

Effects of written anger expression in chronic pain patients: making meaning from pain

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Accepted: January 28, 2008 / Published online: 6 March 2008
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Abstract Based on prior research demonstrating benefits of emotional disclosure for chronically ill individuals and evidence that anger is particularly problematic in chronic pain sufferers, outpatients from a chronic pain center ($N = 102$) were randomly assigned to express their anger constructively or to write about their goals non-emotionally in a letter-writing format on two occasions. Letters were coded for degree of expressed anger and meaning-making (speculation and insight into conditions that precipitated anger). Over a 9 week period, participants in the anger-expression group ($n = 51$) experienced greater improvement in control over pain and depressed mood, and marginally greater improvement in pain severity than the control group ($n = 51$). Degree of expressed anger uniquely accounted for intervention effects and meaning-making mediated effects on depressed mood. These findings suggest that expressing anger may be helpful for chronic pain sufferers, particularly if it leads to meaning-making.

Keywords Chronic pain · Anger expression · Written emotional disclosure · Meaning-making · Depression · Control

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Making meaning from pain: effects of written anger expression in chronic pain patients

“I am in constant pain due to your negligence. I wish I could make you understand what it feels like... I feel so mad... I hope you never have another good night’s sleep in your life. I know I won’t.”

“I can’t believe that after all this I have to listen to a druggist [who] has no idea how I feel... You make me feel like a criminal and a drug addict.”

In these quotes, two people with chronic pain who participated in our research are struggling to come to terms with their anger—one toward a surgeon, the other toward a pharmacist. Circumstances such as these are common among those with chronic pain, who also frequently experience loss of income, inability to perform routine tasks, and insufficient social support (Robinson and Riley 1999). In response to these and other stressors, chronic pain patients report more frequent and more intense anger than most people (Fernandez and Turk 1995; Okifuji et al. 1999; Robinson and Riley 1999). Moreover, chronic pain patients often cope with anger by either suppressing it or, alternatively, expressing anger in openly hostile ways—reactions which are associated with exacerbation of pain, disability, and depression (Burns et al. 2006; Duckro et al. 1994; Kerns et al. 1994). Hostile expression of anger also affects those who help pain sufferers, particularly physicians and family members (Eggy and Tzelepis 2001; Fernandez and Turk 1995). In fact, one reason why those with chronic pain sometimes report suppressing their anger is fear of further alienating caregivers (Feldman et al. 1999). Thus, constructive anger expression, or the clear, goal-directed expression of anger, is a strategy which may be underutilized by people with chronic pain.

Benefits of constructive anger expression have not been previously studied in people with chronic pain. However, related findings suggest that this form of emotional expression is likely to promote well-being in chronic pain patients. Although anger is often viewed as maladaptive, it has a strong motivational component that can lead people to communicate how they feel or to change the situations that precipitate their anger (Brehm 1999; Lazarus 1991). Thus, anger expression is sometimes incorporated in broad psychotherapy programs that are effective for a variety of populations, including chronic pain patients (Deffenbacher et al. 2002; Fernandez 2002). Moreover, preliminary evidence indicates that constructive anger expression is associated with lower resting blood pressure (Davidson et al. 2000). Emotional disclosure in general results in psychological and physical health benefits, for chronic pain patients as well as others (Frattoni 2006; Kelley et al. 1997; Smyth et al. 1999). Although such studies have not directed participants to write about their angry feelings, one study reported that anger was a common theme in participant writings (Spera et al. 1994).

A key reason why constructive anger expression may be helpful for those with chronic pain is that it can facilitate cognitive processes involved in coping with anger, pain, or other difficult circumstances. Chronic diseases often threaten self-identity, leading to attempts at interpretation and understanding (Leventhal et al. 1999). Questions such as “why me?” and “whose fault is it?” are very common among pain patients and efforts to find meaning in pain are critical to successful adaptation (Morris 1999; Turk and Okifuji 2002). Moreover, interference with goal setting and self-regulation contribute to the strong association between pain and negative emotion (Affleck et al. 2001; Hamilton et al. 2004). Thus, a process that enables a chronic pain sufferer to “come to terms” with angry feelings or to set realistic interpersonal goals may be strongly linked to well-being.

Both theory and empirical findings provide strong support for the role of cognitive factors in the effects of written emotional disclosure. The process of organizing emotional thoughts in written form is calming and motivating (Pennebaker 1997; Pennebaker et al. 1997; Smyth et al. 2001). An increase in both causal (e.g., why, because) and insight words (e.g., understand) over the course of writing is a key factor in the benefits derived from emotional expression (Pennebaker and Seagal 1999). Notably, the physical health benefits of emotional expression do not occur in the absence of cognitive processing (Lewis and Butcher 1992). An important aspect of cognitive processing appears to be the process of seeking and making meaning after difficult experiences (Park and Folkman 1997; Tait and Silver 1989; Taylor 1983), a process which involves changing appraisals of specific situations or global beliefs about the world or self (Park and Blumberg 2002).

