The role of depression in pain, psychophysiological syndromes and medically unexplained symptoms associated with chronic fatigue syndrome. J Affect Disord 1999;55:143–8.
10. Manu P. The psychopathology of functional somatic syndromes: neurobiology and illness behavior in chronic fatigue syndrome, fibromyalgia, Gulf War illness, irritable bowel, and premenstrual dysphoria. Binghamton, NY: Haworth Press; 2004.
11. Fishbain D. Evidence-based data on pain relief with antidepressants. Ann Med 2000;32:305–16.
12. Rossy LA, Buckelew SP, Dorr N, Hagglund KJ, Thayer JF, McIntosh MJ, Hewett JE, Johnson JC. A meta-analysis of fibromyalgia treatment interventions. Ann Behav Med 1999;21:180–91.
13. Williams DA, Cary MA, Groner KH, Chaplin W, Glazer LJ, Rodriguez AM, Clauw DJ. Improving physical functional status in patients with fibromyalgia: a brief cognitive behavioral intervention. J Rheumatol 2002;29:1280–6.
14. Sim J, Adams N. Systematic review of randomized controlled trials of nonpharmacological interventions for fibromyalgia. Clin J Pain 2002;18:324–36.
15. Pennebaker JW, Beall SK. Confronting a traumatic event: toward an understanding of inhibition and disease. J Abnorm Psychol 1986;95:274–81.
16. Cameron LD, Nicholls G. Expression of stressful experiences through writing: effects of a self-regulation manipulation for pessimists and optimists. Health Psychol 1998;17:84–92.
17. Greenberg M, Stone A. Emotional disclosure about traumas and its relation to health: effects of previous disclosure and trauma severity. J Pers Soc Psychol 1992;63:75–84.
18. Greenberg M, Wortman C, Stone A. Health and psychological effects of emotional disclosure: a test of the inhibition-confrontation approach. J Pers Soc Psychol 1996;71:588–602.
19. King L, Miner K. Writing about the perceived benefits of traumatic events: implications for physical health. Pers Soc Psychol Bull 2000;26:220–30.
20. Esterling B, Antoni M, Fletcher M, Marguiles S, Schneiderman N. Emotional disclosure through writing or speaking modulates Epstein-Barr virus antibody titers. J Consult Clin Psychol 1994;10:334–50.
21. Pennebaker J, Kiecolt-Glaser J, Glaser R. Disclosure of traumas and immune function: health implications for psychotherapy. J Consult Clin Psychol 1988;56:239–45.
22. Petrie K, Booth R, Pennebaker J. Disclosure of trauma and immune response to a hepatitis B vaccination program. J Consult Clin Psychol 1995;63:787–92.
23. Smyth J. Written emotional expression: effect sizes, outcome types, and moderating variables. J Consult Clin Psychol 1998;66:174–84.
24. Kelley J, Lumley M, Leisen J. Health effects of emotional disclosure in rheumatoid arthritis patients. Health Psychol 1997;16:331–40.
25. Smyth J, Stone A, Hurewitz A, Kaell A. Effects of writing about stressful experiences on symptom reduction in patients with asthma or rheumatoid arthritis. JAMA 1999;281:1304–9.
26. Rosenberg H, Rosenberg S, Ernstoff M, Wolford G, Amdur R, Elshamy M, Bauer-Wu S, Ahles T, Pennebaker J. Expressive disclosure and health outcomes in a prostate cancer population. Int J Psychiatry Med 2002;32:37–53.
27. de Moor C, Sterner J, Hall M, Warneke C, Gilani Z, Amato R, Cohen L. A pilot study of the effects of expressive writing on psychological and behavioral adjustment in patients enrolled in a phase II trial of vaccine therapy for metastatic renal cell carcinoma. Health Psychol 2002;21:615–9.
28. Stanton AL, Danoff-Burg S, Sworowski LA, Collins CA, Branstetter AD, Rodriguez-Hanley A, Kirk SB, Austenfeld JL. Randomized, controlled trial of written emotional expression and benefit finding in breast cancer patients. J Clin Oncol 2002;20:4160–8.

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29. Schoutrop M. Structured writing in processing traumatic events. Unpublished doctoral dissertation. Amsterdam: University of Amsterdam; 2000.
30. Gidron Y, Duncan E, Lazar A, Biderman A, Tandeter H, Shvartzman P. Effects of guided written disclosure of stressful experiences on clinic visits and symptoms in frequent clinic attenders. Fam Pract 2002;19: 161–6.
