THE EFFICACY OF WRITTEN EMOTIONAL EXPRESSION AT REDUCING BACK AND HEADACHE PAIN IN COLLEGE STUDENTS

A dissertation submitted to Kent State University in partial fulfillment of the requirements for the degree of Doctor of Philosophy

by

Crystal A. Gabert-Quillen

August, 2012
Dissertation written by
Crystal A. Gabert-Quillen
B.A., Lebanon Valley College, 2006
M.A., Kent State University, 2009
Ph.D., Kent State University, 2012

Approved by

____________________________________, Chair, Doctoral Dissertation Committee
Douglas Delahanty
____________________________________, Members, Doctoral Dissertation Committee
Jeffrey Ciesla
Wendy Umberger
John Updegraff

Accepted by

____________________________________, Chair, Department of History
Maria Zaragoza
____________________________________, Dean, College of Arts and Sciences
John Stalvey
## LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FREQUENCY OF DEMOGRAPHIC VARIABLES BY GROUP AT BASELINE, 1- AND 3-MONTHS POST-WRITING</td>
<td>45</td>
</tr>
<tr>
<td>2</td>
<td>MEANS AND STANDARD DEVIATIONS OF AGE BY GROUP AT BASELINE, 1- AND 3-MONTHS POST-WRITING</td>
<td>45</td>
</tr>
<tr>
<td>3</td>
<td>MEANS AND STANDARD DEVIATIONS OF STUDY VARIABLES BY GROUP AT BASELINE (N = 113)</td>
<td>46</td>
</tr>
<tr>
<td>4</td>
<td>MEANS AND STANDARD DEVIATIONS OF POSITIVE AND NEGATIVE MOOD CHANGE BY GROUP DURING THE WRITING SESSIONS (N = 110)</td>
<td>49</td>
</tr>
<tr>
<td>5</td>
<td>MEANS AND STANDARD DEVIATIONS OF ATTITUDES ABOUT WRITING BY GROUP AT BASELINE AND 3-MONTHS POST-WRITING</td>
<td>53</td>
</tr>
<tr>
<td>6</td>
<td>MEANS AND STANDARD DEVIATIONS OF PAIN SYMPTOMS, PERCEIVED STRESS, AND OVERALL MOOD BY GROUP AT BASELINE, 1- AND 3-MONTHS POST-WRITING (N = 94)</td>
<td>56</td>
</tr>
<tr>
<td>7</td>
<td>HIERARCHICAL LINEAR REGRESSION TESTING THE EFFECTS OF PRIOR JOURNALING AND WRITING CONDITION ON CHANGE IN PAIN INTENSITY (N = 92)</td>
<td>62</td>
</tr>
<tr>
<td>8</td>
<td>HIERARCHICAL LINEAR REGRESSION TESTING THE EFFECTS OF ALEXITHYMIA (DDF) AND WRITING CONDITION ON CHANGE IN PAIN FREQUENCY (N = 91)</td>
<td>62</td>
</tr>
<tr>
<td>9</td>
<td>HIERARCHICAL LINEAR REGRESSION TESTING THE EFFECTS OF EMOTIONAL-APPROACH AND WRITING CONDITION ON PAIN FREQUENCY BETWEEN 1-MONTHS AND 3-MONTHS POST-WRITING (N = 90)</td>
<td>63</td>
</tr>
</tbody>
</table>
HIERARCHICAL LINEAR REGRESSION TESTING THE EFFECTS OF MODERATING VARIABLES AND WRITING CONDITION ON PAIN MEDICATION USE BETWEEN 1-MONTH & 3-MONTHS POST-WRITING (N = 94)
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CONSORT CHART OF COMPLETERS</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>PLOTTED VALUES ILLUSTRATING POSITIVE MOOD AT SESSION 1, SESSION 2, AND SESSION 3 ($N = 110$)</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>PLOTTED VALUES ILLUSTRATING NEGATIVE MOOD AT SESSION 1, SESSION 2, AND SESSION 3 ($N = 110$)</td>
<td>50</td>
</tr>
<tr>
<td>4</td>
<td>PLOTTED VALUES ILLUSTRATING PAIN MEDICATION USE AT BASELINE, 1- &amp; 3-MONTHS POST-WRITING ($N = 94$)</td>
<td>57</td>
</tr>
<tr>
<td>5</td>
<td>PLOTTED VALUES ILLUSTRATING PRIOR JOURNALING AS A MODERATOR OF GROUP ASSIGNMENT AND CHANGE IN PAIN INTENSITY FROM BASELINE TO 1-MONTH POST-WRITING ($N = 92$)</td>
<td>64</td>
</tr>
<tr>
<td>6</td>
<td>PLOTTED VALUES ILLUSTRATING PRIOR JOURNALING AS A MODERATOR OF GROUP ASSIGNMENT AND CHANGE IN PAIN INTENSITY FROM 1-MONTH TO 3-MONTHS POST-WRITING ($N = 92$)</td>
<td>64</td>
</tr>
<tr>
<td>7</td>
<td>PLOTTED VALUES ILLUSTRATING ALEXITHYMIA AS A MODERATOR OF GROUP ASSIGNMENT AND CHANGE IN PAIN FREQUENCY FROM BASELINE TO 1-MONTH POST-WRITING ($N = 91$)</td>
<td>65</td>
</tr>
<tr>
<td>8</td>
<td>PLOTTED VALUES ILLUSTRATING ALEXITHYMIA AS A MODERATOR OF GROUP ASSIGNMENT AND CHANGE IN PAIN FREQUENCY FROM 1-MONTH TO 3-MONTHS POST-WRITING ($N = 90$)</td>
<td>65</td>
</tr>
<tr>
<td>9</td>
<td>PLOTTED VALUES ILLUSTRATING EMOTIONAL-APPROACH COPING AS A MODERATOR OF GROUP ASSIGNMENT AND CHANGE IN PAIN FREQUENCY FROM 1-MONTH TO 3-MONTHS</td>
<td>65</td>
</tr>
</tbody>
</table>
POST-WRITING \((N = 90)\) 66

10 PLOTTED VALUES ILLUSTRATING EMOTIONAL-APPROACH COPING AS A MODERATOR OF GROUP ASSIGNMENT AND CHANGE IN PAIN MEDICATION USE FROM 1-MONTH TO 3-MONTHS POST-WRITING \((N = 94)\) 66

11 PLOTTED VALUES ILLUSTRATING AVOIDANT COPING AS A MODERATOR OF GROUP ASSIGNMENT AND CHANGE IN PAIN MEDICATION USE FROM 1-MONTH TO 3-MONTHS POST-WRITING \((N = 94)\) 67
I would first like to thank Douglas Delahanty for advising me throughout my graduate career and most of all, throughout this project. His unique ability to inspire confidence in my own work is more valuable to me than he will ever know. I would also like to thank the members of my committee: Jeffrey Ciesla, Wendy Umberger, and John Updegraff. I would like to acknowledge all of my undergraduates for helping me to recruit participants, run parts of the study, and enter in the data. I am glad I found reliable and responsible individuals who actually cared about the project. I would also like to thank the Delahanty Lab especially Bryce Hruska, Adam Morris, Maria Pacella, and Leah Irish. I could not ask for better people to be around for six years. I am forever indebted to my parents, sister, and parents-in-law for their unconditional love, support and encouragement. Finally, I have to thank my husband Bill, whose patience and acceptance throughout these six years deserves an honorary degree.
The Efficacy of Written Emotional Expression at Reducing Back and Headache Pain in College Students

The experience of pain is a common occurrence in most of the general population. In a special feature on pain, the National Center for Health Statistics (NCHS; 2006) reported that pain affects more Americans than diabetes, heart disease and cancer combined. More than one-quarter of Americans aged 20 years and over (about 76.5 million Americans) report that they have had a problem with pain of any sort that persisted for more than 24 hours in duration (NCHS, 2006). When asked about four common types of pain, respondents indicated that low back pain was the most common (27%), followed by severe headache or migraine pain (15%), neck pain (15%) and facial ache or pain (4%; NCHS, 2006). In 2006, 13.3 million Americans visited their physician complaining of back pain and 10.2 million Americans visited complaining of headache pain (Cherry, Hing, Woodwell, Rechtsteiner, 2008). In addition, health care visits due to back and/or headache pain have been estimated to cost Americans $50-90 billion dollars a year (Luo, 2004; Robbins, 2001).
When analyzing health trends among college freshman, Sax (1997) discovered that rates of general health declined during the ten year period between 1987 and 1997. Over the past decade, the American College Health Association (ACHA) has conducted numerous surveys across thousands of schools asking college students about where they get their health information (e.g., health center, internet, and flyers), their health behaviors, general well-being, and specific health symptoms. In their 2008 survey, 92% of college students reported good health. However, when asked about specific health symptoms, 46% reported back pain (headache pain was not assessed). Similarly, in a survey of 779 Kent State University (KSU) undergraduates, 90.6% reported good health; however, 28% reported back pain and 39.2% reported headaches. These rates exceed those reported in the general population (Gabert-Quillen & Delahanty, under review).

In college students, poor physical health is related to higher rates of substance and alcohol use (Dorsey, Scherer, & Real, 1999; Park, Armeli, & Tennen, 2004), higher credit card debt (Nelson, Lust, Story, & Ehlinger, 2008), lower retention rates (DeBerard, Spielmans, & Julka, 2004), and poor academic performance (Chow, 2007; Garrity & Ries, 1985). Specific to pain, research from the ACHA (2008) found that in 3.2% of college students, chronic pain has led to poor academic performance (i.e., receiving an incomplete, dropping a course, receiving a lower grade in class, on an exam, or on an important project). One study specifically demonstrated that headache pain was associated with poor academic performance in college students (Bigal, Bigal, Betti, Bordini, Speciali, 2001). Other studies found that pain was associated with higher
medication usage (e.g., self-medication, opiates) in college students (Acocella, 2005; McCabe, Teter, & Boyd, 2005; McCabe, Cranford, Boyd, & Teter, 2007).

While there are many individual differences in the experience of pain, for most, pain is debilitating and stressful. Oftentimes there are no neurogenic causes for the pain (Brannon & Feist, 2007; Haber, Kuczmierczyk, & Adams, 1985; Mastrovito, 1974; Menges, 1983). However, a primary contributor and potential etiological factor for pain is thought to be stress.

**College Student Stress**

Longitudinal studies have noted increases in the amount of stress experienced by college students over the past few years (Murphy & Archer, 1993). College students are particularly prone to stress due to the adjustment of being away from home, being responsible for course work, and needing to multi-task between family, friends, jobs, and academics (Gall, Evans, & Bellerose, 2000; Rao, Moudad, & Subbakrishna, 2000; Jackson & Finney; 2002; Towbes & Cohen, 1996). However, stress is not limited to school-related areas, nor is it limited to stressful events occurring while attending college (MacGeorge, Samter, Feng, Gillihan, & Graves, 2004). Research has shown that college students begin college with a history of negative life events (e.g., occupation, friendship, and family stressors) and traumatic stressors (e.g., childhood maltreatment, assault, rape, or car accident; Bernat, Ronfeldt, Calhoun, & Arias, 1998; Giaconia et al., 1995; Smyth, Hockemeyer, Heron, Wonderlich, & Pennebaker, 2008). Furthermore, trauma history prevalence rates for college students (55.8% to 84.5; Smyth et al., 2008) are comparable
to and often higher than prevalence rates in an adult population (55% to 69%; Adlaf, Glicksman, Demers, 2001; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). In 2009, based on 21,000 responses, the ACHA found that approximately 41% of students reported more than average levels of stress and only 2.5% experienced no stress. In our survey of 770 Kent State University undergraduates 22.6% reported high levels of stress (Gabert-Quillen, & Delahanty, under review).

There are many specific consequences of stress for college students. For instance, research from the ACHA (2008) finds that for about 33.9% of college students, stress has led to poor academic performance. Others find that stress is related to a higher likelihood of dropping out of school (Rickinson & Rutherford, 1995; 1996). Furthermore, stressed students are more likely to report worse health, less likely to practice healthy behaviors, and more likely to practice unhealthy behaviors (e.g., drinking, drug use, overeating, and unprotected sex) compared to less stressed college students (Dorsey, Scherer, & Real, 1999; Engelmann, Krupka, & Verner, 1993; Hudd et al., 2000; Nelson, Lust, Story, & Ehlinger, 2008; Pritchard, Wilson, & Yamnitz, 2007). Moreover, while engaging in these risky behaviors, it has been hypothesized that college students also feel less vulnerable to the consequences, putting them at an even higher risk for health problems (Grace, 1997).

Stress impacts not only an individual’s mental well-being, but also has been linked to poor physical well-being. Research has also demonstrated that there is a cyclical relationship between stress and health such that poor stress-related health creates more stress, perpetuating the stress-poor health cycle. Therefore, it is essential to not only understand the psychosocial influences that contribute to poor physical health, but to
also recognize the impact stress and physical health consequences of stress may have on emotional well-being.

**Relationship between stress and health**

The relationship between stress and general health is well understood. Studies have consistently found a negative relationship between stress and physical health (for a review see Krakowski, 1982; for a meta-analytic review see Segerstrom & Miller, 2004). Researchers who explored this relationship further have found it to hold true despite a variety of other variables contributing to the relationship (e.g., personality variables, Garrity, Somes, Marx, 1977; anxiety and depression, Rawson, Bloomer, Kendall, 2001; sense of control, Suls & Mullen, 1981). However, most of the research on the relationship between stress and physical health has been conducted in adult populations with few studies focused on college student populations (Edwards et al., 2001; Hudd et al., 2000; Largo-Wright, Peterson, & Chen, 2005; MacGeorge et al., 2004; Roth, Wiebe, Fillingim, & Shay, 1989; Sax, 1997). We have previously found a significant negative correlation between perceived stress and poor self-reported physical health in college students ($r = -.33$, $p < .001$; Gabert-Quillen & Delahanty, under review). Fortunately, stress and physical health problems tend to decline with more years in school. More specifically, freshman students tend to experience the most stress and health problems compared to students with higher class standing (Adlaf et al., 2001; Rawson et al., 2001).

With respect to pain, the majority of studies have reported a positive relationship between stress and pain in the general population (Dysvik, Natvig, Eikland, & Lindstorm,
2005; Endler, Corace, Summerfeldt, Johnson, & Rothbart, 2003). However, less is known about this relationship in the college student population, and even less is known about the relationships between stress and back and headache pain.