Current study and hypotheses

The current study examined effects of written anger expression on physical and emotional health in patients with a variety of chronic pain problems. We hypothesized that patients instructed to write letters on two occasions expressing their angry feelings in a goal-directed manner would show greater improvement from baseline in pain severity, perceived control over pain, and depressed mood compared to patients assigned to write about neutral topics. These three outcomes are particularly important contributors to patient satisfaction with pain interventions (Hanson and Gerber 1990). Moreover, depression and pain are strongly and bi-directionally associated (Hamilton et al. 2004). Outcomes were assessed at two timepoints: approximately 4 weeks after the second writing exercise, and approximately 9 weeks after the second writing exercise. Of the two outcome time points, we expected to observe greater benefits at the latter because rheumatoid arthritis patients (who comprised a sizeable portion of the current sample) have been shown to take longer than 4 weeks to evidence benefits from emotional expression (Smyth et al. 1999).

We expected that the amount of anger expressed in letters, as distinguished from other forms of negative affect, would account for differences observed between the two groups. We also hypothesized that *meaning-making* evidenced in participant letters would mediate benefits of the intervention. Following recommendations to examine causal thinking and insight in participant writing (Pennebaker and Seagal 1999) and to assess meaning-making broadly (Park and Blumberg 2002), we assessed two indicators of meaning-making: the degree to which participant letters showed speculation about circumstances related to pain and anger, and the degree to which they showed insight and understanding. We expected that those who expressed their anger would show greater evidence of meaning making and that meaning making would be associated with benefits in depressed mood, control over pain, and pain severity.

Methods

Participants

Participant volunteers were recruited during routine visits to a university hospital-affiliated outpatient pain center providing pharmacological and interventional treatments to those with pain from diverse sources. Participants were not paid but were entered into a raffle for two prizes of \$100 each. They were told that the goal of the study was “to find out more about what it is like for people experiencing

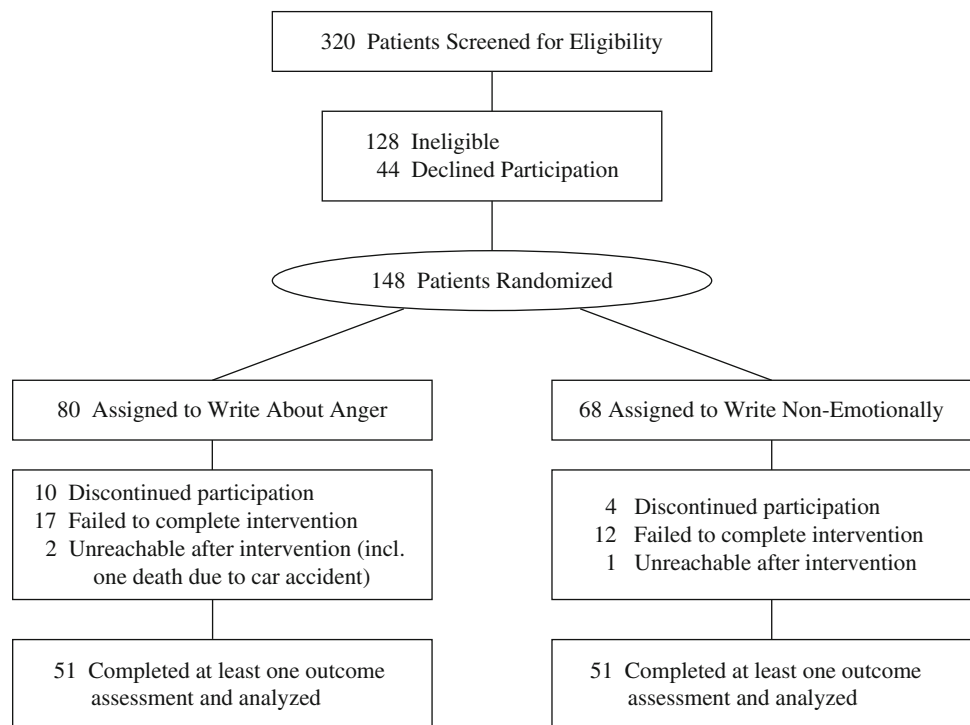
chronic pain” and how chronic pain affects day to day activities, feelings, and thoughts.

Patients were eligible to participate if they (1) were being seen at the pain center regularly and at least once a month, (2) were able to write in English for 20 min, (3) had experienced pain for at least 6 months, and (4) did not have pain that was primarily due to cancer. The majority (90%) of all patients with a routine appointment within a four-month time period were screened for eligibility. Of the 192 eligible participants, 148 (77%) expressed interest and completed an in-person structured interview that included baseline assessment of the outcome measures and demographics. Following this assessment, participants were randomly assigned to the control or the intervention group using a computer-generated random assignment scheme by an individual not involved in outcome assessment. Slightly more participants (55%) were assigned to the intervention group to allow for differential attrition rates. As expected, attrition was slightly higher in the intervention group, resulting in equivalently-sized groups (see Fig. 1). Although the majority in both groups who explicitly withdrew from the study said they were no longer interested because of time constraints, slightly more participants in the intervention group than the control group withdrew because they found the prospect of the writing tasks frustrating or difficult ($X^2(1) = 1.88, p = .17, ns$). In addition, 17 participants in the intervention group and 12 in the control group failed to complete the writing tasks in a timely fashion, due to missed appointments or relocation,

and 3 participants were unreachable after writing, including 1 who died. Thus, 102 participants completed both writing tasks and at least one outcome assessment (51 in the intervention group and 51 controls). The overall participation rate of 69% (102 out of 148 enrolled) is better than rates reported with many patient groups (Schnoll et al. 2005). Analyses revealed no significant differences on dispositional, demographic, situational, or other study variables between those who completed at least one outcome assessment and those for whom we had only baseline data (P 's > .20). Power analyses indicated that 51 participants in each group would provide adequate power to observe the moderate effect sizes that have been found in writing interventions (Smyth 1998).