31. Solano L, Donati V, Pecci F, Persichetti S, Colaci A. Postoperative course after papilloma resection: effects of written disclosure of the experience in subjects with different alexithymia levels. Psychosom Med 2003;65:477–84.
32. Van Houdenhove B, Neerinckx E, Lysens R, Vertommen H, Van Houdenhove L, Onghena P, Westhovens R, D'Hooghe MB. Victimization in chronic fatigue syndrome and fibromyalgia in tertiary care: a controlled study on prevalence and characteristics. Psychosomatics 2001; 42:21–8.
33. Carpenter M, Hugler R, Enzenauer R, Rosier K, Kirk J, Brehm W. Physical and sexual abuse in female patients with fibromyalgia. J Clin Rheumatol 1998;4:301–6.
34. Walker EA, Keegan D, Gardner G, Sullivan M, Bernstein D, Katon WJ. Psychosocial factors in fibromyalgia compared with rheumatoid arthritis, II: sexual, physical, and emotional abuse and neglect. Psychosom Med 1997;59:572–7.
35. Buskila D, Neumann L. Musculoskeletal injury as a trigger for fibromyalgia/posttraumatic fibromyalgia. Curr Rheumatol Rep 2000;2: 104–8.
36. Buskila D, Neumann L, Vaisberg G, Alkalay D, Wolfe F. Increased rates of fibromyalgia following cervical spine injury: a controlled study of 161 cases of traumatic injury. Arthritis Rheum 1997;40:446–52.
37. Olden KW, Drossman DA. Psychologic and psychiatric aspects of gastrointestinal disease. Med Clin North Am 2000;84:1313–27.
38. Ringel Y, Drossman DA, Turkington TG, Bradshaw B, Hawk TC, Bangdiwala S, Coleman RE, Whitehead WE. Regional brain activation in response to rectal distension in patients with irritable bowel syndrome and the effect of a history of abuse. Dig Dis Sci 2003;48:1774–81.
39. Heim C, Ehlert U, Hanker JP, Hellhammer DH. Psychological and endocrine correlates of chronic pelvic pain associated with adhesions. J Psychosom Obstet Gynecol 1999;20:11–20.
40. Penza KM, Heim C, Nemeroff CB. Neurobiological effects of childhood abuse: implications for the pathophysiology of depression and anxiety. Arch Womens Ment Health 2003;6:15–22.
41. Walker EA, Gelfand AN, Gelfand MD, Koss MP, Katon WJ. Medical and psychiatric symptoms in female gastroenterology clinic patients with histories of sexual victimization. Gen Hosp Psychiatry 1995;17:85–92.
42. Burckhardt C, Woods S, Schultz A, Ziebarth D. Quality of life of adults with chronic illness: a psychometric study. Res Nurs Health 1989;12: 347–54.
43. Spielberger C, Gorsuch R, Lushene R, Vagg P, Jacobs G. Manual for the state-trait anxiety inventory (Form Y). Palo Alto, CA: Consulting Psychologists Press; 1983.
44. Beck AT, Steer RA, Brown GK. Beck Depression Inventory®—II Manual. San Antonio, Texas: Harcourt Assessment, Inc; 1996.
45. Beck AT, Steer RA, Garbin MG. Psychometric properties of the Beck Depression Inventory: twenty-five years of evaluation. Clin Psychol Rev 1988;8:77–100.
46. Kerns R, Turk D, Rudy T. The West Haven-Yale Multidimensional Pain Inventory (WHYMPI). Pain 1985;23:345–56.
47. Turk D, Rudy T. Toward an empirically derived taxonomy of chronic pain patients: integration of psychological assessment data. J Consult Clin Psychol 1988;56:233–8.
48. Burns JW, Kubilus A, Bruehl S, Harden RN. A fourth empirically derived cluster of chronic pain patients based on the Multidimensional Pain Inventory: evidence for repression within the dysfunctional group. J Consult Clin Psychol 2001;69:663–73.
49. Rudy TE, Turk DC, Zaki HS, Curtin HD. An empirical taxometric alternative to traditional classification of temporomandibular disorders. Pain 1989;36:311–20.
50. Turk D, Rudy T. The robustness of an empirically derived taxonomy of chronic pain patients. Pain 1990;42:27–35.
51. Jamison R, Rudy T, Penzien D, Mosley T. Cognitive-behavioral classifications of chronic pain: replication and extension of empirically derived patient profiles. Pain 1994;57:277–92.