**Stress and Back pain.** In general, a limited amount of research has been conducted on the relationship between back pain and stress. However, existent studies have consistently found a positive relationship between stress and back pain in both specific samples (college students, Kennedy, Kassab, Gilkey, & Lennel, Morris, 2008; health care workers, Ahlberg-Hulten, Theorell, & Sigala, 1995; Gonge, Jensen, & Bonde, 2002; Karahan, Kav, Abbasoglu, & Dogan, 2009; Mitchell et al., 2009; chronic low back pain patients, Klapow et al., 1995) and in the general population (Croft et al., 1995; National Center for Health Statistics, 2006). In a prospective study of a large British cohort, Power and colleagues (2001) found that the experience of psychological distress doubled the risk of low back pain. More importantly, these findings were significant regardless of other variables (e.g., workload or physical stress on the spine). Gonge and colleagues (2002) also found this to be true in a sample of nursing personnel. In the only published examination of this relationship in undergraduates, Kennedy and colleagues (2008) were not able to control for spinal stress variables, so less is known about the impact of back pain and stress on college students. In our sample of KSU undergraduates (Gabert-Quillen, unpublished data), we found a positive and significant relationship between perceived stress and back pain ($r = .21$), but we also did not assess possible neurogenic factors that could contribute to back pain (e.g., posture, trauma, lifting).
**Stress and Headache pain.** The relationship between stress and headache pain has been reported in individuals experiencing life stressors (Hovanitz & Wander, 1990; Reynolds & Hovanitz, 2000), daily hassles (Bottos & Dewey, 2004), migraine headaches (Amery & Vandenbergh, 1987) and recurrent tension headaches (Holm, Holroyd, Hyrsey, Penzien, 1986). Some researchers have also demonstrated that the appraisal of the stressor has a greater impact on the relationship between stress and headache pain than the amount of stress exposure (Martin, Lae, & Reece, 2007). Other researchers found this relationship despite confounding variables such as family history of headaches and health habits (Labbe, Murphy, & O’Brien, 1997). However, confounding variables have not been thoroughly examined in headache pain sufferers. In college students, researchers have found that an increase in stress is associated with an increase in headache vulnerability and reporting (Andrasik, Holroyd, & Abell, 1979; Labbe et al., 1997; Levine, Krass, & Padawer, 1993; Martin & Nathan, 1987); with the frequency being much higher in American undergraduates than other countries (i.e., Australian, Martin & Nathan, 1987). In our sample of KSU undergraduates, we found a positive and significant relationship between perceived stress and frequency of headache pain ($r = .23$; Gabert-Quillen, unpublished data). Additionally, individuals who report recurrent headaches tend to experience stressful events more frequently (Ficek & Wittrock, 1995), suggesting a cyclical relationship between these two variables.

The financial, mental, and physical impact that stress and pain symptoms have on the college population underscores the importance of further study into understanding the relationship between stress and back and headache pain, as well as research into
interventions designed to decrease these symptoms. College students have relatively poor techniques for coping with their stress and health problems (Campbell, Svenson, & Jarvis, 1992; Lawrence & Shank, 1993; Nelson et al., 2008; Pritchard et al., 2007; Twenge, Zhang, & Im, 2004). In fact, one study found that 33% of their sample considered their method of dealing with stress to be a ‘serious problem’ and about 60% of them did not relax enough (Page, 1987). Others have found that the stress management programs developed for college students are essentially ineffective and cite participant attrition as being a huge problem (Nicholson, Belcastro, & Duncan, 1989). Additionally, as college students are less likely to seek medical assistance for their health problems (Brannon & Feist, 2007; Madey & Gomez, 2003); interventions may be an effective and efficient way of reducing pain reports in college students.

Pain interventions. Given the high percentage of pain reports that cannot be linked to a direct medical cause, researchers have explored stress-reducing interventions as a means by which to alleviate pain. Numerous interventions have been developed to help chronic pain patients manage their symptoms (Buckelew et al., 1990; Dysvik et al., 2005; Turner, Romano, & Karolyn, 1991). For back pain patients, interventions such as coping-skills training or stress management techniques (Carmody, 2001; Schell, Theorell, Hasson, Arnetz, & Sarate, 2008), learning about the amount of control they have over their health (Harkapaa, Jarvikoski, Mellin, & Hurri, 1991), or changing their pain appraisals (Glombiewski, Hartwich-Tersek, & Rief, 2010) have shown promise. However, these interventions are typically time and labor-intensive. For instance, Menzel and Robinson (2006) conducted a 6-week Cognitive Behavioral Therapy (CBT)
intervention for individuals with back pain who also endorsed high levels of stress and depression. While pain scores declined over time, drop-out rates were high over the course of the program with participants blaming time and the emotional nature of the intervention as their main reasons for leaving.

Comparison studies have suggested that relaxation training was better for tension headache sufferers while biofeedback was more beneficial for migraine headache sufferers (Holroyd & Penzien, 1994). In another study, researchers found that CBT was better than biofeedback in relieving headache pain (Martin, Forsyth, & Reece, 2007). Other researchers have found that behavioral treatments (e.g., relaxation training) administered online were effective among headache sufferers (Devineni & Blanchard, 2005). The efficacy of biofeedback and relaxation training has been demonstrated five years post-intervention among individuals with tension and vascular headaches (Blanchard, Appelbaum, Guarnieri, & Morrill, 1987). One study found symptom improvement in migraine sufferers three years after relaxation and stress-coping training (Sorbi, Tellegen, & du Long, 1989). Similar to back pain interventions, most of these techniques take time to implement, and the likelihood of attrition is high (Barton & Blanchard, 2001; Martin et al., 2007). One intervention that has been shown to have a moderate effect on college students’ physical and mental health problems is written emotional expression.

Written Emotional Expression
In 1986, Pennebaker and Beall found that a brief and simple writing paradigm helped to decrease health problems (i.e., health center visits) in an undergraduate population. In their protocol, participants wrote about a traumatic or stressful event for 15 to 20 minutes a day over four consecutive days. Writing sessions were typically done in private without any feedback given; participants were also instructed to “let go” of their thoughts and feelings and write without worry of spelling and grammar.

Most of the early work on written emotional disclosure was conducted in normal, healthy samples of individuals. Written emotional expression was found to be a popular and effective technique for improving mental and psychological health (Epstein et al., 2005; Hemenover, 2003; King, 2001; King & Miner, 2000; Pennebaker, Kiecolt-Glaser, & Glaser, 1988; Schoutrop, Lange, Haneweld, Davidovich, & Salomon, 2002; Sheese et al., 2004; Sloan & Marx, 2004a) and improving academic performance (Lumley & Provenzano, 2003; Pennebaker, Colder, & Sharp, 1990) in undergraduates. Research has also demonstrated that writing about stressful or traumatic topics led to better long-term health in Holocaust survivors (Pennebaker et al., 1989), reduced work absenteeism (Francis & Pennebaker, 1992), and improved coping with job loss (Spera, Buhrfeind, & Pennebaker, 1994). Written emotional expression also relieved symptoms in other populations such as depressed caregivers (Barry & Singer, 2001; Candell, 2003), people experiencing gay-related stress (Pachankis & Goldfried, 2010), individuals with posttraumatic stress disorder (Gidron et al., 1996), and older adults (Heffner, 2002). Finally, researchers found that WEE improved mental and physical health symptoms in various disease groups such as individuals with asthma and rheumatoid arthritis (Smyth
et al., 1999), cancer (De Moor et al., 2002; Gellaitry, Peters, Bloomfield, & Home, 2010; Rosenberg et al., 2002; Stanton et al., 2002), fibromyalgia (Broderick, Junghaenel, & Schwartz, 2005), stress injuries (Mankad, Gordon, & Wallman, 2009), and chronic pelvic pain (Norman, Lumley, Dooley, & Diamond, 2004).

A number of possible explanations have been posited for the success of WEE. Before the writing paradigm was established, research demonstrated that those who had not disclosed their stressors or traumatic events often reported poorer health compared to those who had (Pennebaker, 1985; Pennebaker, Barger, Tiebout, 1989; Pennebaker & O’Heeron, 1984; for a review see Pennebaker & Susman, 1988). However, Pennebaker (1997) noted that the expression of emotions is not enough to produce physical health changes and there must be other theories that explain why the paradigm was so effective. By analyzing the actual writing of the participants, Pennebaker and colleagues (1990) found that individuals who wrote more positive words and a moderate amount of negative words saw greater improvements in their health than those who wrote all negative words and no positive words. Notably, those who wrote more causal (e.g., because, reason) and insight words (e.g., understand, realize) saw the most improvements. These were word categories that required more thought and cognitive components than merely writing feelings and emotions down. Other researchers have agreed that written emotional expression is a way for participants to gain insight into (Frattaroli, 2006) or revise their way of thinking (Sloan & Marx, 2004b) about their stressful or traumatic experience. Finally others have added that written emotional
disclosure is a form of exposure therapy that causes individuals to think about events that they may have once avoided (Frattaroli, 2006; Sloan & Marx, 2004b).

**Meta-analyses of written emotional expression**

With the growing success of WEE, three meta-analyses have been conducted regarding its efficacy. The first was conducted on the initial studies published on WEE in normal, healthy samples. This meta-analysis revealed a large effect size ($k = 14, d = .47$ or $r = .23$) for the finding that written emotional disclosure enhanced health in four outcomes: reported physical health, psychological well-being, physiological functioning, and general functioning (Smyth, 1998).

The second meta-analysis was conducted on studies that included individuals with medical or psychiatric disorders. Frisina and colleagues (2004) revealed an effect size of $d = .19$ ($r = .10$) finding that written emotional was successful for those with physical health problems, but was not successful for those with mental health problems.

The most recent and perhaps comprehensive meta-analysis of 146 studies revealed the smallest, though still significant, effect size ($r = .075$ or $d = .067$; Frattaroli, 2006). This meta-analysis found that written emotional disclosure was only moderately successful for psychological health, physiological health, reported health, general functioning, and the subjective impact of the intervention. Despite the smaller effect size, written emotional expression is still a popular and brief intervention for mental and physical health symptoms.
Variations of the WEE paradigm

Following Pennebaker’s original work, researchers began testing whether modifications to the design would alter the efficacy of WEE. Some of these changes to the protocol have likely also been responsible for observed decreases in effect sizes. Specific changes that have been examined include changes to the stressor, changes to the writing directions, the mode of disclosure, the number and timing of assessments, and the comparison group.

Changes to the stressor. One of the most explored aspects of the WEE protocol is the topic that the participant is instructed to write about. Instead of having participants write about a general stressor or traumatic event of their choosing; some studies have instructed participants to write about a specific stressful or traumatic event. Some of these involved diagnosis or adjustment to cancer (Low et al., 2010; Zakowski, Ramati, Morton, Johnson, & Flanigan, 2004), recovering from a sports injury (Mancad et al., 2009), coming to college (Pennebaker et al., 1990), being a victim of gay-related discrimination (Pachankis & Goldfried, 2010), abuse or assault (Antal & Range, 2009; Brown & Heimberg, 2001), racial discrimination (Stetler, Chen, & Miller, 2006), coping with the death of a spouse (Segal et al., 2001), and coping with a stressful family event (Bell-Pringle, 2004). One researcher had college students write about an imaginary traumatic event versus a real traumatic event and found decreased health center visits in both groups (Greenberg, Wortman, Stone, 1996).

Some researchers have abandoned the idea of writing about negative events altogether and suggested that a patient can benefit just as much when writing about
positive events as they can when writing about negative events (Burton & King, 2004; 2009; King, 2002; Marlo & Wagner, 1999; Wing, Schutte, & Byrne, 2006). For example, writing about one’s best possible future self led to greater improvements in health compared to those who wrote about a negative event (Austenfeld et al., 2006; King, 2001). However in a similar comparison study, Aldridge and colleagues (2005) instructed groups of participants to write about positive events and others to write about negative events. While the findings were similar for both of these groups in that physical health improved, those who wrote about negative events found more psychological benefit in the writing paradigm. Others have found that writing about other events such as life goals also leads to health improvements (Harrist et al., 2007). In a recent meta-analysis, Frattaroli (2006) did not find a significant difference between those writing about negative or positive events and the effects on health.

**Changes to the writing directions.** Another large variation on the paradigm has involved changing the writing directions. Whereas in the original paradigm participants were instructed to “let go” and focus their thoughts and emotions about the stressor, instructions in other paradigms have varied considerably. For instance, other researchers have focused on the importance of the participants writing a narrative about their trauma (Cepeda et al., 2008; Danoff-Burg et al., 2010; Dunnack et al., 2009; Pennebaker & Seagal, 1999). In a comparison study, Danoff-Burg and colleagues (2010) randomized participants into three groups: a control group, a standard writing group, and a narrative group. The narrative group was given explicit instructions to write “a story told about a specific event, or sequence of events, that the storyteller, or narrator, experienced. The
narrator paints a picture for the reader, describing the circumstances (who, when, what, where, why, and how) of the story as a foundation for connections to be made.” These researchers found that while both experimental groups were superior to the control group, the standard writing group found more meaning in their writing, but the groups did not differ on mood and health variables. They concluded that while forming a cohesive narrative may be beneficial, the freedom to write in the standard form should not be discounted.

Other participants have been instructed to write imagined dialogue (Brody & Park, 2004; Burke & Bradley, 2007; Green et al., 1996). For example, participants were given instructions to write as if “talking with someone else” of their choosing. In their comparison study, Burke & Bradley (2007) found that imagined dialogue showed greater improvements in mood than did writing a narrative about the stressor. Other paradigms had a more cognitive focus by which participants were instructed to think about their emotions in other ways (Broderick, Stone, Smyth, & Kaell, 2004; Kllay et al., 2008; Low, Stanton, & Bower, 2008). Alternatively, participants have been told to “focus on how the experience had affected their lives and what it has meant to them” (Sloan, Marx, Epstein, & Lexington, 2007). However, in this study the original paradigm was associated with better outcomes than the cognitive paradigm with respect to both psychological and physical health.

Another possible variation to the writing task was having participants look at the positive aspects of the trauma or attempt to find meaning/benefit from the stressor (Bower et al., 2003; 2009; Danoff-Burg et al., 2006; King & Miner, 2000; Yamasaki,
Uchida, & Katsuma, 2010). King and Miner (2000) randomized participants into one of four writing groups: writing about benefits of trauma vs. not writing about benefits and writing about trauma vs. not writing about trauma. Their study found that at 3- and 5-months after writing, the trauma-only group and the perceived benefits-only group showed both mood and physical health improvements compared to the other groups. Finally, other variations have included writing from a religious perspective (Chen & Contrada, 2010) and expressing anger about the stressful event (Graham, Lobel, Glass, & Lokshina, 2008). In the most recent meta-analysis, Frattaroli (2006) did not find a significant difference between those that used the original writing instructions and those that focused on a cognitive change.