Participants had been attending the pain center for an average of 3.3 years ($SD = 2.8$) and were representative of the patients attending the center in terms of their demographic and pain characteristics. Location and source of participants' pain (obtained from participant report and chart review) were heterogeneous; non-mutually exclusive pain sources included arthritis (22.4%), injury (57.2%), complex regional pain syndrome (9.7%), and other (27.5%), such as myofascial pain, pancreatitis, and migraine; location included back (65.5%), shoulder/arms (41.8%), neck (14.5), hips/pelvis (11.5%), hands/feet (12.7), head (9.2), and “all over” (6.9%). At the beginning of the study, the majority were receiving pharmacological treatment exclusively (76.1%). The remainder were receiving some procedural anesthetic treatment (e.g., epidural injections),

Fig. 1 Trial profile



usually in conjunction with pharmacological treatment. More than half (57.3%) of the sample were female; participants were 22–70 years old ($M = 46.3$, $SD = 7.5$). The majority (89.1%) described themselves as White, 6.4% Multi-ethnic, 2.7% Latino, 0.9% Black, and 0.9% Asian. Median yearly household income was approximately \$35,000 and median education was high school completion. A majority (56.2%) were married or living as if married and most (71.8%) were no longer working, primarily because of pain.

Intervention

Study participants wrote a letter on two occasions, approximately 2.5 weeks apart. As learned from debriefing, no participant in the intervention group guessed that the writing task was expected to be salutary and all participants felt that they were providing potentially useful information to the experimenters. Control group participants believed they were providing information about what they were able to do in a given day. Intervention group participants believed they were providing information about the aspects of their pain that they found frustrating or anger-provoking.

Other than the directed letter format and anger-expression component (described below), the two groups were given similar instructions based on those used in other studies of written emotional expression (Pennebaker 1997). All participants were asked to write for 20 min; those who finished early were asked to continue writing about the same topic until the time expired. Participants were instructed not to worry about grammar, spelling, or style and were told that their letters would be kept confidential and that only members of the research team would review the letters.

The letter-writing format is unique to this study and was developed to enable the intervention group to express anger in a directed way but without actual confrontation. Before writing each letter, intervention group participants completed a short exercise designed to focus their attention on existing anger related to their pain experience. In this brief questionnaire, participants were asked to consider if they currently or recently felt anger towards a health care provider, themselves, or someone or something else and, if so, to remember and/or focus on it. This technique was based on methods used in prior research to elicit anger (Rusting and Nolen-Hoeksema 1998). A pilot test of this exercise with healthy young adults confirmed that it temporarily increases anger without significantly affecting other emotional states. After completing this short exercise, which took an average of 10 min and involved writing a few sentences to aid in focusing, participants in the intervention group were given a writing tablet and instructions to write a

letter to the person at whom or thing at which they were most angry. They were instructed to focus on their anger rather than other emotions. Instructions also included specific guidelines to encourage constructive anger expression using criteria from other studies (Davidson et al. 2000): they were asked to (1) describe their feelings clearly, pointing to specific things that made them angry and describing how they felt, (2) try to explain their angry reaction (as opposed to just venting), and (3) to try to state what they wish would be done to help them feel less angry.

Participants in the control group did not complete the short anger-focusing exercise and were instructed to write a letter to a person of their choosing, describing their plans for the upcoming day. They were instructed to write about their goals in detail but without discussing any of their thoughts and feelings.

For the first writing task, participants either wrote their letter in a quiet, private room at the pain center before or after their appointment, or were allowed to take the materials home to write the letter at their convenience and mail it back in a pre-addressed, stamped envelope. Instructions for the second writing task approximately two weeks later were the same (including the anger-focusing exercise for those in the intervention group), with the addition that participants attempt to make their thoughts, feelings, and wishes even more clear than previously. Approximately 75% of participants completed the first writing task at home. Location of the writing task was not significantly associated with study outcomes or participant ratings of pain and physical comfort during the task. All of the second writing tasks were completed at home and returned by mail.

Outcome measures were assessed in two structured interviews. The first was conducted in-person during a routine visit to the pain center, a minimum of 2 weeks and an average of 4.3 weeks ($SD = 2.2$) after the second writing exercise. The second was conducted 9.2 ($SD = 1.9$) weeks after the second writing exercise. To maximize retention and minimize participant burden, the second interview was conducted by telephone. All interviews were conducted by trained research assistants blind to condition and uninvolved in letter coding. Intervals between the writing exercise and each outcome assessment were not significantly different for the two groups and were not correlated with demographic factors or outcome variables.