52. Melzack R. The McGill Pain Questionnaire: major properties and scoring methods. Pain 1975;1:277–99.
53. Dubuisson D, Melzack R. Classification of clinical pain descriptions by multiple group discriminant analysis. Exp Neurol 1976;51:480–7.
54. Melzack R. Psychologic aspects of pain. Pain 1980;8:143–54.
55. Reading AE. The internal structure of the McGill Pain Questionnaire in dysmenorrhoea patients. Pain 1979;7:353–8.
56. Wu AW, Rubin HR, Mathews WC, Ware JE Jr, Brysk LT, Hardy WD, Bozzette SA, Spector SA, Richman DD. A health status questionnaire using 30 items from the Medical Outcomes Study: preliminary validation in persons with early HIV infection. Med Care 1991;29:786–98.
57. Burckhardt CS, Clark SR, Bennett RM. The Fibromyalgia Impact Questionnaire: development and validation. J Rheumatol 1991;18: 728–33.
58. Broderick J, Stone A, Smyth J, Kaell A. The feasibility and effectiveness of an expressive writing intervention for rheumatoid arthritis via home-based videotaped instructions. Ann Behav Med 2004;27:50–9.
59. Cohen J. Statistical power analysis for the behavioral sciences. New York: Academic Press; 1977.
60. Pennebaker JW, Francis ME, Booth RJ. Linguistic inquiry and word count (LIWC): LIWC2001. Mahwah, NJ: Erlbaum Publishers; 2001.
61. Francis M, Pennebaker J. Putting stress into words: the impact of writing on physiological, absentee, and self-reported emotional well-being measures. Am J Health Promot 1992;6:280–7.
62. Klapow JC, Schmidt SM, Taylor LA, Roller P, Li Q, Calhoun JW, Wallander J, Pennebaker J. Symptom management in older primary care patients: feasibility of an experimental, written self-disclosure protocol. Ann Intern Med 2001;134:905–11.
63. Norman SA, Lumley MA, Dooley JA, Diamond MP. For whom does it work? moderators of the effects of written emotional disclosure in a randomized trial among women with chronic pelvic pain. Psychosom Med 2004;66:174–83.
64. Lumley MA, Provenzano KM. Stress management through written emotional disclosure improves academic performance among college students with physical symptoms. J Educ Psychol 2003;95:641–9.
65. Walker BL, Nail LM, Croyle RT. Does emotional expression make a difference in reactions to breast cancer? Oncol Nurs Forum 1999;26: 1025–32.
66. Lange A, Schoutrop M, Schrieken B, van de Ven J-P. Interapy: a model for therapeutic writing through the internet. In Lepore S, Smyth J, editors. The writing cure: how expressive writing promotes health and emotional well-being. Washington, DC: American Psychological Association; 2002:215–38.
67. Redondo JR, Justo CM, Moraleda FV, Velayos YG, Puche JJ, Zubero JR, Hernandez TG, Ortells LC, Pareja MA. Long-term efficacy of therapy in patients with fibromyalgia: a physical exercise-based program and a cognitive-behavioral approach. Arthritis Rheum 2004;51:184–92.
68. Vlaeyen JW, Teeken-Gruben NJ, Goossens ME, Rutten-van Molken MP, Pelt RA, van Eek H, Heuts PH. Cognitive-educational treatment of fibromyalgia: a randomized clinical trial, I: clinical effects. J Rheumatol 1996;23:1237–45.
69. Bennet RM, Burchkhardt CS, Clark SR, O'Reilly CA, Wiens AN, Campbell SM. Group treatment of fibromyalgia: a six-month outpatient program. J Rheumatol 1996;23:521–8.
70. Richards SC, Scott DL. Prescribed exercise in people with fibromyalgia: parallel group randomised controlled trial. BMJ 2002;325:185.
71. Mannerkorpi K, Ahlmen M, Ekdahl C. Six- and 24-month follow-up of pool exercise therapy and education for patients with fibromyalgia. Scand J Rheumatol 2002;31:306–10.
72. Pennebaker J, Francis M. Cognitive, emotional, and language processes in disclosure. Cognit Emot 1996;10:601–26.
73. Sloan D, Marx B. Taking pen to hand: evaluating theories underlying the written disclosure paradigm. Clin Psychol Sci Pract 2004;11:121–37.