**Mode of disclosure.** The original writing paradigm was conducted in a private room in which the participant hand wrote their responses. Subsequent research has also modified this aspect of the protocol. Researchers have found that typing their responses on a computer provided similar benefits in mood enhancement compared to writing longhand (Brewin & Lennard, 1999; Sharp & Hargrove, 2004). Sharp & Hargrove (2004) suggested that a more computer literate population (e.g., college students) may benefit from the typing paradigm. However, Brewin & Lennard (1999) noted that hand writing may lead to more disclosure compared to typing.

Other paradigms have tested whether writing was important or whether having participants speak aloud into a tape recorder would be similarly efficacious (Esterling, Antoni, Fletcher, Margulies, & Schneiderman, 1994; Murray & Segal, 1994; Pennebaker et al., 1987). Results have been mixed with this method with some researchers finding
that the participants who spoke expressed fewer emotions and did not improve compared to the hand written disclosure group (Esterling et al., 1994). However others found no differences between the groups, and that the speaking group expressed more emotions than the writing group (Murray & Segal, 1994).

In other paradigms, participants were asked not to speak into a tape recorder, but to speak to another person. The other person was a therapist who did not provide any feedback. Participants who spoke to a therapist had a decrease in negative mood after the disclosure, but the participants were unable to articulate why a therapist helped in this process (Donnelly & Murray, 1991). However, speaking about the traumatic event to another person may defeat the purpose of disclosing a topic that is meant to be conducted in private (Donnelly & Murray, 1991; Harrist et al., 2007; Hartke et al., 2007; Keefe et al., 2008; Radcliffe et al., 2007).

Finally, researchers began to move the writing paradigm from the laboratory into participants’ homes and even to the internet. Some researchers conducted written emotional disclosure studies in the home (Gillis et al., 2006; Low, Stanton, Bower, & Gyllenhammer, 2010; van Middendorp et al., 2007; Wetherell et al., 2005), while others cautioned against it (Sheffield et al., 2002) citing the problem of having less control over the writing situation (e.g., duration of writing, when participants wrote, where participants wrote). Others have found promise in using the internet, creating a “blog” or journal for participants to disclose through (Han et al., 2008; Johnston, Startup, Lavender, Godfrey, & Schmidt, 2010; Kraaij et al., 2010; Pachankis & Goldfried, 2010). One study found that participants preferred the internet over face to face discussion; however, the
efficacy of the original paradigm was not explored in this study (Johnston et al., 2010).

In general, although the results have been mixed, the majority of researchers have favored a private writing session whether it is in the lab, at home, or on the internet.

Studies have been mixed in the effectiveness of the mode of disclosure. In Frattaroli’s meta-analysis (2006), it was found that the mode of disclosure did not have an effect on the outcome variables whether the disclosure paradigms were hand written, typed, or spoken aloud into a tape recorder. Nor did effect sizes differ for those who shared their writing samples with a lab assistant. However, Pennebaker (2002) commented on the importance of the writing sessions being a private experience and underscored that writing sessions should be conducted without a researcher present.

**Number of assessments.** Researchers have also questioned if the number and spacing of writing sessions mattered when examining the efficacy of the writing paradigm, and results have been relatively mixed. Some researchers have found benefit in shorter sessions (writing for two, two minute sessions, Burton & King, 2008; one day session, Greenberg et al., 1996) and longer sessions (writing for five, 45-minute sessions, Schoutrop et al., 2002). In another study, Chung & Pennebaker (2008) found that the benefits of a condensed 1-hour writing session were similar to that of the original paradigm; however, the shorter writing sessions produced greater mood changes immediately after. It was also demonstrated that expanding the paradigm for several weeks led to health improvements in participants (Francis & Pennebaker, 1992). Frattaroli (2006) found that studies that had at least three or more disclosure sessions and
that involved writing sessions lasting at least 15 minutes provided more benefit to participants.

**The comparison group.** The final variation of the original writing paradigm involves the writing instructions provided to the comparison group. In the original paradigm, participants in the comparison group were instructed to write about a superficial or neutral topic such as the contents of their closet or how they brush their teeth. After a published study demonstrating the effectiveness of writing about a stressor versus writing about time management (Spera et al., 1994), Pennebaker (1994) emphasized that writing about time management would produce more benefits than a trivial writing group. In their review, Radcliffe and her colleagues (2007) noted that some comparison groups who wrote about superficial topics actually reported worse health symptoms over time. They hypothesized that significant findings may be due to the comparison group getting worse while the experimental group improves slightly, and not due to simple improvement of the experimental group. This has also been demonstrated in the empirical literature (Opre, Coman, Kallay, Rotaru, & Marnier, 2005; Pennebaker, Kiecolt-Glaser, & Glaser, 1988). In a comparison study, it was demonstrated that after writing, the time management control group had similar results to a no-writing control group in mood; however, the study did not compare the time management group to a superficial writing group (Radcliffe et al., 2007). Although the superficial writing group does not always lead to a decline in health symptoms in participants (Sharp & Hargrove, 2004), most studies have adapted the time management comparison group over the superficial writing group.
Written Emotional Expression for Back and Headache Pain

As previously demonstrated, the written emotional exposure paradigm has been administered in many physical health populations. It has also been administered in pain populations such as those with general chronic pain (Graham et al., 2008), and those with specific pain syndromes such as chronic pelvic pain (Norman et al., 2004), fibromyalgia (Gillis et al., 2006; Junghaenel, Schwartz, & Broderick, 2008), and rheumatoid arthritis (Lumley, Kelley, & Leisen, 1997). The majority of studies have produced significant improvements in pain disability and intensity ratings (Gillis et al., 2006; Graham et al., 2008; Norman et al., 2004), and changes in overall mood (Graham et al., 2008) in written expression patients compared to a control group with only one exception (Broderick et al., 2005).

No studies have been conducted examining the efficacy of WEE at reducing back pain, and there have been only two published studies conducted on the efficacy of written emotional disclosure at reducing headaches. In these studies, researchers compared the efficacy of written emotional disclosure and relaxation training in a group of undergraduate students with migraine and tension headaches. They reported that relaxation training, and not written emotional disclosure, led to improvements in severity and disability from headache symptoms compared to a control group, especially in the tension headache group (D’Souza et al., 2008; Kraft et al., 2008). However, participants in the relaxation training group also wrote about time management, so perhaps a “true” relaxation training group is needed or another comparison group was needed (e.g., wait-list, informational brochure) to examine group differences.
Moderators of Written Emotional Expression

Despite the success and popularity of the typical written emotional expression paradigms, subsequent research began to suggest that certain individuals may benefit more than others from written emotional expression. Moderator variables of particular interest are emotion and mood variables, coping techniques, and stress or PTSD symptoms.

Alexithymia. The benefits of emotional written expression are not effective for every individual and personality type. The term alexithymia means “lacking words for feelings” and was coined back in the 1970’s by clinicians whose clients could not express their emotions and were not able to verbalize their emotions (Lumley, Tojek, & Macklem, 2002). Taylor and colleagues (1992) have explored the alexithymic personality and concluded that alexithymia is a deficit in identifying, processing, and expressing emotions. In a review, researchers found that alexithymia was associated with mental and physical health problems, poor health care behaviors, and a lack of health care use (Lumley, Stettner, & Wehmen, 1996). A recent study found that college students who are unable to express their emotions experienced higher levels of perceived stress and worse adjustment to college (Kerr, Johnson, Gans, & Krurine, 2004). Researchers have also found that individuals with higher levels of alexithymia may report higher pain ratings (Katz, Martin, Page, & Calleri, 2009; O’Conner & Ashley, 2008). While research has demonstrated that people who are alexithymic may not benefit from written emotional disclosure (Kelley, Lumley, & Leisen, 1997), others find that those high in alexithymia may benefit more from WEE (Baike & McIlwain, 2008; Solano, Donati,
Pecci, Persichetti, & Colaci, 2003). Based on these mixed findings, there is a need to further investigate how alexithymia will impact the efficacy of WEE.

**Ambivalence over emotional expression.** While alexithymia is an inability to express emotions, those who are ambivalent about expressing their emotions can express their emotions, they just are uncertain about doing so (Lumley et al., 2002). Researchers have found that those who are ambivalent about expressing their emotions may not be able to cope with life’s stressors and may be prone to depression (Trachsel, Gurtner, von Kanel, & Holtforth, 2010). Additionally, individuals high in ambivalence over expressing their emotions suffer from greater levels of distress and poor physical health (King & Emmons, 1990; 1991; Michael et al., 2006). More specifically, in patients with chronic pain symptoms, researchers found that patients who had higher ambivalence scores reported higher levels of pain and greater negative mood (Carson et al., 2007; Porter, Keefe, Lipkus, & Hurwitz, 2005). Research on the efficacy of WEE for those who are ambivalent about expressing emotions find both mental and physical health benefits from WEE (Lu & Stanton, 2010; Norman et al., 2004).

**Negative affect.** Watson and Clark (1984) first introduced negative affect as a stable and trait-like predisposition to experience distress even in times when events are not particularly stressful. Additionally, a reciprocal relationship has been found between negative affect and stress (Bolger, DeLongis, Kessler, & Schilling, 1989). In their review, Watson & Pennebaker (1989) found that while negative affect was related to increases in health complaints, it was not related to health status suggesting that these individuals are more likely to perceive health problems. Furthermore, those high in
negative affect are more likely to self-report specific physical symptoms (e.g., tension headaches, neck, and back pain; Johnson, 2003). While negative affect is positively correlated with depression and anxiety, positive affect (i.e., having an enthusiasm for life) is negatively correlated with depressive symptoms (Watson, Clark, & Carey, 1988). Further, having a positive affect may be beneficial for one’s physical health (Clark & Watson, 1988; Yamasaki, Nagai, & Uchida, 2007) and lead to health promoting behaviors (Griffin, Friend, Eitel, & Lobel, 1999). While positive and negative affect are most often examined as outcome variables for the writing paradigm, they have recently been examined as moderators of the relationship. For instance, some studies found that those who are high in negative affect benefit more from disclosure in both general mood and physical health compared to those with positive affect (Lumley & Provenzano, 2003; Norman et al., 2004).

**Coping styles.** Many researchers find that certain coping styles help protect individuals from a stressful experience. Both Lazarus and Folkman (1980) and Billings and Moos (1981) have examined how the appraisal of life events, and the coping resources chosen to deal with these life events, have an effect on an individual’s mental and physical well-being. In a recent meta-analysis, Penley and colleagues (2004) found that problem-focused coping (i.e., dealing with the source of stress by making changes) was positively correlated with better physical health outcomes compared to emotional-approach (i.e., using emotional support) and avoidant coping techniques (i.e., ignoring or avoiding the stressor). More specifically, in pain patients, those with more avoidant coping styles reported more pain severity and disability compared to those with more
problem-focused coping styles (Carmody, 2001; Lake, 2009). Researchers also found that those who used an avoidant coping style exhibited more mental and physical health problems over time (Kenardy & Tan, 2006). However, other expressive writing studies found that participants who used emotional-approach coping benefited more from expressive writing than those in the control group (Kraft et al., 2008). Overall, the literature is mixed as to what type of coping styles leads to health benefits after expressive writing.

**Stress and Posttraumatic Stress Symptoms.** In Frattaroli’s meta-analysis (2006), stress was found to be a significant moderator of written emotional exposure, specifically for physical health problems. However, findings may differ for individuals who have been exposed to traumatic stress and have subsequently developed posttraumatic stress disorder (PTSD). PTSD is associated with poorer health outcomes across a variety of disorders (see Schnurr and Jankowski, 1999). In general, research has demonstrated that those who are exposed to trauma are more likely to report greater physical health symptoms (Friedman & Schnurr, 1995; Schnurr & Jankowski, 1999). One study found that WEE was a detriment to PTSD participants’ physical health (Gidron, Peri, Connolly, & Shalev, 1996) and it has been further hypothesized that those with severe PTSD may not benefit from WEE, and that this group should be examined with caution (Pennebaker & Seagal, 1999). More recently, WEE has shown to improve mental and physical well-being in individuals with a severe trauma history (Schoutrop et al., 2002) and those with PTSD (Chen, 2005; Sloan & Marx, 2004a; Sloan, Marx, & Epstein, 2005; Smyth, Hockemeyer, & Tulloch, 2008).
The Current Study

College students experience higher levels of back and headache pain compared to the general population. While pain symptoms are sometimes linked to medical causes, psychogenic causes, like stress, are often to blame. Few stress-reducing interventions have been developed that focus on relieving pain symptoms in undergraduate populations. The current study examined the efficacy of WEE at reducing back and headache pain in college students.

Our analysis of the literature allowed us to make the following hypotheses regarding our WEE paradigm:

- **Hypothesis #1.** It was hypothesized that the WEE group would experience worse mood during the course of the writing sessions than the comparison group.

- **Hypothesis #2.** Compared to the comparison group, participants in the WEE group would find the experiment more meaningful and would be more likely to share their thoughts and feelings.

- **Hypothesis #3.** It was also hypothesized that those in the WEE group would see an improvement in physical and mental health problems 1- and 3-months post-writing compared to the comparison group.
  - 3a. For the WEE group, there would be decreases in frequency, intensity and disability of pain, and decreases in pain medication use 1- and 3-months post-writing.
  - 3b. The WEE group would have decreases in perceived stress and negative affect 1- and 3-months post-writing.
Hypothesis #4. There would be various moderators of the efficacy of WEE. These included pain group, prior journaling experience, alexithymia (e.g., difficulty describing feelings), ambivalence over emotional expression, negative affect, coping styles, and PTSD symptoms. More specifically:

- 4a. Individuals with certain pain problems (i.e., back or headache pain) may benefit more from WEE than others.
- 4b. A prior experience with writing in a journal will provide more benefits to individuals in the WEE group.
- 4c. Individuals who score high in alexithymia will not benefit from WEE.
- 4d. Those in the WEE group who score high in ambivalence might find more benefit than those low in ambivalence.
- 4e. Individuals with an overall negative affect will benefit more from expressive writing than those in the time management group.
- 4f. Those with an emotional approach and problem-focused coping style will benefit from expressive writing while those with an avoidant coping style will not benefit from expressive writing.
- 4g. People with higher PTSD symptoms will experience worse mental and physical health problems when writing about a traumatic experience.
Method

Participants

Undergraduates from the Kent State University SONA subject pool were recruited for the current study. 1479 undergraduates were screened to determine eligibility for the study. Participants were eligible if they experienced high amounts of back and/or headache pain (i.e., symptoms occurring once a week or more). Exclusionary criteria included individuals who reported back and/or headache pain but were being treated by a physician or had a medical reason for their pain. Of the 1479 assessed for eligibility criterion, 1126 did not meet requirements for the study for the following reasons: did not wish to be contacted about other studies ($n = 395$), did not have back or headache pain ($n = 574$), and had back or headache pain, but had a medical reason ($n = 157$). 353 participants were eligible to participate and were contacted through email and telephone; however, 83 declined and 145 never responded. Therefore, 125 participants were recruited for the current study; however, twelve individuals dropped out before the first session. This was likely due to it being the beginning or end of the semester when students were busier. One-hundred thirteen participants (17 males and 96 females) completed the baseline questionnaires (see Figure 1 for a chart of participant enrollment
and progress). Tables 1 and 2 provide more information about participants’ demographic information.