Mediator variables

All participant letters, including those from the control group, were coded by trained research assistants who did not interact with participants and who were blind to study hypotheses. The initial coding scheme was developed in collaboration with a psycholinguist and after consultation

with another researcher who has used similar methods (J. Pennebaker, personal communication, December, 2002). After a consensus-building stage, during which discrepancies in codes were thoroughly discussed and resolved, 90% of the letters were coded for anger expression and meaning making by two research assistants who achieved an inter-rater reliability (Kappa) of .90; the remaining 10% of letters in this process were coded by one research assistant. At a later date, letters were coded for expression of sadness/depressed mood, anxiety, and constructiveness of anger expression using a similar process; two research assistants achieved an inter-rater reliability of .89 during dual-coding of 20% of letters and the remaining letters were coded by one research assistant.

Expressed anger was coded on a scale from 0 (*none*) to 4 (*very much*). A code of 4 was given when the letter included an explicit statement indicating that the participant was a) very angry or furious, etc., or b) if the participant had used many examples that sounded frustrating and/or used underlining, exclamation points, or other techniques for emphasis; a code of 0 was given when the participant neither identified at all with an anger-related emotion (including frustration) nor gave any examples that seemed frustrating. Expressed sadness or depressed mood, and expressed anxiety were similarly coded on a 0 (*none*) to 4 (*very much*) scale. Anger constructiveness (how well participants followed directions to express anger in a constructive way) was coded with several components, which were then summed to create a 0–4 scale: Clarity of anger was coded from 0 (*not at all clear, or non-existent expression*) to 2 (*very clear and well-explained anger*); success in being goal-directed with anger expression was also coded from 0 (*not at all goal-directed*) to 2 (*very goal-directed*); half to one point was subtracted from the overall anger constructiveness score for the few letters that were very negative and vitriolic.

Letters were also coded for the degree to which the writer was engaged in meaning-making about anger-provoking circumstances related to their pain. Whereas a simple statement about the physical reason for pain (e.g., “this pain is the result of a car accident two years ago”) was not coded as showing meaning-making, statements about trying to understand the reasons and implications of a particular incident (e.g., “why did this car accident happen: why me?”) were coded as showing meaning-making, as were statements relevant to the way in which pain-related negative circumstances changed participants’ appraisals, goals, and assumptions about the world (e.g., “now I realize the world is just unfair and don’t take it personally”). We coded two indicators of meaning-making: (1) speculation and (2) insight and understanding about the causes and implications of the circumstances that precipitated participant anger. Both indicators were scored on a scale from 0 (*no speculation/*

insight/ understanding) to 3 (*strong speculation/ insight/ understanding*).

Outcome measures

Pain severity was assessed using the Pain Severity subscale of the West Haven-Yale Multidimensional Pain Inventory (MPI) (Kerns et al. 1985), a widely used inventory developed exclusively for chronic pain patients. There is substantial support for the reliability and validity of these subscales based on heterogeneous samples with a variety of pain complaints (Kerns et al. 1985; Riley et al. 1999; Tait 1999). The Pain Severity subscale contains three items to which participants respond from 0 to 6, with 6 indicating more extreme pain. With approval from the instrument’s author, instructions for some items were changed slightly to focus on pain in the last week and increase the inventory’s sensitivity to change over time.

Feelings of personal control over pain were measured using the Control subscale of the Survey of Pain Attitudes (SOPA) (Jensen et al. 1987). The SOPA is the most widely used measure of pain-related attitudes (DeGood and Tait 2001; Jensen et al. 1987) and possesses good psychometric properties and clinical applicability. Participants respond to items on a 5 point scale from 0 (*this is very untrue for me*) to 4 (*this is very true for me*). After reversing responses on the four absence of control items, responses are summed to create a total score.

The Center for Epidemiological Studies Depression Scale (CES-D) (Radloff 1977) was used to measure depressed mood. The CES-D has been used to measure clinical and sub-clinical levels of depression in medical populations and effectively identifies depression among chronic pain patients (Geisser et al. 1997; Tait 1999). Item responses are from 0 to 3, with 3 representing the greatest frequency of depressed mood over the past week. After responses on four items are reversed, responses on all 20 items are summed.

Trait measures

The baseline interview also included assessment of several trait measures. Dispositional optimism was measured with the well-validated Revised Life Orientation Test (Scheier et al. 1994). A dispositional tendency to use constructive anger expression was assessed with the self-report Constructive Anger Behavior-Verbal scale (Davidson et al. 2000). Sample items include, “I express anger to solve a problem” and “I find that after expressing anger I feel closer to a resolution.” Trait tendencies toward more negative expression of anger and anger suppression were assessed with the widely used State-Trait Anger Expression Inventory (Spielberger 1999).