Figure 1. CONSORT chart of completers.
Fifty-seven individuals were randomized to receive WEE, and 56 were randomized to the comparison group. Only one participant withdrew from the WEE group before the final session. Two participants withdrew from the comparison group. One participant withdrew after the first session explaining that the study “was not for him/her.” Therefore, the final sample consisted of 56 individuals randomized to receive WEE and 54 randomized to the comparison group. At the 1-month post-writing follow-up, 52 participants were retained in the WEE group (7.2% drop-out rate) and 46 participants were retained in the comparison group (14.8% drop-out rate). At the 3-month post-writing follow-up, 48 participants were retained in the WEE group (7.7% drop-out rate) and all 46 participants were retained in the comparison group. The final sample at the 3-month follow-up assessment consisted of 94 participants (13 males, 81 females).

Participants who dropped out at 1- and 3-months reported experiencing a greater number of traumas than those who remained in the study ($p < .05$). At 1- and 3-months, participants who dropped out reported less frequent back pain at baseline ($p < .01$). There were no significant differences in any demographic or other study variables between participants who dropped out and those who were retained at any time point (all $ps > .05$).

**Procedure**

**Initial Screening & Recruitment.** We identified students who reported high levels of back and headache pain through an online screener in SONA. Students were
asked questions about their stress (Perceived Stress Scale (PSS); Cohen & Williamson, 1988), general health (Short-Form 36, Ware & Sherbourne, 1992), number of health center visits last semester, and back and headache pain ratings (Pennebaker Inventory of Limbid Languidness (PILL); Pennbaker, 1982). Only participants who reported pain with no neurogenic cause were eligible. Therefore, screeners asked students about previous physical trauma that may have contributed to their back and headache pain. Students who reported spending most of their time sitting, standing, or lifting heavy objects were excluded from the study as it could be connected to back or headache pain through muscle strain. Students were also asked an open-ended question about the causes for their back and headache pain. Finally since this was an intervention study, students could not be receiving therapy (i.e., physical or clinical) for their pain. The screener took less than 30 minutes to complete and students earned one research credit for their participation. Eligible participants were contacted either by phone or email by a lab researcher. The researcher explained that the purpose of the study was to examine how writing effects well-being and told the participant they would be writing about a personal topic. If interested, they scheduled a time for the participant to come in for the writing sessions. As mentioned, participants were not made aware that there was more than one study condition.

**Participant Randomization.** Participants who reported high levels of back and/or headache pain were randomly assigned to be in either the comparison group or the WEE group. Block randomization was used to ensure equal representation of males and females in the study. An online randomization program was used to assign a participant
number to either the comparison or WEE groups for back and/or headache pain participants. Packets containing the study materials were labeled according to participant number, and participants were assigned their number as they signed up for the study.

**Writing Sessions.** Upon entering the first writing session, the participants were greeted by a trained lab assistant who explained the details of the study. It is important to note that the lab assistants did not know what writing topic the participant was assigned. Participants were only made aware that they would be writing about highly personal topics. Informed consent was obtained at that time and participants also signed up for the follow-up sessions on SONA 2 (i.e., a system similar to SONA except that participants would be paid for completing questionnaires).

Participants were next asked to complete a questionnaire packet. More specifically, participants completed a questionnaire packet asking them about their pain severity (i.e., pain frequency, intensity and disability, and pain medication use; Melzack, 1987; Pennebaker, Colder, & Sharp, 1990), level of perceived stress (PSS; Cohen & Williamson, 1988), and traumatic stress (Post-Traumatic Stress Diagnostic Scale (PDS; Foa, 1995). The questionnaire packet also focused on participants’ reluctance in expressing emotions (Ambivalence Over Emotional Expressiveness Questionnaire (AEQ); King & Emmons, 1990), inability to express emotions to others (Toronto Alexithymia Scale (TAS-20); Bagby, Parker, & Taylor, 1994a), whether they experience positive or negative emotions (Positive and Negative Affect Scale (PANAS), Watson & Clark, 1994), and whether they use certain coping styles to deal with stress (Brief COPE; Carver, 1997). These questionnaires took approximately 30-40 minutes to complete.
Before the participants began writing, they completed a brief mood survey (PANAS, Watson & Clark, 1994). The lab assistant then handed the participant an envelope containing their writing topic. Writing sessions were based on Pennebaker’s original procedure (detailed in Pennebaker, 1994). Briefly, participants who were in the WEE group wrote about a stressful or traumatic event of their choosing (“the most upsetting experience in your life”) while the comparison group wrote about a time management topic (“describe what you did yesterday”). The lab assistant monitored the time, but remained outside of the room to provide privacy. After 20 minutes, the lab assistant knocked on the door and participants were instructed to place whatever they wrote into the envelope and seal it if they wanted. After the participants finished, they completed another brief mood survey and were allowed to leave.

For the second and third writing sessions, the participant was greeted by a lab assistant who again relayed similar information about the study, took them to a private writing room, administered a brief mood survey, gave them their writing assignment, and gave them another brief mood survey. After the third writing session, participants were given a final questionnaire focusing on their attitudes and moods about the writing experiment itself (Pennebaker et al., 1990). Participants were also reminded of the follow-up sessions. Participants received four research credits for their participation in the writing sessions.

**Follow-up.** At approximately 1- and 3-months post-writing, participants completed brief online questionnaires on SONA 2. Justification for multiple follow-ups has been suggested in other studies and reviews (Frattaroli, 2006; Sloan, Feinstein, &
Marx, 2008). Questionnaires asked participants about their current mood, stress levels, and physical health symptoms. These questionnaires were similar to the questionnaires they took during their initial screening. Participants also took questionnaires regarding their attitudes and moods regarding the experiment. These were similar to the other questionnaires the participant completed. These questionnaires took no more than 20 minutes to complete. In order to decrease chances of attrition, participants were awarded a $10 gift card to a local eatery (i.e., a choice between Starbucks & Chipotle) for completing both questionnaires. After the last participant completes the study (i.e., Mid-June), participants will receive a final debriefing revealing the true nature of the study.

Measures

Perceived stress. The Perceived Stress Scale (PSS-10; Cohen & Williamson, 1988) measured the degree to which situations in one’s life were appraised as stressful. This 10-item measure included statements about how often “you felt difficulties were piling up so high that you could not overcome them” and “you felt you were unable to control the important things in your life” on a scale from 0 (never) to 5 (very often). The PSS was administered as one of the screener questionnaires and at the participants’ 1- and 3-month follow-up to briefly determine participants’ stress levels. The PSS has been validated and is considered reliable (Cohen et al., 1983). Internal consistency for the PSS was acceptable in our sample (baseline alpha = .90; 1-month = .91; 3-months = .91).

Traumatic stress. Participants’ trauma history and Posttraumatic Stress Disorder Symptoms were assessed by the Post-Traumatic Stress Diagnostic Scale (PDS; Foa, 1995).
In this 48-item measure, participants completed a trauma history checklist and a symptom severity portion for the most stressful trauma. This 17-item portion included statements like “reliving the event” and “trying not to think about the event” where participants would rate the statements on a scale from 0 (not at all bothered them) to 3 (bothered more than 5x a week). A cutoff score of 17 identified individuals with a “probable” PTSD diagnosis (Giffin, Uhlmansiek, Resick, & Mechanic, 2004). Higher scores on the symptom severity portion of this measure indicated higher symptoms of PTSD. The PDS is considered to be a valid and reliable measure of PTSD (McCarthy, 2008). Internal consistency for the PDS was acceptable in our sample (alpha = .88).

**General and specific health.** To understand participants’ general health, they completed a modified version of the Short-Form 36 (SF-36; Ware & Sherbourne, 1992). Participants were asked to complete questions comparing their health now to how it was a year ago, comparing their health to other people, and answering questions about their current health. Participants responded on a scale from 1 (excellent) to 5 (poor). To determine the participants who reported high levels of back and headache pain, participants completed the Pennebaker Inventory of Limbid Languidness (PILL; Pennbaker, 1982). This survey listed several health symptoms and participants indicated the frequency of symptoms on a scale from 1 (never experience the symptom) to 5 (experience this symptom more than once a week). To be eligible for the study, the participant must have reported a 4 or 5. Participants were asked to estimate how many times they had visited the health center or a physician and how many days they had been sick. Both of these
measures have been shown to be reliable and valid measures of health (Pennebaker, 1982; Ware, 2002).

**Pain severity.** To determine the pain severity of participants throughout the study, participants were asked to answer several questions. These questions were modified from the McGill Pain Questionnaire (Melzack, 1987) and Pennebaker’s standard questionnaires (Pennebaker et al., 1990). In this measure, participants responded about the frequency of their pain, the frequency that they are less active because of their pain, and how many pain relievers they took. In addition, participants reported on the intensity of their pain on a scale from 1 (no pain) to 10 (worst possible pain). Different versions of the pain severity questionnaire were distributed depending on the time of assessment. More specifically, questionnaires asked them to think about their pain currently, since the writing experiment, or since the last questionnaire.

**Attitudes about expression.** Questionnaires were developed to understand participants’ thoughts and feelings after written emotional expression. The Attitudes about Expression Questionnaire is a 10-item measure including statements: “how much did you reveal your emotions” and “to what degree do you feel that the experiment had a positive long-lasting effect on you” (Pennebaker et al., 1990). Most well-being questions asked were on a scale from 1 (not at all) to 7 (a great deal). Different versions of this questionnaire were distributed depending on the time of assessment. More specifically, participants gave their opinion about the study after finishing, since the writing experiment, or since the last questionnaire.
Alexithymia. We determined those individuals who have trouble expressing their emotions by having participants complete the revised version of the Toronto Alexithymia Scale (TAS-20; Bagby et al., 1994a). This is a 20-item measure that assessed alexithymia on three subscales (difficulty describing feelings (DDF), difficulty identifying feelings (DIF), and externally oriented thinking (EOT)) and also allowed for a total alexithymia score. Participants responded to statements on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree). Examples of statements would include: “I am often confused about what emotion I am feeling” and “I have feelings that I can’t quite identify”. Ratings were summed across items; higher scores indicated higher levels of alexithymia. Several studies have found this to be a valid and reliable measure in different samples (Baby, Taylor, Parker, & Loiselle, 1990; Taylor, Bagby & Parker, 1992; Bagby, Taylor, & Parker, 1994b). Internal consistency for the TAS was acceptable in our sample (total alpha: .84; DDF = .79; DIF: .86; EOT: .59).

Ambivalence. Participants’ reluctance to express their emotions openly was assessed by the Ambivalence over Emotional Expressiveness Questionnaire (AEQ; King & Emmons, 1990). The AEQ is a 28-item measure that assessed ambivalence about expressing positive and negative emotions and also allowed for a total ambivalence score. Examples of statements include: “Often I find that I am not able to tell others how much they really mean to me.” Participants responded to each statement on a 5-point scale from 1 (I have never felt like this) to 5 (I frequently feel like this). Ratings were summed across items; higher scores indicated more ambivalence. The AEQ has been shown to be reliable and valid in several populations (King & Emmons, 1990; 1991). Internal
consistency for the AEQ was acceptable in our sample (total alpha: .92, positive alpha: .90, negative alpha: .77).

**Positive and negative affect.** To determine the participants’ mood, the Positive and Negative Affect Scale (PANAS; Watson & Clark, 1994) was administered. These two, 10-item measures asked participants to rate the extent they have felt certain emotions within the past week (e.g., “afraid”, “excited”, “strong”) on a 5-point scale from 1 (not at all) to 5 (extremely). Ratings were summed for each sub-scale; higher scores indicated higher levels of positive or negative affect. The PANAS has been shown to be reliable and valid in a wide variety of populations for thousands of assessments (Egloff, Schmukle, Burns, Kohlmann, & Hock, 2003). Internal consistency for the PANAS was acceptable in our sample (negative mood baseline alpha = .87; negative mood 1-month = .90; negative mood 3-months = .87; positive mood baseline alpha = .90; positive mood 1-month = .87; positive mood 3-months = .91). A similar version of this measure was given to participants before and after writing their writing sessions. This was to determine negative (i.e., “anger”, “guilt”, “sadness”) and positive (i.e., “calmness” and “happiness”) mood changes. Pennebaker called this shorter version the Emotion Checklist (1982) and found it to be internally consistent and to have good test-retest reliability.

**Coping Styles.** Coping style was assessed with the Brief COPE which is a 28-item inventory of 14 different coping styles individuals may use when faced with stress (Carver, 1997). Participants rated statements such as “I’ve been getting help and advice from other people” and “I’ve been making jokes about it” on a 4-point scale from 1 (I haven’t been doing this at all) to 4 (I’ve been doing this a lot). In the current study the
items were grouped into three subscales: emotional-approach coping, problem-focused coping, and avoidant coping (Carver & Scheier, 1994; Cooper, Katona, & Livingston, 2008). Both the Brief COPE and the longer version (Carver, Scheier, & Weintraub, 1989) have strong validity and reliability. Internal consistency for the Brief COPE was acceptable in our sample (emotional-approach coping alpha = .77; problem-focused coping: .83; avoidant coping: .75).

Data analysis plan

Normality and Missing Data. A power analysis was conducted to determine the appropriate sample size necessary for confidence in the statistical analyses. At an alpha level of .05 (two-tailed), 90 participants will provide 80% power to detect a group difference with a moderate effect size. Before any analyses were conducted, individual items and subscales were checked for univariate normality with skewness < 2 and kurtosis < ±7. Data were relatively normally distributed for all variables in the analyses. In cases where an individual had < 20% of responses missing, data were imputed at the subscale level by substituting the individual’s average subscale score. This resulted in imputation at the mean subscale level for: two participants who were missing one response on the initial PSS, two participants who were missing one response on the TAS, one participant who was missing one item on AEQ, and one participant missing two items on the PANAS (one each subscale). One participant was missing a considerable amount of data for the 1- and 3-month follow-ups so his/her data were not used in the analyses.
Dropout and Group Differences. In order to test for possible differences in attrition, chi square analyses were conducted between the categorical variables of dropout (yes or no), group assignment (WEE and time management), gender, race (Caucasian, African American, other) and class standing (Freshman, Sophomore, Junior, Senior) before completion of the writing sessions, and at 1- and 3-months post-writing. One-way ANOVAs were also conducted between the dropout variables and age to examine group differences.