Data analytic strategy

Analyses were conducted using SPSS version 14. Due primarily to missed appointments, 22 participants were missing some data at either the 4 or 9 week outcome time point. Analyses comparing the 80 participants (40 in the intervention and 40 in the control group) with outcome data at both time points to the full 102 participants suggested that these data could be considered “missing at random.” That is, having some missing data was not associated with demographic, pain (e.g., pain source), or outcome variables (all P 's > .30). Therefore, we utilized the full sample of 102 participants (51 in each group) and a mixed models approach (2005). One advantage of mixed modeling is its ability to compute estimates in the presence of randomly missing data in a time series. In addition, increasing evidence points to advantages in internal validity and statistical conclusions for mixed model over generalized linear modeling approaches when analyzing the effects of random group assignment over time (Seco et al. 2006). Thus, mixed models with a maximum likelihood estimation approach were used to analyze change over time between the two groups, using data at baseline, 4 weeks after writing, and 9 weeks after writing. Effect sizes (Cohen's d) were calculated as the difference between the groups on the change in outcome (9 week follow-up minus baseline) divided by the pooled standard deviation of the change scores. Positive values of d indicate more improvement for the intervention than control group. As gender differences have been reported in anger expression and pain (Fernandez 2002), hierarchical regression analyses were conducted to test for gender by intervention group moderation and separate mixed modeling analyses were conducted by gender. Non-significant results are summarized briefly because of space constraints.

To determine whether baseline differences existed on demographic and outcome variables, the control and intervention groups were compared using Chi-square analysis and analysis of variance (ANOVA). Mediation analyses were computed with linear regression, using guidelines established by Baron and Kenny (Baron and Kenny 1986) and by MacKinnon and colleagues (MacKinnon et al. 2002). No missing data imputation was used in these analyses so the number of participants included across analyses varied slightly.

Results

Preliminary analyses

All variables met requirements for univariate normality. Reliability of all outcome measures was good to excel-

lent, with internal consistency coefficients (Cronbach's α) ranging from .70 to .96. Average pain for the sample at baseline was 4.6 ($SD = 1.1$) on the MPI and average CES-D scores at baseline were 24.8 ($SD = 11.4$). Using a cutoff of 27 for the CES-D, as recommended for chronic pain patients (Geisser et al. 1997), 37% of the sample was clinically depressed. An additional 30% scored between 16 and 27, indicating mild depression. High incidence of depression and depressed mood is typical for patients with long term pain (DeGood and Tait 2001). The control and intervention groups did not differ significantly on demographic, psychological trait, or outcome variables at baseline. The groups had been attending the pain center for an equivalent number of years (3.7 years, $SD = 3.1$ for the control group and 2.9 years, $SD = 2.4$ for the intervention group) and did not differ in the source or location of their pain. The groups also did not differ significantly in the percent receiving anesthetic procedural treatments for pain, or the percent who were receiving psychological therapy, involved with litigation, or receiving financial compensation because of their pain (P 's > .25).

Content of letters

Some participants addressed their letters to a friend (17%) or a family member (14%), with others writing to a health care provider (13%) or a researcher (14%). Other specific addressees included the self (6%), pain or a diagnosis (6%), fate or God (3%), an employer (1.5%), or an insurance company (1.5%). Although a small number of control group participants expressed some anger and frustration in their letters, the intervention group expressed substantially more anger in their letters ($M = 3.07$, $SD = 2.38$) than the control group ($M = .49$, $SD = .69$), $t(100) = -7.19$, $P < .001$. Just after the anger focusing exercise and just before each writing task, participants in the intervention group also reported their anger on a scale similar to that used by letter coders. Self-reported anger was highly correlated with the amount of anger expressed in letters at 4 weeks ($r = .69$, $P < .01$) and 9 weeks ($r = .79$, $P < .001$). Because expressed anger in participant letters was highly stable across the two time points ($r = .74$, $P < .01$), expressed anger at 4 and 9 weeks was summed to create an overall measure of expressed anger.

Coding of anger constructiveness and expression of other forms of negative affect enabled a check of how well intervention group participants followed directions to express anger constructively and to focus on anger to the exclusion of other emotions. Anger constructiveness was strongly correlated with the degree of anger expressed, $r = .87$, $P < .01$. Moreover, the vast majority of letters,

even those where anger expression was given a code of 3 or 4, were positive or neutral in their overall tone, as opposed to vitriolic, nasty, or bitter. Participants were also largely successful at expressing anger and not sadness or anxiety. Expression of depressed mood or sadness (summed from both letters) was correlated with anger expression, $r = .24$, $P < .05$, but was far more infrequent in intervention group letters than was anger ($M = .60$, $SD = 1.26$ vs. $M = 3.26$, $SD = 2.29$, $t(50) = -7.61$, $P < .001$) and very infrequent in control group letters ($M = .15$, $SD = .63$). Similarly, expression of anxiety was also correlated with anger expression, $r = .22$, $P < .05$, but also less frequent than anger in intervention group letters ($M = .88$, $SD = 1.12$, $t(50) = -7.45$, $P < .001$) and infrequent in control group letters ($M = .74$, $SD = .98$).

There was no evidence of meaning-making in letters of control group participants, as expected. Among intervention group participants, the two components of meaning-making (speculation and insight/understanding) were correlated ($r = .39$, $P < .05$ at both time points) and stable over time ($r = .33$, $P < .05$ for both speculation and insight). The speculation and insight components were summed to create a total meaning-making variable across time.

Outcomes over time

State anger and state anxiety were equivalent between groups at both 4 and 9 weeks after the writing manipulation. Means for state anger at 4 weeks were 19.02 ($SD = 7.42$) and 21.33 ($SD = 9.37$) for the control and intervention groups, respectively, $t(90) = -1.27$, $P = .21$, and at 9 weeks were 19.70 ($SD = 7.03$) and 20.00 ($SD = 6.89$), $t(92) = -.21$, $P = .83$.

Change over time in control over pain, depressed mood, and pain severity by experimental condition are shown in Fig. 2. Repeated measures mixed model analyses using all three time points (baseline, 4 weeks after writing, and 9 weeks after writing) revealed that there was a significant time by condition interaction for control over pain, $F(1,179.64) = 4.49$, $P < .05$, $d = .75$, indicating that only participants in the intervention group showed an increase in control over pain across time. There was also a significant time by condition interaction for depressed mood, $F(1,180.52) = 7.47$, $P < .01$, $d = .50$, with only participants in the intervention group showing a decrease in depressed mood. The time by condition interaction for pain severity was marginally significant and in the expected direction, $F(1,182.83) = 3.51$, $P = .06$, $d = .17$, with those in the intervention group showing a decrease in pain severity relative to the control group. We also conducted repeated measures ANOVAs using the 80 participants with

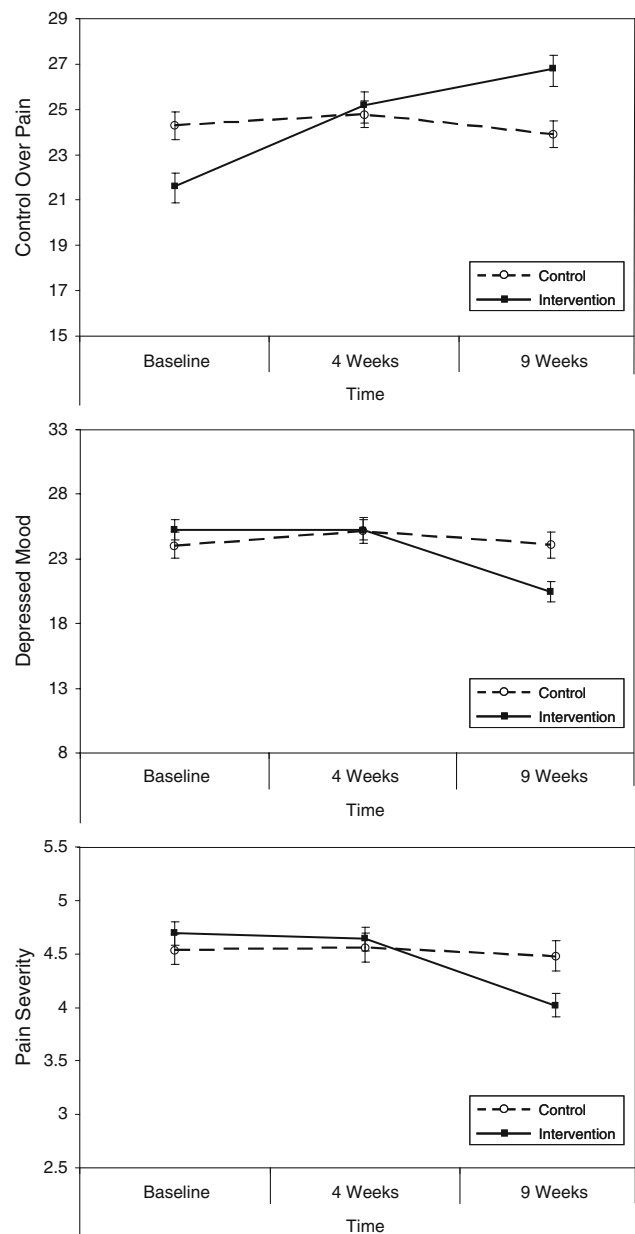


Fig. 2 Control over pain, depressed mood, and pain severity across time. Error bars represent standard error

complete data (baseline and both outcome time points); results were equivalent for all three outcomes.

Gender

Women and men reported equivalent levels of optimism and dispositional anger expression styles, but women reported a greater tendency toward anger suppression, $t(100) = -2.02$, $P < .05$. Women and men did not express different amounts of anger in their letters, $t(100) = -1.23$, $P = .22$, and there was no evidence that gender moderated effects of the intervention.

Mediation of group status effects by anger expression

We calculated a series of regression equations to examine whether the amount of anger expressed in participant letters predicted outcomes, whether it accounted for the effect of group status (intervention versus control), and whether it predicted outcomes better than expression of depressed mood or anxiety in letters. Controlling for baseline levels, these regressions predicted the 9 week value of each outcome because, as expected, improvement in the intervention group was primarily seen at 9 weeks rather than earlier (see Fig. 2). Degree of expressed anger predicted greater control over pain, $t(91) = 2.30$, $P < .05$, and it continued to do so after controlling for group status, $t(90) = 2.09$, $\beta = .20$, $P < .05$. Group status was no longer a significant predictor of control over pain with anger expression in the equation, $t(90) = 0.78$, $\beta = .04$, $P = .69$. As group status was also strongly associated with degree of expressed anger, expressed anger met guidelines for mediating the group effect on control over pain (MacKinnon et al. 2002) and a Sobel test confirmed that this effect was significant, $z = 2.11$, $P < .05$. Similarly, greater expressed anger predicted less depressed mood, $t(90) = -2.30$, $P < .05$; it continued to do so after controlling for group status, $t(89) = -2.09$, $\beta = -.18$, $P < .05$, and group status was no longer a significant predictor of depressed mood with anger expression in the equation, $t(89) = -1.02$, $\beta = -.13$, $P = .16$. Expressed anger thus also met guidelines for mediating the group effect on depressed mood as confirmed by a Sobel test, $z = 2.04$, $P < .05$. Expressed anger marginally predicted lower pain severity, $t(91) = -1.83$, $P < .09$, but this was non-significant after controlling for group status, $t(90) = -1.64$, $\beta = -.16$, $P = .15$.