Although it was expected that randomization provided relatively similar groups, the control and WEE group was compared on demographics and baseline levels of the outcome measures. More specifically, in order to identify possible control variables, chi square analyses were conducted between the categorical variables of group assignment, gender, race and class standing at the baseline, 1- and 3-month assessments. One-way ANOVAs were also conducted between categorical and continuous variables to examine group differences in age, pain severity variables, perceived stress levels, trauma history, PTSD symptoms, mood before writing, overall mood, alexithymia, and ambivalence to emotional expression at the baseline, 1- and 3-month assessments. If significant differences emerged, these variables were used as covariates in the analyses.

Adherence and manipulation checks. Several checks on the success of the manipulation were conducted. First, two research assistants who were blind to the participant’s specific group assignment read each participant’s writing responses and judged which group he/she was assigned. Accuracy of the research assistants were compared to actual group assignment. The raters also determined if participants adhered
to the specific writing assignment they were given. Comparisons were made to determine if the WEE group provided more personal information than the control group. Writings were also reviewed to determine what types of stressors the WEE group disclosed.

Manipulation check analyses were also tested to examine whether the intervention created the expected immediate mood effects (Hypothesis #1). Change scores were calculated in both negative and positive moods for each session and mean change scores were calculated by averaging mood change scores. Repeated measures ANOVAs were conducted to examine changes in positive and negative mood across the three writing sessions. For these analyses, group (WEE vs. time management) was the between-subjects factor and time of assessment (sessions one, two, and three) was the within-subjects factor. Tests of between-subjects effects were examined for an overall main effect of group, and multivariate results (Wilk’s Lambda) were examined for a main effect of time and a group x time interaction. If a significant main effect of time emerged, pairwise comparisons within SPSS were conducted to determine which time points were significantly different from one another. If a significant group x time interaction was found, post-hoc analyses were conducted in the form of parameter estimates (t-tests) to determine if groups were significantly different from each other at each time point. Repeated measures ANOVAs were also conducted on groups separately to determine if the effect of time was different for each group.

Finally, group differences were examined for participants’ opinions of their writing experience (Hypothesis #2). One-way ANOVAs were conducted between categorical (group assignment) and continuous variables to examine group differences in
how personal the essays were, how much the experiences were disclosed previously, how much emotions were revealed during writing, how much the participant wanted to talk about the event, how difficult it was to write, how much they thought about the experiment, how important anonymity was, and how meaningful/valuable the study was at the final session questionnaire.

Main effects on outcome measures. A series of mixed design repeated measures ANOVAs were conducted to test whether WEE was efficacious at producing group differences in frequency of pain, intensity of pain, and disability from pain, pain medication use, perceived stress, negative mood, and positive mood (Hypothesis #3). For these analyses, group (WEE vs. time management) was the between-subjects factor and time of assessment (baseline, 1- and 3-months) was the within-subjects factor. Tests of between subjects effects were examined for an overall main effect of group, and multivariate results (Wilk’s Lambda) were examined for a main effect of time and an interaction between group x time on the outcome variables. For significant group differences, separate repeated measures ANOVAs were conducted for each group to determine if the different effects of time. If a significant main effect of time emerged, pairwise comparisons within SPSS were conducted to determine which time points were significantly different from one another. If a significant group x time interaction was found, post-hoc analyses were conducted in the form of parameter estimates (t-tests) to determine if groups were significantly different from each other at each time point.

Moderation effects on outcome measures. For the nine potential moderators (i.e., pain group, prior experience with journaling, alexithymia, ambivalence at
expressing emotions, negative affect, emotional-approach coping, problem-focused coping, avoidant coping, and PTSD symptoms), another series of 2 x 3 mixed design repeated measures ANOVAs were conducted with moderator variables analyzed separately (Hypothesis #4). Three-way interactions of Group x Time x Moderator were examined. If a significant interaction emerged, moderation analyses were conducted through hierarchical linear regressions with the outcome variables being the change scores between each time point (1-month minus baseline and 3-months minus 1-month). In Step 1, the group (WEE & comparison) and the moderator variables were entered as predictors to test for main effects. In Step 2, the interaction term was included. All of the continuous moderator variables were standardized by using Z-scores and the interaction terms were created from the standardized variables (Baron & Kenny, 1986). Simple slope analyses were conducted to determine which of the lines represents a statistically significant relationship (see Preacher, Curran, Bauer, 2006).

**Intent-to-treat Analyses.** More conservative intent-to-treat analyses were conducted on individuals who dropped out, such that, for participants lacking some or all follow-up data, their last reported values were carried forward. Intent-to-treat analyses were conducted on both main effects and moderator effects analyses.
Results

Preliminary analyses

**Participant pain.** Of the 1,084 participants who wished to be contacted about the study, we identified 510 (47%) participants who reported either back or headache pain. Of the 510, 30.8% had a neurogenic cause for their pain leaving 69.2% of the sample consisting of individuals who experienced pain without a medical reason. In our recruited sample of 113 participants, 63.3% reported experiencing back pain every week or more and 74.1% reported experiencing headache pain every week or more. Participants reported taking an average of 2.7 aspirin or aspirin substitutes a week (Range 0 – 16) for their back or headache pain. Participants reported that in the past 30 days, they had an average of 9.5 days that they were experiencing pain (Range: 0 – 30) with an average pain intensity of 6.5 when pain was at its worst (Range: 1 – 10). At the time of the baseline questionnaire, participants’ pain intensity rating was an average of 2.7 (Range: 1 – 7). Participants reported an average of 3.2 headache pain symptoms (Range: 1 – 7) and 2.6 back pain symptoms (Range: 1 – 6). More specifically, 81.8% described their pain as aching, 69.1% described their pain as knotted/knitted, and 47.3% described their pain as tightness around the spine and lower back. When reporting the type of headache pain experienced, 77.6% described their pain as throbbing or pounding, 63.8%
described their pain as aching, 60.3% described their pain as pressure, and 48.3%
described their pain as tightness around the head.

**Participant stress/trauma.** At baseline, participants had an average perceived stress rating of 19.5 (Range: 2-37). Seventy-one percent \((n = 80)\) of undergraduates endorsed experiencing at least one traumatic even in their lifetime, with the number of reported prior traumas per participant ranging from 1 to 9 \((M = 1.50, SD = 1.53)\). With respect to the most commonly endorsed worst events experienced, 21.7% endorsed an accident, 21.7% experienced or were exposed to a life-threatening illness, 17.4% endorsed death of a family member/friend, 17.3% endorsed sexual assault, and the remaining 21.9% endorsed non-sexual assaults, natural disasters, or the other category (i.e., emotional abuse, being kicked out of the house, accidental overdose). According to the PDS, 49.3% of participants endorsed a traumatic event that met criterion A (i.e., experienced the event with fear, helplessness, or horror). PTSD symptom scores ranged from 0 to 33 \((M = 11.1, SD = 8.9)\). Based on the previously mentioned cutoff score, 28.2% \((n = 20)\) of the undergraduates would have a probable PTSD diagnosis. Descriptive statistics for all study variables are presented in Tables 1 – 3.
### Table 1

**Frequency of Demographic Variables by Group at Baseline, 1- and 3-Months Post-Writing**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline (n = 113)</th>
<th>1-Month Post-Writing (n = 98)</th>
<th>3-Months Post-Writing (n = 94)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control (n)</td>
<td>WEE (n)</td>
<td>χ²</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>8</td>
<td>9</td>
<td>.05</td>
</tr>
<tr>
<td>Female</td>
<td>48</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>42</td>
<td>43</td>
<td>.85</td>
</tr>
<tr>
<td>African</td>
<td>10</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>American</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Class</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>30</td>
<td>26</td>
<td>1.33</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Sophomore</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Junior</td>
<td>11</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Senior</td>
<td>8</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* (n) = frequency; WEE = Written emotional expression group, Control = Time management group.

*χ² = chi square value from analyses examining group differences in gender and race

* *p < .05, **p < .01, ***p < .001

### Table 2

**Means and Standard Deviations of Age by Group at Baseline, 1- and 3-Months Post-Writing**

| Baseline (n = 113) | 1-Month Post-Writing (n = ) | 3-Months Post-Writing (n = ) |
### Table 3

**Means and Standard Deviations of Study Variables by Group at Baseline (n = 113)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline</th>
<th>Control</th>
<th>WEE</th>
<th>F testa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
</tr>
<tr>
<td>Pain frequency</td>
<td></td>
<td>9.5 (6.8)</td>
<td>9.6 (6.9)</td>
<td>.01</td>
</tr>
<tr>
<td>Pain intensity</td>
<td></td>
<td>2.6 (1.9)</td>
<td>2.7 (1.6)</td>
<td>.08</td>
</tr>
<tr>
<td>Pain disability</td>
<td></td>
<td>.89 (1.9)</td>
<td>.95 (1.9)</td>
<td>.02</td>
</tr>
<tr>
<td>Pain medication</td>
<td></td>
<td>2.5 (2.9)</td>
<td>2.8 (3.8)</td>
<td>.23</td>
</tr>
<tr>
<td>Perceived Stress</td>
<td></td>
<td>19.3 (6.8)</td>
<td>19.7 (7.2)</td>
<td>.10</td>
</tr>
<tr>
<td>Positive Mood (baseline)</td>
<td></td>
<td>3.3 (.94)</td>
<td>3.5 (.87)</td>
<td>.47</td>
</tr>
<tr>
<td>Negative Mood (baseline)</td>
<td></td>
<td>1.4 (.63)</td>
<td>1.5 (.64)</td>
<td>.33</td>
</tr>
<tr>
<td>Positive Mood (overall)</td>
<td></td>
<td>31.9 (8.0)</td>
<td>31.7 (8.8)</td>
<td>.03</td>
</tr>
<tr>
<td>Negative Mood (overall)</td>
<td></td>
<td>23.2 (7.7)</td>
<td>24.9 (7.9)</td>
<td>1.38</td>
</tr>
<tr>
<td>Ambivalence</td>
<td></td>
<td>91.7 (18.8)</td>
<td>87.7 (20.4)</td>
<td>1.14</td>
</tr>
<tr>
<td>Alexithymia</td>
<td></td>
<td>13.6 (3.1)</td>
<td>13.2 (3.3)</td>
<td>.35</td>
</tr>
<tr>
<td>Trauma History</td>
<td></td>
<td>1.6 (1.9)</td>
<td>1.4 (1.1)</td>
<td>.50</td>
</tr>
<tr>
<td>PTSD Symptoms</td>
<td></td>
<td>10.8 (8.5)</td>
<td>11.2 (9.2)</td>
<td>.04</td>
</tr>
</tbody>
</table>

*Note. M = mean; (SD) = standard deviation; WEE = Written emotional expression group, Control = Time management group.*

*F test = F value from analysis examining group differences in study variables*

* * * p < .05, ** * * p < .01, *** p < .001
**Group differences.** Results from chi square analyses revealed that the WEE and time management group did not differ by gender, race, or class standing ($ps > .10$). Results from one-way ANOVAs also revealed no significant differences between groups on age ($ps > .10$). One-way ANOVAs examining differences between the WEE and the time management group at baseline on pain severity variables, current and overall mood, perceived stress, trauma history, and PTSD symptoms were not significant (all $ps > .10$). Therefore, none of the demographic or study variables were included as covariates in the current analyses.

**Adherence and Manipulation Checks**

**Differences in mood.** Repeated measures ANOVAs were conducted on changes in positive and negative mood over the course of the three writing sessions. Results of the repeated measures ANOVAS are in Table 4. No significant main effect of time was evident for positive and negative mood (Wilk’s $\lambda = .99$, $F (2, 108) = .82$, $p > .05$, partial $\eta^2 = .01$; Wilk’s $\lambda = .93$, $F (2, 108) = 1.89$, $p > .05$, partial $\eta^2 = .02$, respectively). However, a significant main effect of group was present for changes in mood (positive mood: $F (1, 108) = 34.13$, $p < .001$, partial $\eta^2 = .24$; negative mood: $F (1, 108) = 55.29$, $p < .001$, partial $\eta^2 = .34$), such that WEE participants had a greater change in positive ($M = -.41$, $SD = .79$) and negative mood ($M = .58$, $SD = .79$) than the time management participants (positive mood: $M = .16$, $SD = .61$; negative mood: $M = -.09$, $SD = .31$). This main effect was qualified by a significant group x time interaction indicating that compared to the time management participants, WEE participants experienced increases
in positive mood (Wilk’s $\lambda = .91, F(2,108) = 5.18, p = .006, \text{ partial } \eta^2 = .05$) and decreases in negative mood (Wilk’s $\lambda = .91, F(2,108) = 4.52, p = .012, \text{ partial } \eta^2 = .04$) over the course of the writing sessions. The group x time interactions for change in positive and negative mood are displayed in Figures 2 & 3. Post-hoc analyses in the form of parameter estimates revealed significant group differences in changes in negative mood at baseline, 1- and 3-months ($t(111) = -6.17, p < .001; t(109) = -7.35, p < .001; t(108) = -4.15, p < .001$, respectively). Separate repeated measures ANOVAs revealed that the main effect of time for changes in negative mood was significant in the WEE group (Wilk’s $\lambda = .84, F(2, 55) = 3.35, p = .04, \text{ partial } \eta^2 = .01$) and was a trend in the time management group (Wilk’s $\lambda = .92, F(2, 53) = 2.99, p = .05, \text{ partial } \eta^2 = .06$). The main effect of time for changes in positive mood was also significant in the WEE group (Wilk’s $\lambda = .85, F(2, 55) = 4.41, p = .014, \text{ partial } \eta^2 = .07$), but was not significant in the time management group (Wilk’s $\lambda = .96, F(2, 53) = 1.14, p > .05, \text{ partial } \eta^2 = .04$).
<table>
<thead>
<tr>
<th>Group x Time Interaction</th>
<th>Positive Mood M (SD)</th>
<th>Negative Mood M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time Management</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 1</td>
<td>.19 (.68)</td>
<td>-.18 (.47)</td>
</tr>
<tr>
<td>Session 2</td>
<td>.23 (.57)</td>
<td>-.06 (.24)</td>
</tr>
<tr>
<td>Session 3</td>
<td>.07 (.59)</td>
<td>-.03 (.21)</td>
</tr>
<tr>
<td><strong>Written Emotional Expression</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session 1</td>
<td>-.53 (.95)</td>
<td>.63 (.86)</td>
</tr>
<tr>
<td>Session 2</td>
<td>-.50 (.69)</td>
<td>.70 (.74)</td>
</tr>
<tr>
<td>Session 3</td>
<td>-.21 (.72)</td>
<td>.42 (.78)</td>
</tr>
</tbody>
</table>

*Note.* WEE = Written emotional expression group, Control = Time management group. Scores reflect average change (mood after – mood before).

\(a\) \(M(SD)\) = Means and standard deviations of significant \((p < .05)\) group x time interactions. \(b\) \(M(SD)\) = Means and standard deviations of significant \((p < .05)\) main effect of time. \(c\) \(M(SD)\) = Means and standard deviations of significant \((p < .05)\) main effect of group.
Figure 2. Plotted values illustrating positive mood at session 1, session 2, and session 3 ($n = 110$).

Figure 3. Plotted values illustrating negative mood at session 1, session 2, and session 3 ($n = 110$).
Examining writing samples. Similar to other studies, we had participants write about a stressful or traumatic event of their choosing (Epstein et al., 2005; Park & Blumberg, 2002; Sloan & Marx, 2004a), therefore there was a considerable range in the types of events participants selected to write about. The most frequent topics disclosed by the expressive writing group was having family or relationship problems (31.1%), experiencing the death of someone close to them (19.6%), daily stressors (14.8%), a violent or sexual assault (9.8%), having past thoughts of suicide or other mental health problems (9.7%), having or knowing someone who has a life-threatening illness (4.9%), and other stressors (9.9%; e.g., problems with drugs, being in an accident, being harassed by a teacher). We also gave participants the option to write on the same topic each day, or switch topics. Approximately 70% of individuals in the expressive writing group ($n = 31$) wrote on the same topic or returned to the initial topic they disclosed over the course of the three writing sessions. After examining the content of the writing samples, we identified five participants who did not completely follow directions. Three of these individuals were from the expressive writing group. We identified these individuals because they did not express emotions about their particular stressors or wrote about “positive” stressful experiences. For the two people in the time management group, we found they expressed emotions for more than one session. Removing people that did not follow directions did not make a difference in the analyses.

Attitudes about writing. One-way ANOVAs examining differences on attitudes about the writing study between the WEE and the time management group after completion of the writing sessions were significant for all variables analyzed. More
specifically, those in the WEE group wrote about more personal information and revealed more emotions ($ps < .001$). They also actively held back from telling others about the information they wrote down; however, they wanted to talk to others about their experiences ($ps < .001$). WEE participants also indicated that it was difficult for them to write down these experiences and that they thought about the experiment throughout the past couple of days ($ps < .001$). They also found great importance in the anonymity of the essays and the fact that the study was meaningful to them beyond earning research credits ($ps < .001$). When asking the participants for their comments about the study, they stated: “I somewhat enjoyed this experiment. It was nice to write out a lot of my feelings that I have never really previously expressed,” “I want to thank you for giving me the opportunity to be a part of it! I learned a lot about myself through this reflection process,” and “I think this experiment came just in time for me, personally. You would be surprised how much it helped me sort my thoughts about my condition.” One-way ANOVAs are displayed in Table 5. Finally, when asking participants at the 3-month follow-up if they would participate in the study again, there were no group differences ($p > .05$) as most expressed they “probably” would. At 3-months post-writing, compared to those in the time management group, those in the WEE group still thought about what they wrote ($p = .004$) and felt the study was valuable and meaningful ($p < .001$).
<table>
<thead>
<tr>
<th>Variables</th>
<th>Baseline (n = 113)</th>
<th>3-Months (n = 94)</th>
<th>( F ) test(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How personal were the essays</td>
<td>3.9 (1.8)</td>
<td>6.3 (1.1)</td>
<td>70.9***</td>
</tr>
<tr>
<td>How much have you held back from telling others about what you wrote</td>
<td>2.7 (1.9)</td>
<td>4.2 (1.9)</td>
<td>16.4***</td>
</tr>
<tr>
<td>How much did you reveal your emotions</td>
<td>2.5 (1.5)</td>
<td>5.7 (1.2)</td>
<td>146.8***</td>
</tr>
<tr>
<td>Prior to the experiment, how much have you wanted to talk about what you wrote</td>
<td>2.5 (1.6)</td>
<td>4.4 (1.8)</td>
<td>33.2***</td>
</tr>
<tr>
<td>How difficult was it for you to write</td>
<td>1.7 (1.2)</td>
<td>3.3 (1.9)</td>
<td>26.7***</td>
</tr>
<tr>
<td>How much have you thought about the study &amp; what you wrote</td>
<td>3.2 (1.6)</td>
<td>4.8 (1.5)</td>
<td>29.1***</td>
</tr>
<tr>
<td>How important to you that your essays were anonymous</td>
<td>2.6 (1.8)</td>
<td>4.3 (2.3)</td>
<td>18.0***</td>
</tr>
<tr>
<td>To what degree has this experiment been valuable or meaningful to you</td>
<td>3.4 (1.5)</td>
<td>5.0 (1.4)</td>
<td>31.1***</td>
</tr>
</tbody>
</table>

Note. \( M = \) mean; \( (SD) = \) standard deviation; WEE = Written emotional expression group, Control = Time management group.

\(^a\) \( F \) test = \( F \) value from analysis examining group differences from the attitudes about writing questionnaire. Measured on a continuous scale from 1 – 7 (1 = not at all, 7 = extremely/a great deal)

* \( p < .05 \), ** \( p < .01 \), *** \( p < .001 \)
Main effects and group x time interactions

Mixed design (between and within group) repeated measures ANOVAs were conducted on the following physical and mental health outcomes: pain severity (i.e., frequency, intensity, & disability, and pain medication use), perceived stress, and positive and negative mood. Means and standard deviations of the significant main effects of time are displayed in Table 6.

Results revealed a significant main effect of time for pain frequency (Wilk’s $\lambda = .90$, $F(2, 87) = 4.92, p = .009$, partial $\eta^2 = .10$) in that all participants demonstrated significant decreases in pain frequency over time (baseline: $M = 9.49$, $SD = 6.76$; 1-month: $M = 8.24$, $SD = 7.80$; 3-months: $M = 6.88$, $SD = 7.05$). Pairwise comparisons indicated that significant mean level differences were evident between the baseline and 3-month follow-up ($t(92) = 3.24, p = .002$) but not between baseline and the 1-month follow-up or the 1- and 3-month follow-up ($p s > .05$). However, there was no group main effect ($F(1, 88) = .36, p > .05$, partial $\eta^2 = .03$) or group x time interaction (Wilk’s $\lambda = .99$, $F(2, 87) = .47, p > .05$, partial $\eta^2 = .01$).

Regarding pain medication use, there was no significant main effect of time (Wilk’s $\lambda = .96$, $F(2, 92) = 1.46, p > .05$, partial $\eta^2 = .02$) and a trend main effect of group ($F(1, 92) = 3.20, p = .08$, partial $\eta^2 = .03$). There was however a significant group x time interaction indicating that compared to the time management participants, WEE participants reported decreases in pain medication use while time management participants reported increases in pain medication use over the course of the writing sessions (Wilk’s $\lambda = .94$, $F(2, 92) = 3.22, p = .04$, partial $\eta^2 = .03$). The group x time
interaction for pain medication use is displayed in Figure 4. Post-hoc analyses in the form of parameter estimates revealed significant group differences in medication use 3-months post-writing ($t(92) = 2.28, p = .03$). Separate repeated measures ANOVAs revealed that the main effect of time for pain medication use was not significant in the WEE group (Wilk’s $\lambda = .97, F(2, 46) = .83, p > .05$, partial $\eta^2 = .04$), but was a trend in the time management group (Wilk’s $\lambda = .88, F(2, 44) = 2.83, p = .07$, partial $\eta^2 = .11$).

Results revealed a significant main effect of time for negative mood (Wilk’s $\lambda = .89, F(2, 91) = 5.31, p = .007$, partial $\eta^2 = .10$) in that all participants demonstrated significant decreases in negative mood over time (baseline: $M = 23.8, SD = 7.8$; 1-month: $M = 21.9, SD = 8.0$; 3-months: $M = 21.9, SD = 7.2$). Pairwise comparisons indicated that significant mean level differences were evident between the baseline and 3-month follow-up ($t(92) = 1.00, p = .05$) but not between the 1- and 3-month follow-up or baseline and 1-month follow-up ($ps > .05$). However, there was no group main effect ($F(1, 92) = 1.39, p > .05$, partial $\eta^2 = .02$) or group x time interaction (Wilk’s $\lambda = .99; F(2, 91) = .24, p > .05$, partial $\eta^2 = .01$).

There was a trend for participants to show decreases in perceived stress over time (Wilk’s $\lambda = .95, F(2, 90) = 2.30, p = .10$, partial $\eta^2 = .05$). However, there was no group main effect ($F(1, 91) = .37, p > .05$, partial $\eta^2 = .00$) or group x time interaction (Wilk’s $\lambda = .98, F(2, 90) = .47, p > .05$, partial $\eta^2 = .02$). There were no main effects of time, main effects of group, or group x time interactions for pain disability or intensity, or for positive mood.
Table 6

Means and Standard Deviations of Pain Symptoms, Perceived Stress, and Overall Mood by Group at Baseline, 1- and 3-Months Post-Writing (n = 94)

<table>
<thead>
<tr>
<th>Group x Time Interaction</th>
<th>Pain Frequency</th>
<th>Pain Intensity</th>
<th>Pain Disability</th>
<th>Pain Medication Use</th>
<th>Perceived Stress</th>
<th>Positive Mood</th>
<th>Negative Mood</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Management</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
</tr>
<tr>
<td>Baseline</td>
<td>9.9 (7.3)</td>
<td>2.7 (1.9)</td>
<td>.85 (1.9)</td>
<td>2.6 (3.0)</td>
<td>19.5</td>
<td>31.8</td>
<td>23.1</td>
</tr>
<tr>
<td></td>
<td>(6.8)</td>
<td>(8.0)</td>
<td>(7.6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-Month</td>
<td>9.0 (8.1)</td>
<td>2.8 (1.9)</td>
<td>.85 (1.8)</td>
<td>4.0 (6.5)</td>
<td>17.9</td>
<td>31.2</td>
<td>21.2</td>
</tr>
<tr>
<td></td>
<td>(7.3)</td>
<td>(7.1)</td>
<td>(7.5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-Months</td>
<td>6.8 (7.1)</td>
<td>2.2 (1.6)</td>
<td>.76 (1.4)</td>
<td>4.7 (8.1)</td>
<td>17.6</td>
<td>31.2</td>
<td>20.8</td>
</tr>
<tr>
<td></td>
<td>(8.0)</td>
<td>(8.6)</td>
<td>(7.6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WEE</td>
<td>9.1 (6.3)</td>
<td>2.6 (1.7)</td>
<td>.75 (1.4)</td>
<td>2.4 (3.4)</td>
<td>19.5</td>
<td>32.2</td>
<td>24.4</td>
</tr>
<tr>
<td></td>
<td>(7.7)</td>
<td>(8.8)</td>
<td>(7.5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-Month</td>
<td>7.4 (7.5)</td>
<td>2.5 (2.0)</td>
<td>1.2 (3.1)</td>
<td>2.4 (4.5)</td>
<td>19.3</td>
<td>31.0</td>
<td>22.5</td>
</tr>
<tr>
<td></td>
<td>(8.0)</td>
<td>(7.4)</td>
<td>(8.5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3-Months</td>
<td>6.9 (7.1)</td>
<td>2.4 (1.6)</td>
<td>.81 (1.8)</td>
<td>1.9 (3.0)</td>
<td>18.7</td>
<td>31.5</td>
<td>23.0</td>
</tr>
<tr>
<td></td>
<td>(6.8)</td>
<td>(6.6)</td>
<td>(6.7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. WEE = Written emotional expression group, Control = Time management group.  
\(^a\)M(SD) = Means and standard deviations of significant (p < .05) group x time interactions.  
\(^b\)M(SD) = Means and standard deviations of significant (p < .05) main effect of time.  
\(^c\)M(SD) = Means and standard deviations of significant (p < .05) main effect of group.
Moderation effects on outcome measures

Mixed design repeated measures ANOVAs were conducted with moderator variables and the physical and mental health outcome variables previously analyzed. Four variables selected a priori (i.e., ambivalence at expressing emotions, negative affect, problem-focused coping, and PTSD symptoms) were not significant moderators for any of the physical and mental health outcome variables \((p_s > .05)\). The significant moderating effects are shown in Tables 7 – 10.

**Pain group.** The group x time x pain group interaction for negative mood reached trend level significance (Wilk’s \(\lambda = .92, F (4, 178) = 1.94, p = .10\), partial \(\eta^2 = .04\)). However, there was not a significant group x time x pain group interaction for any other physical and mental health outcome variables \((p_s > .05)\).
**Prior Journaling.** While the majority of the physical and mental health outcome variables were not moderated by prior journaling ($ps > .05$), there was a significant group x time x journaling interaction for pain intensity (Wilk’s $\lambda = .90$, $F(4, 176) = 2.42$, $p = .05$, partial $\eta^2 = .05$). This significant finding was further analyzed through hierarchical linear regressions with change scores for pain intensity. Analyses revealed a significant moderating effect of group x journaling on change in pain intensity from baseline to 1-month post-writing ($\beta = .39$, $p = .006$). To understand this interaction, a plot of predicted values was constructed and simple slope analyses were performed. The figure and simple slope analyses revealed that for those in the WEE group, a significant positive relationship was found between prior journaling and pain intensity ($B = 2.33$, $t (88) = 2.64$, $p = .01$), but the negative relationship was not significant for the time management group ($B = -.94$, $t (92) = -1.22$, $p > .05$). The moderating effect of group x journaling for pain intensity from baseline to 1-month is displayed in Figure 5. However a significant negative relationship was found for change in pain intensity from 1-month to 3-months post-writing ($\beta = -.31$, $p = .03$). Simple slope analyses were conducted and the figure revealed that for those in the WEE group, a significant negative relationship was found between journaling and pain intensity ($B = -1.88$, $t (88) = -2.22$, $p = .03$), but the positive relationship was not significant for the time management group ($B = .59$, $t (88) = .79$, $p > .05$). The moderating effect of group x journaling on pain intensity from 1-month to 3-months is displayed in Figure 6.

**Alexithymia.** A significant group x time x alexithymia (i.e., difficulty describing feelings) interaction was identified for pain frequency (Wilk’s $\lambda = .88$, $F(4, 170) = 2.72$, 2.72,
To further understand this significant finding, hierarchical linear regressions with change scores were conducted for pain frequency. Analyses revealed a significant moderating effect of group x alexithymia on change in pain frequency from baseline to 1-month post-writing ($\beta = .45, p = .005$). The significant interaction was examined further through simple slope analyses and a plot of predicted values. Consistent with hypothesis 4c, a significant positive relationship between alexithymia and pain frequency was found for those in the WEE group ($B = 2.23, t (87) = 2.31, p = .02$), and a negative relationship was at trend significance for the time management group ($B = -2.00, t (87) = -1.78, p = .08$). The moderating effect of group x alexithymia for pain frequency from baseline to 1-month is displayed in Figure 7.