In contrast to anger expression, neither anxiety nor depressed mood expressed in letters significantly predicted any of the key outcome variables. Moreover, anger expression continued to uniquely predict control over pain and depressed mood when depressed mood and anxiety expression were added to these regression equations, $t(89) = 2.22$, $P < .05$ and $t(88) = -2.28$, $P < .05$, respectively.

Mediation by meaning making

Intervention group participants who expressed more anger were also likely to show more evidence of meaning making ($r = .72$, $P < .001$). Meaning making, which was not evidenced at all in control group letters, did not mediate the effect of group status on any outcome. We thus tested the hypothesis that meaning making in the letters of intervention group participants would mediate the benefits of expressed anger they experienced. As both anger expression and meaning making were coded from participant

letters, we utilized anger expression from the first letter and meaning making from the second letter in these analyses to better examine mediation over time. Controlling for baseline outcome levels, meaning making did not significantly predict control over pain at 9 weeks, $t(45) = 1.62$, $P = .15$, or pain severity at 9 weeks, $t(45) = -.81$, $P = .37$. However, meaning making did significantly predict less depressed mood at 9 weeks, even after controlling for expressed anger, $t(44) = -3.09$, $P < .01$. Expressed anger was no longer significantly associated with 9 week levels of depressed mood after controlling for meaning making, $t(44) = -.72$, $P = .36$. A Sobel test indicated that this mediation effect was significant, $z = -2.26$, $P < .05$.

Discussion

This study follows a tradition of research on emotional disclosure which has documented some of its psychological and physical health benefits in healthy and chronically ill samples (Frattaroli 2006; Pennebaker 1997). However, the emphasis on anger and the directed letter format of the writing intervention in this study are unique. To our knowledge, this is the first study to suggest that anger expression can result in benefits for chronic pain patients. Compared to control group participants, patients assigned to write about their angry feelings related to pain showed improvement in perceived control over pain and depressed mood following the intervention; these effects were explained by the amount of anger expressed in participant letters and not by expression of sadness or anxiety. Participants also experienced marginally greater improvement in pain after the intervention. As we had anticipated based on prior studies of emotional expression in similar samples, greater improvement was observed at 9 than at 4 weeks after the writing intervention.

Although the intervention did not significantly reduce pain severity, improved mood and enhanced feelings of control over pain are extremely important outcomes for this population. Chronic pain patients often state that they would be satisfied with an intervention that provided them with more control over their pain, regardless of their degree of pain (Hanson and Gerber 1990). Furthermore, both control over pain and better mood are associated with adaptive coping and physical activity (Coyne 1976; Hadjistavropoulos et al. 1999), which may lead to greater well-being or reduced pain over additional time.

The degree to which intervention group participants showed evidence of meaning-making, defined as speculation about and insight into the causes and implications of anger-provoking circumstances, accounted for the effect of anger expression on emotional distress. This result corroborates theories of coping which suggest that people who

structure and resolve negative feelings show improvements in well-being (Park and Fenster 2004; Tait and Silver 1989; Taylor 1983). It is also consistent with the reliable association between benefit finding (i.e., perceiving positive effects following traumatic events) and lower depressed mood (Helgeson et al. 2006). Finally, the current research corroborates studies of written emotional disclosure which have shown that meaning-making potentiates the benefits of emotional expression (Park and Blumberg 2002; Pennebaker and Seagal 1999) and it suggests that meaning-making attempts may be central to some of the benefits of anger expression.

This and related studies highlight the potential value of a focus on negative emotion under certain circumstances. Our intervention was designed not only to facilitate cognitive processing but to encourage the *constructive* expression of anger. Intervention-group participants were asked to explain their anger calmly, pointing to specific things that made them angry and expressing what they wished would happen to make them feel better. Our coding of letters suggested that participants were highly successful at explaining their anger clearly and being goal-directed with their anger. As so defined, constructive anger expression has been associated with lower resting blood pressure (Davidson et al. 2000).

Notably, meaning-making did not mediate the effects of anger expression on control over pain in this study. Future research will be needed to elucidate other factors that explain the benefits of anger expression on this and other outcomes. One possibility is that study participants who expressed their anger were less likely to blame the targets of their anger, which has been shown to enhance feelings of control and well-being (Tennen and Affleck 1990; Thoresen et al. 2000). An additional possibility is that some participants communicated their feelings to the targets of their anger or otherwise engaged in problem solving that led to greater feelings of control. Anger expression may also trigger physiological changes. For example, changes in anger management style or hostility may result in decreased somatic sensitivity or muscle tension (Burns et al. 2006), potentially reducing pain severity and, perhaps indirectly, increasing feelings of control.

Limitations and other future directions

The effects of the intervention were modest, particularly the marginal effect on pain severity. It is quite possible that 9 weeks is not long enough for strong health benefits to emerge in chronic pain patients. A study of non-specific emotional expression in rheumatoid arthritis patients found that some health improvements did not appear until 16 weeks after writing (Smyth et al. 1999). Moreover, benefits of anger expression on mood may precede changes

in pain and behavior: Perhaps only as patients begin to feel better emotionally are they likely to take part in activities which may alleviate some of their pain.

Several aspects of this study suggest that it offers a conservative test of the value of writing about anger. Many previous studies have communicated to participants that writing tasks are potentially therapeutic (Langens and Schuler 2007). In the current study, however, participants were unaware that the writing task was central to the study, or that it was intended to be therapeutic. Thus, it is very unlikely that findings in the current study are attributable to participant expectancy effects, which are more likely to have contributed to the effects seen in prior studies of emotional disclosure. Furthermore, participants' comments during debriefing suggested the possibility that even those assigned to the control group may have benefited from participation in this study, attenuating observed differences between the two groups.

Research with emotional expression in general suggests that individuals vary in response to such interventions (Frattaroli 2006). Individuals may also vary in the degree to which pain and emotion are linked (Hamilton et al. 2004; Zautra et al. 2001). We did not limit participation based on criteria likely to affect benefits, such as including only those who reported ongoing problems with anger. However, participants assigned to write about anger were somewhat more likely to withdraw from the study at the letter writing stage than control participants. If we had retained them, those who withdrew might have derived either less or more benefit from the intervention than fully compliant participants. The generalizability of current results is thus somewhat unclear. Future studies, especially those able to offer greater participation incentives, might determine how and for whom written anger expression is optimal, with the eventual goal of targeting particular individuals. In addition to other factors, such studies should continue to examine gender: Although gender did not influence the impact of this intervention, gender and dispositional traits may be relevant to people's interest in or willingness to express anger. For example, women may be more reluctant than men to express anger because women who express anger are often perceived negatively (Jack 2001). Studies targeting individuals with particular pain conditions will also be important to advance research on the value of anger expression and would enable evaluation of disease-specific improvement trajectories.

Results of the present study require replication and further investigation before clinically-relevant interventions focused on anger expression can be recommended. Although content analyses suggested that anger and not expression of other forms of negative affect was associated with benefits, an ideal test of clinical applicability would be to contrast an anger-focused intervention with a more

standard emotional expression intervention encouraging disclosure in general or an intervention focusing on expression of different emotions. Moreover, attrition issues in this study resulted in estimation of data in some analyses, which is less than ideal with only 3 time points (McKnight et al. 2007); although results from these analyses were replicated with analyses utilizing complete data, future studies with larger samples maximizing participant retention and employing longer term outcome assessments could better examine whether benefits of anger expression persist, decline, or increase beyond 9 weeks. It will also be important to determine whether benefits are enhanced by an intervention involving more than two writing sessions. Finally, although the sample in the current study was diverse in terms of diagnosis, the results may not be applicable to all people suffering from chronic pain. Participants in the current study were regularly visiting a pain center for treatment and were also predominantly White. Emotional expression interventions involving writing also are not appropriate for patients unable to write and perhaps not for those less cognitively sophisticated.

Conclusion

The way chronic pain patients feel about themselves, their situation, and their well-being can have a strong impact on their health, compliance with medical care, and interactions with others, including health care providers (Turk and Flor 1999; Turk and Okifuji 2002). Even pain resulting from obvious physical pathology is affected by a complex psychological appraisal process that is influenced by others' responses (Flor et al. 1992; Turk and Flor 1999). Attending to psychosocial factors is thus crucial in treating chronic pain (Gatchel and Turk 1999).

The current study suggests that anger expression can result in health-related and psychological benefits. Reductions in depressed mood were attributable to meaning making—attempting to make sense of the negative emotion and events common to pain experience. In conjunction with other research on the value of forming a narrative about one's reactions to stressful experiences (Park and Blumberg 2002; Pennebaker and Seagal 1999), the current research suggests that it may sometimes be useful for chronic pain patients to focus on and express anger, particularly if they can do so in goal-directed ways. A longer-lasting or more intensive intervention might offer stronger benefits as well as the potential for behavioral improvement. Such an intervention would likely never replace conventional medical or psychosocial therapies. Eventually, however, constructive anger expression might represent a supplemental therapy that would require few, if any, resources from practitioners and could help patients to cope independently with their illness and anger.

Acknowledgments This study was funded by awards from the American Psychological Association and Stony Brook University to Jennifer Graham. Marci Lobel received support from NIH Grant R01HD39753. We thank Drs. Susan Brennan and Anne Moyer for advice with study methodology, the director (Dr. Carole Agin), physicians, staff, and patients at the pain center, and our capable team of research assistants.

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