Contrary to the previous finding, a significant negative relationship was found for change in pain frequency from 1-month to 3-months post-writing ($\beta = -.42, p = .009$). Simple slope analyses and the plotted figure revealed that for those in the WEE group, a negative relationship was found between alexithymia and pain frequency ($B = -2.12, t (86) = -1.98, p = .05$), and a positive relationship was at trend significance for the time management group ($B = 2.26, t (86) = 1.82, p = .07$). The moderating effect of group x alexithymia on pain frequency from 1-month to 3-months is displayed in Figure 8.

None of the other physical and mental health variables had a significant interaction with alexithymia ($ps > .05$).

**Emotional-approach coping.** There was not a significant group x time x emotional-approach coping interaction for most of the physical and mental health outcome variables ($ps > .05$). However, a significant group x time x emotional-approach
coping interaction was identified for pain frequency and pain medication use (Wilk’s $\lambda = .87$, $F(4, 170) = 2.92, p = .02$, partial $\eta^2 = .06$; Wilk’s $\lambda = .85$, $F(4, 180) = 4.30, p = .002$, partial $\eta^2 = .09$, respectively).

A hierarchical linear regression was conducted to further analyze the moderation finding for change in pain frequency. Analyses revealed that emotional-approach coping significantly moderated the group effect on change in pain frequency from 1-month to 3-months post-writing ($\beta = -.35, p = .02$). To understand the nature of this interaction, a plot of predicted values was constructed and simple slope analyses were performed. These procedures revealed that for those in the time management group, a positive relationship was found between emotional-approach coping and pain frequency ($B = 2.81, t(86) = 2.61, p = .01$), but the negative relationship was not significant for the WEE group ($B = -1.02, t(86) = -.91, p > .05$). The moderating effect of group x emotional-approach coping on pain frequency is displayed in Figure 9. The moderating effect of group x emotional-approach coping on pain frequency from baseline to 1-month post-writing was not significant ($\beta = -.09, p > .05$).

The significant moderation relationship for change in pain medication use was further analyzed through hierarchical linear regressions. Analyses revealed a significant moderating effect of group x emotional-approach coping on change in pain medication use from 1-month to 3-months post-writing ($\beta = -.29, p = .04$). The significant interaction was examined further through simple slope analyses and graphical representation. Consistent with hypothesis 4f, for those in the time management group, a positive relationship was found between emotional-approach coping and pain medication
use ($B = 2.66, t (90) = 3.72, p < .001$), but was not significant for the WEE group ($B = 0.51, t (90) = 0.69, p > .05$). The moderating effect of group x emotional-approach coping on pain medication is displayed in Figure 10. The moderating effect of group x emotional-approach coping on pain medication use from baseline to 1-month post-writing was not significant ($\beta = 0.01, p > .05$).

**Avoidant coping.** There was a significant group x time x avoidant coping interaction for pain medication use ($\text{Wilk's } \lambda = .91, F (4, 180) = 2.54, p = .04$, partial $\eta^2 = .05$). This significant finding was further analyzed through hierarchical linear regressions with change scores for pain medication use. Analyses revealed a significant moderating effect of group x avoidant coping on change in pain medication use from 1-month to 3-months post-writing ($\beta = -0.40, p = .007$). Simple slope analyses and a graphical representation of the results revealed that for those in the time management group, a positive relationship was found between avoidant coping and pain medication use ($B = 1.78, t (90) = 2.29, p = .02$), but was not significant for the WEE group ($B = -1.20, t (90) = -1.61, p > .05$). The moderating effect of group x avoidant coping on pain medication use is displayed in Figure 11. The moderating effect of group x avoidant coping on pain medication use from baseline to 1-month post-writing was not significant ($\beta = .14, p > .05$).

There was a trend significance for the group x time x avoidant coping interaction for perceived stress ($\text{Wilk's } \lambda = .92, F (4, 178) = 2.30, p = .06$, partial $\eta^2 = .05$). There was not a significant group x time x avoidant coping interaction for the other physical and mental health variables ($ps > .05$).
Table 7

*Hierarchical Linear Regression Testing the Effects of Prior Journaling and Writing Condition on Change in Pain Intensity (n = 92)*

| Step and Variables | Baseline to 1-Month | | | Baseline to 1-Month | | | 1-Month to 3-Months | | | 1-Month to 3-Months |
|-------------------|---------------------|------|------|---------------------|------|------|---------------------|------|------|---------------------|------|------|
|                   | $B$ | $SE$ | $\beta$ | $\Delta R^2$ | $B$ | $SE$ | $\beta$ | $\Delta R^2$ | $B$ | $SE$ | $\beta$ | $\Delta R^2$ | $B$ | $SE$ | $\beta$ | $\Delta R^2$
| Step 1            |       |      |        |           |      |      |        |           |      |      |        |           |      |      |        |           |
| Group             | -.23 | .47  | -.05  | .06      | .27  | .44  | .06  | .05     | .27  | .44  | .06  | .05     | .27  | .44  | .06  | .05     |
| Journal           | .48  | .60  | .08   | .01      | -.49 | .57  | -.09 | .01     | -.49 | .57  | -.09 | .01     | -.49 | .57  | -.09 | .01     |
| Step 2            |       |      |        |           |      |      |        |           |      |      |        |           |      |      |        |           |
| Group             | -.82 | .50  | -.19  \( ^{\dag} \) | .17     | .71  | .48  | .17  | .16     | .71  | .48  | .17  | .16     | .71  | .48  | .17  | .16     |
| Journal           | -.94 | .77  | -.17  | .11      | .59  | .74  | .11  | .10     | .59  | .74  | .11  | .10     | .59  | .74  | .11  | .10     |
| Group x Journal   | 3.28 | 1.17 | .39 \( ^{**} \) | .08 \( ^{**} \) | -2.47 | 1.12 | -31 \( ^{*} \) | .05 \( ^{*} \) | -2.47 | 1.12 | -31 \( ^{*} \) | .05 \( ^{*} \) | -2.47 | 1.12 | -31 \( ^{*} \) | .05 \( ^{*} \) |

\( ^{\dag} p < .10, \ * p < .05, \ ** p < .01, \ *** p < .001 \)

Table 8

*Hierarchical Linear Regression Testing the Effects of Alexithymia (DDF) and Writing Condition on Change in Pain Frequency (n = 91)*

| Step and Variables | Baseline to 1-Month | | | 1-Month to 3-Months | | | | 1-Month to 3-Months | | | |
|-------------------|---------------------|------|------|---------------------|------|------|---------------------|------|------|---------------------|------|------|
|                   | $B$ | $SE$ | $\beta$ | $\Delta R^2$ | $B$ | $SE$ | $\beta$ | $\Delta R^2$ | $B$ | $SE$ | $\beta$ | $\Delta R^2$ | $B$ | $SE$ | $\beta$ | $\Delta R^2$
| Step 1            |       |      |        |           |      |      |        |           |      |      |        |           |      |      |        |           |
| Group             | -.64 | 1.49 | -.05  | .10      | 1.53 | 1.65 | .10  | .10     | 1.53 | 1.65 | .10  | .10     | 1.53 | 1.65 | .10  | .10     |
| Alexithymia       | .76  | .06  | .01   | .01      | -.25 | .84  | -.03 | .01     | -.25 | .84  | -.03 | .01     | -.25 | .84  | -.03 | .01     |
|                   |       |      |        |           |      |      |        |           |      |      |        |           |      |      |        |           |
| Step 2            |       |      |        |           |      |      |        |           |      |      |        |           |      |      |        |           |
| Group             | -.43 | 1.43 | -.03  | .09      | 1.33 | 1.60 | .09  | .09     | 1.33 | 1.60 | .09  | .09     | 1.33 | 1.60 | .09  | .09     |
| Alexithymia       | -2.00 | 1.12 | -.28 \( ^{\dag} \) | .29 \( ^{\dag} \) | 2.44 | 1.24 | .29 \( ^{\dag} \) | .29 \( ^{\dag} \) | 2.44 | 1.24 | .29 \( ^{\dag} \) | .29 \( ^{\dag} \) | 2.44 | 1.24 | .29 \( ^{\dag} \) | .29 \( ^{\dag} \) |
| Group x Alexithymia | 4.23 | 1.48 | .45 \( ^{**} \) | .09 \( ^{**} \) | -4.38 | 1.64 | -.42 \( ^{*} \) | .08 \( ^{**} \) | -4.38 | 1.64 | -.42 \( ^{*} \) | .08 \( ^{**} \) | -4.38 | 1.64 | -.42 \( ^{*} \) | .08 \( ^{**} \) |

*Note. DDF = Difficulty Describing Feelings*

\( ^{\dag} p < .10, \ * p < .05, \ ** p < .01, \ *** p < .001 \)
Table 9

*Hierarchical Linear Regression Testing the Effects of Emotional-Approach and Writing Condition on Pain Frequency Between 1-Months and 3-Months Post-Writing (n = 90)*

<table>
<thead>
<tr>
<th>Step and Variables</th>
<th>Pain Frequency</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>ΔR²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>1.56</td>
<td>1.63</td>
<td>.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional-approach Coping</td>
<td>.97</td>
<td>.80</td>
<td>.13</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>1.54</td>
<td>1.58</td>
<td>.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional-approach Coping</td>
<td>2.81</td>
<td>1.08</td>
<td>.37*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group x Emotional-approach Coping</td>
<td>-3.83</td>
<td>1.55</td>
<td>-.35*</td>
<td>.06*</td>
<td></td>
</tr>
</tbody>
</table>

†p < .10, * p < .05, ** p < .01, *** p < .001

Table 10

*Hierarchical Linear Regression Testing the Effects of Moderating Variables and Writing Condition on Pain Medication Use Between 1-Month & 3-Months Post-Writing (n = 94)*

<table>
<thead>
<tr>
<th>Step and Variables</th>
<th>Emotional-Approach Coping</th>
<th>Avoidant Coping</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>SE B</td>
</tr>
<tr>
<td>Step 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>-1.26</td>
<td>1.06</td>
</tr>
<tr>
<td>Moderator</td>
<td>1.61</td>
<td>.52</td>
</tr>
<tr>
<td>Step 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group</td>
<td>-1.26</td>
<td>1.04</td>
</tr>
<tr>
<td>Moderator</td>
<td>2.66</td>
<td>.72</td>
</tr>
<tr>
<td>Group x Moderator</td>
<td>-2.15</td>
<td>1.02</td>
</tr>
</tbody>
</table>

†p < .10, * p < .05, ** p < .01, *** p < .001
Figure 5. Plotted values illustrating prior journaling as a moderator of group assignment and change in pain intensity from baseline to 1-month post-writing ($n = 92$).

* $p < .05$

Figure 6. Plotted values illustrating prior journaling as a moderator of group assignment and change in pain intensity from 1-month to 3-months post-writing ($n = 92$).

* $p < .05$
Figure 7. Plotted values illustrating alexithymia as a moderator of group assignment and change in pain frequency from baseline to 1-month post-writing (n = 91).
† p < .10, * p < .05

Figure 8. Plotted values illustrating alexithymia as a moderator of group assignment and change in pain frequency from 1-month to 3-months post-writing (n = 90).
† p < .10, * p < .05
Figure 9. Plotted values illustrating emotional-approach coping as a moderator of group assignment and change in pain frequency from 1-month to 3-months post-writing ($n = 90$).
* $p < .05$

Figure 10. Plotted values illustrating emotional-approach coping as a moderator of group assignment and change in pain medication use from 1-month to 3-months post-writing ($n = 94$).
* $p < .05$
Intent-to-Treat Analyses

Intent-to-treat analyses were conducted with the last observation carried forward for the mental and physical health outcome variables. Most of the analyses did not change in significance from the completer analyses discussed above. However, there were some differences in the moderator effects analyses.

More specifically, prior journaling was no longer a significant moderator of pain intensity (Wilk’s $\lambda = .94$, $F(4, 206) = 1.59$, $p > .05$, partial $\eta^2 = .03$). Avoidant coping was a trend for pain medication use (Wilk’s $\lambda = .93$, $F(4, 212) = 2.17$, $p = .07$, partial $\eta^2 = .04$). Although once a trend, there was no significant group x time x pain group interaction for negative mood (Wilk’s $\lambda = .94$, $F(4, 210) = 1.60$, $p > .05$, partial $\eta^2 = .03$).
Alexithymia was no longer at trend significance for being a moderator of pain medication use (Wilk’s $\lambda = .94$, $F (4, 210) = 1.45, p > .05$, partial $\eta^2 = .05$). Finally, avoidant coping was no longer at trend significance for the moderation of perceived stress (Wilk’s $\lambda = .95$, $F (4, 210) = 1.31, p > .05$, partial $\eta^2 = .02$).

**Power Analyses**

Power analyses were conducted a priori to determine if there was sufficient power to conduct repeated measures ANOVAS and hierarchical linear regressions using the given sample. For the repeated measures ANOVAS, a large effect size ($f = .4$) was powered at 1.00, for a medium effect size ($f = .15$) power was 1.00, and for a small effect size ($f = .10$) power was at .52. For the linear regressions, a large effect size ($f = .35$) was powered at 1.00, a medium effect size ($f = .15$) was powered at .95, and a small effect size ($f = .02$) was powered at .26.
Discussion

The present study examined the efficacy of written emotional expression at reducing mental and physical health problems in undergraduates with high amounts of back and headache pain. To our knowledge, this was the first study to include participants with back pain in an expressive writing intervention. The aims of the present study were to (a) understand prevalence rates of pain problems and stress symptoms in an undergraduate sample (b) determine if expressive writing leads to immediate mood changes in participants (c) examine the efficacy of expressive writing for mental and physical health outcomes in a group of undergraduates with high amounts of back and/or headache pain (d) identify moderators of the expressive writing paradigm. Overall, students reported high amounts of back and headache pain, and the majority of them have experienced at least one traumatic stressor in their lifetime. While the majority of the participants were adherent to the writing instructions and significant mood changes were found, there were no group differences between the written emotional expression group and the time management group for pain severity, perceived stress, and negative mood during the 3-month follow-up period. Rather, participants in both conditions reported improvements in pain frequency, perceived stress, and negative mood over time. Further, a significant group x pain medication use interaction was identified in that participants in
the expressive writing group had decreases in their pain medication use compared to the time management group. Several moderators of pain frequency and pain medication use were also identified (e.g., alexithymia and emotional-approach coping).

Since there have been few studies conducted investigating back and headache problems in an undergraduate population, obtaining more information about this particular population was warranted. Overall, students reported large amounts of back and headache pain, and a greater percentage of students experienced pain without a medical reason. As we were speculating stress to manifest itself through pain problems, we also examined the relationship between pain and stress. Both traumatic stress and perceived stress were only marginally correlated with pain variables (i.e., pain disability, pain medication use, pain rating when pain is the worst). Additionally, students did not report high amounts of perceived stress, so it is possible that they experienced back and headache pain due to other reasons (i.e., other emotion regulation problems). In most expressive writing studies, more successful paradigms have either examined mental or physical health problems, not both. Less successful paradigms have included multiple outcome types (Frattaroli, 2006). Perhaps focusing only on the impact of stress on physical health problems and excluding participants based on certain criteria led to these findings. Finally, since we did not find any group differences in perceived stress, it is not surprising that improvements in pain frequency, disability, and intensity were also not observed.

Overall, participants were relatively adherent to the writing instructions. While five participants were not compliant, removal of these participants from the analyses did
not affect the current results. Additionally, significant group differences in mood over the course of the writing sessions indicated that the WEE group was writing about more emotional topics than the time management group. While it was hypothesized the WEE participants to have worse moods by the end of the third writing session, their moods actually improved. The greatest mood changes were from the second to the third writing session. Pennebaker (1994) attributes this to the writing prompt received on the last day where participants are instructed to reflect on “how is this experience related to your current life and your future”. Of the studies that assess mood immediately after writing, the majority have found worse mood immediately after writing in the expressive writing participants (e.g., Norman et al., 2004; Pennebaker & Beall, 1986) with one exceptions (Smyth et al., 2008). A more in depth analysis of the writing samples is needed to further understand the mood changes.

There have been few published studies examining pain medication usage as an outcome variable in expressive writing studies. D’Souza and colleagues (2008) suggested this as a future direction for headache pain participants. Furthermore, medication use was grouped with illness behaviors (e.g., doctor’s visits) so the effect of WEE on pain medication usage is not well-established (Frattaroli, 2006). In line with the hypotheses, participants in the expressive writing group decreased their pain medication use, while participants in the time management group increased their pain medication use. Although participants were only taking a small amount of pain medication at the beginning of the study ($M = 2.5, SD = 3.2$), at 3-months, those in the time management group were taking an average of 4.8 aspirin or aspirin substitutes compared to the WEE
group who were taking an average of 1.9 aspirin or aspirin substitutes. While the effect size of this interaction was relatively small (partial $\eta^2 = .04$), the most recent meta-analysis reported effect sizes ranging from .02-.07 when examining reported health outcomes (Frattaroli, 2006). Additionally, this finding was moderated by both emotional-approach coping and dysfunctional coping such that for those in the time management group, higher reports of these types of coping led to increases in pain medication usage. Although slightly different than medication usage, there have been a few studies examining the efficacy of expressive writing on medication adherence. For example, increased medication adherence and optimism was found for HIV-infected women who were instructed to write about having a positive future (Mann, 2001). Another study found that for individuals who had discovered meaning during the writing intervention, this led to increased medication adherence (Westling, Garcia, Mann, 2007). Therefore there may be other moderators of the relationship of between group and pain medication use that was not examined in the current study.

The moderation findings were a little inconsistent with the expressive writing literature. It was originally hypothesized that alexithymia would moderate the effects of disclosure such that improvement would be seen in the disclosure group only among those with lower levels of alexithymia. The majority of research finds that alexithymia is related to poor physical health, and individuals who are high on alexithymia will not improve and actually do worse after expressive writing (for a review see Lumley, 2004). The results for pain frequency from baseline to 1-month were consistent with these findings; however the findings for pain frequency from 1-month to 3-months were the
opposite. Rather, individuals with higher levels of alexithymia experienced decreases in pain frequency. These results were more consistent with other research (Baikie & McLlwain, 2008, O’Connor & Ashley, 2008; Paez et al., 1999). Researchers have explained this finding as beneficial because those high in alexithymia may feel they are not being forced to put a label on their emotions (Baikie & McLlwain, 2008). Perhaps expressive writing has a delayed effect on individuals high in alexithymia. The benefits of expressive writing for physical health problems need a more thorough investigation.

Although assessing journal writing is often suggested as a future direction or limitation of expressive writing paradigms (Radcliffe et al., 2007; Zakowski et al., 2004), participants were asked at baseline if they wrote in a journal or blog prior to the expressive writing session. Again, the results were slightly different from expected in that those that wrote in a journal and were in the expressive writing group reported increases in pain intensity from baseline to 1-month follow-up analyses, but for the 1- to 3-month follow-up analyses, these individuals had decreases in pain intensity. Writing about a stressful or traumatic topic may have come as a surprise for participants, especially if this was something they already wrote about previously. For this group the benefits came later after the initial impact of the writing sessions wore off. Further studies examining potential moderators of the expressive writing relationship regarding journaling is needed.

Some alternative explanations of the current study are possible. One likely explanation is that students expected to feel better and developed better ways of coping with their stress and pain due to their participation in the study, regardless of what they
wrote about. This “expectancy theory” may also be considered one type of placebo effect (for a review see Stewart-Williams & Podd, 2004). All participants were told that they would be writing on a personal topic and the purpose of the study was to examine how “writing affects your well-being”. However, when asked what they thought this study was about, most time management participants responded that the study was about how writing affects their mood or how their mood is affected by daily activities which was not very different from expressive writing participants (e.g., writing about our deepest thoughts can improve your mood). While participants’ motivation to join the study was not assessed, they might have been motivated to join the study to improve their overall well-being (i.e., mood) even though the writing prompts were different for the two groups.

Secondly, demand characteristics may have influenced the results in that participants may have responded to follow-up questionnaires in order to “help” the researchers, due to the personal nature of the writing, or to make it appear that writing impacted their well-being. Other characteristics of the current study such as having the participants complete a lengthy battery of questionnaires (e.g., trauma history, coping, emotion regulation difficulties) may have influenced the findings. Completing these questionnaires may have influenced what they wrote about and their ideas about the purpose of the study. However, since no group differences were found for the beneficial nature of the study among the expressive writing group at both baseline and 3-months post-writing, this may not have been entirely the case.
Thirdly, there were a few participants who did not completely follow the writing prompt. However in studies where expressive writing participants did not follow directions, if they wrote about some stress, they remained in the analyses (Lumley & Provenzano, 2003). Additionally, since participants had a choice in what events they disclosed, some might have disclosed an event that did not really bother them. In fact, a good percentage of them (14.8%) decided to write about daily stressors (e.g., trouble in school, job stress). However, group differences in how personal the essays were and the changes in mood across the three writing sessions suggest that individuals in the WEE group did express more emotions (and more personal emotions) than those in the time management group. Therefore, the immediate benefits of expressive writing were demonstrated, but they did not have lasting effects.

In addition, participants were not asked about any stressful events or traumatic experiences that may have occurred during the 1- and 3-month follow-up periods of the study. Events such as finals week, graduation, breakups, or death of family members could have occurred during this time which may have impacted any of the mental and physical health outcomes. However, this study was conducted throughout the course of the year and follow-up periods varied among participants, so stressors such as finals week and graduation should have also been randomized among participants.

Finally, it is possible that the expressive writing group did not significantly differ from the time management group for the various mental and physical outcomes because the expressive writing paradigm itself was ineffective. Although the findings may imply that writing overall, not just writing about a particularly stressful or emotional topic,
might produce benefit, this is not the most likely conclusion. As previously indicated, expressive writing is still a fairly new intervention technique. Since it has been frequently modified, it is possible that there are specific writing paradigms that produce more benefits with certain groups. While the original paradigm might have been beneficial for healthy individuals (Pennebaker & Bealle, 1986), this is often not the case among certain health groups (D’Souza et al., 2008; Koopman et al., 2005). For example, benefit finding was more successful than expressive writing in a group of individuals with lupus and rheumatoid arthritis (Danoff-Burg et al., 2006) and writing about positive experiences led to decreases in health-center visits among college students (Burton & King, 2004). These speculations have not been readily confirmed by the recent meta-analysis (Frattaroli, 2006). However, Smyth & Pennebaker (2008) proposed that there are no longer paradigms that are better than others and it is about finding the right “recipe” for your participants.

The current study is not without its limitations, and future studies are necessary. One limitation was the spacing of the writing sessions. While 45.1% of the participants wrote for three consecutive days, many students could not come three days in a row. However, participants were required to come in within a week of starting the first writing session (which only made us lose 2 participants). While this did not affect any of the outcome variables, placing stricter requirements about scheduling may be needed.

Secondly, the number of male participants in this study was quite low ($n = 13$ at 3-months post-writing). Obtaining a greater number of male participants would allow us to examine if there were any gender differences in the expressive writing paradigm.
Some studies have hypothesized that expressive writing would benefit men more than it would women due to the type of setting the disclosure takes place (e.g., Epstein et al., 2005). While gender has been examined as a moderator in a few expressive writing studies, the majority did not find any significance (for a brief review see Frattaroli, 2006). Gender was also not a significant moderator in our study for any of the physical and mental health outcomes (all \( p > .05 \)); however, this finding is likely underpowered.

Additionally, the original paradigm was followed closely and participants only wrote for three 20-minute sessions. Although this may have led to initial changes in well-being, these changes did not persist to the 1- and 3-month follow-ups. Meaning, participants may need more time to thoroughly explore their thoughts and feelings about the event (participants even commented that they would have liked more time to write, especially the WEE group). Furthermore, for seriously traumatized individuals not having a long enough time to write actually could have led to the findings that expressive writing was a detriment to participants’ well-being (Gidron et al., 1996). However, lengthier sessions pose a problem in that it may lead to increases in attrition since it requires more time. The goal of the intervention was to make this study more feasible for participants than other stress-reducing interventions (Menzel and Robinson, 2006) and future research should be conducted to examine the feasibility of longer sessions while minimizing attrition.

Less stringent exclusion criteria for the back and headache pain groups may be needed. Since the impact of expressive writing on back pain was initially unknown, it was also unclear what group of back pain participants would lead to a significant effect of
the paradigm. Also, while headache pain participants have been previously examined, a
strict recruitment criterion was not imposed on participants as it was in the current study
(D’Souza et al., 2008). Additionally, while the different classifications of headaches
were not examined, migraine headaches were a main focus of an expressive writing vs.
relaxation training intervention (Kraft et al., 2008). Other than reporting high amount of
back and headache pain, this was a relatively normal, healthy sample. Participants rated
their health as being good and about the same as their health in the past year. Participants
also reported few visits to the health center and rarely feeling sick. It is possible that
while this group had high amounts of back or headache pain, their problems were more
short-lived. It is also possible that the sample did not benefit the same as those with
chronic or more serious health problems (De Moor et al., 2002; Gellaitry et al., 2010;
Mann, 2001). Examining those individuals with high amounts of perceived stress along
with high amounts of pain may be a better option. While the current study screened
participants for high amounts of back and headache pain, higher amounts of stress were
not screened. However, this was not preferable because it could substantially limit
recruitment.

Another limitation of the study was that participants were given an option of what
stressful or traumatic event they wanted to write about. Participants chose an array of
events to write about. Some chose to write about their daily stressors, while others wrote
about recent traumatic events, and yet others wrote about traumatic events that happened
years ago. However, this poses a potential problem. In an earlier meta-analysis, it was
reported that writing about more recent events may lead to greater benefits than writing
about past stressors (Smyth, 1998). This is rooted in the idea that prior events may have been disclosed and processed more so than recent events. Additionally, it was found that writing about an event 15 months prior led to significant changes in psychological and reported health than events that were further in time (Frattaroli, 2006). Although some of the participants indicated how long ago their event happened, there was no way to exactly know the date of their event and how much of it they disclosed before.

Finally, since the efficacy of expressive writing was short-lived, future research should concentrate on other methods to prolong the mental and physical health effects of expressive writing. One idea that has been suggested is implementing a “booster session” in-between writing sessions and follow-up time points. The idea of booster sessions for expressive writing was introduced by Gortner and colleagues (2006) with the idea originally coming from cognitive therapy studies of individuals with depression and depressive symptoms (Beck et al., 1979). However, Gortner and colleagues (2006) found that their booster session did not work, and since then, no other studies have examined reinstating the paradigm. One reason for this might have been that the booster session was offered at 5-weeks post-writing, and follow-up was not until 6-months. This may have been too far away from the initial writing sessions and not close enough to the follow-up to cause lasting benefits. More research should be conducted on the proper way to conduct booster sessions, the amount of time that should pass post-writing, and the timing of the follow-up session in order to fully determine its efficacy.

**Conclusions**
In summary, writing has some mental and physical health benefits for undergraduates with back and headache pain. More specifically, writing about a personal topic (which does not necessarily have to be stressful or traumatic) may have some temporary reductions in pain frequency and negative mood. However, the efficacy of expressive writing in this particular pain group may vary depending on the type of writing prompt (e.g., just focusing on benefits of the upsetting experience, writing about positive events, writing about their best selves). Expressive writing had benefits for pain medication reduction which is useful since pain medication abuse is an increasing concern in the undergraduate population. More research needs to be conducted examining pain medication use in other pain groups during expressive writing interventions. Overall, the investigation found that expressive writing was a feasible treatment for this group of participants. As expected, the study was well-received with participants as the majority of them were retained for all of the writing sessions. More so, those in the WEE group found value in their experience both immediately and at 3-months post-writing. Future studies should examine more specific mechanisms of this effect (e.g., self-efficacy, length of pain problems, depression, and mindfulness) and examine variables that may contribute to an individual’s pain perceptions. Finally, offering participants booster sessions soon after writing may lead to greater mental and physical health benefits.
References


Bell-Pringle, V. J., Jurkovic, G. J., & Pate, J. L. (2004). Writing about upsetting family


Belmont, CA.


among university students in Edmonton, Canada. *Perceptual and Motor Skills, 75*(2), 552-554.


Chen, Y. Y., & Contrada, R. J. (2009). Framing written emotional expression from a


Psychological Bulletin, 132(6), 823-865.


the transition to college: Alexithymia, perceived stress, and psychological symptoms. *Journal of College Student Development, 45*(6), 593-611.


Kraaij, V., van Emmerik, A., Garnefski, N., Schroeters, M. J., Lo-Fo-Wong, D., van


routes of administration associated with nonmedical use of prescription opioids.

*Addictive Behaviors, 32*(3), 562-575.


Murphy, M. C., & Archer, J. (1993). Stressors on the college campus: A comparison of


disclosure procedure. *Journal of Consulting and Clinical Psychology, 72*(2), 165-175.


after papilloma resection: Effects of written disclosure of the experience in subjects with different alexithymia levels. *Psychosomatic Medicine, 65*, 477-484.


emotional disclosure buffers the effects of social constraints on distress among cancer patients. *Health Psychology, 23*(6), 555-563.