THE EFFECTS OF WRITTEN DISCLOSURE ON PHYSICAL AND MENTAL HEALTH IN INDIVIDUALS WITH ASTHMA

By

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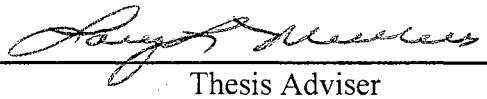

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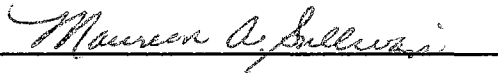

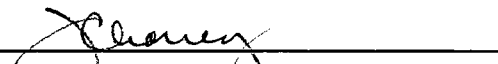

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CHAPTER I

INTRODUCTION

Historically, the nature and function of emotional expression has been a primary interest in the study and practice of psychology. Psychologists have long noted that the expression of emotions has positive effects on mental and physical health (e.g., Breuer & Freud, 1895/1966; Rachman, 1980). Conversely, not expressing emotions is often regarded as having detrimental effects on health. Recently, clearer links have been observed between nondisclosure of emotion and health-related symptoms. Individuals classified as nondisclosurers or repressors demonstrate higher cancer rates (Kissen, 1966), mortality rates following breast cancer diagnosis (Derogatis, Abelof, & Melisaratos, 1979), blood pressure elevation (Davies, 1970; Mann & Delon, 1995), and physical disease rates in general (Blackburn, 1965). Compared to individuals that are emotionally expressive, those who do not disclose have been shown to visit physicians more frequently, demonstrate impaired immune function, and exhibit greater autonomic nervous system irregularities (Emmons & King, 1988; Jamner, Schwartz, & Leigh, 1988; Larson & Chastain, 1990; McClelland, 1979).

Traditionally, the effects of disclosing or inhibiting emotions have been examined via verbal expression, such as psychotherapy. More recently, a growing body of literature has more closely examined the effect of writing about past traumatic experiences. A brief

but apparently powerful written emotional expression task has been developed by Pennebaker (e.g., Pennebaker & Beall, 1986) which has been a focus of a large number of experiments examining the effects of disclosing information. These studies have demonstrated that participants who write about past traumatic or emotionally upsetting events have fewer physician visits for illness in the months following the writing task, (e.g., Greenberg & Stone, 1992; Pennebaker, 1991; Pennebaker & Beall, 1986; Pennebaker, Colder & Sharp, 1990) evidence improved immune functioning (Esterling, Antoni, Kumar, & Schneiderman, 1990; Pennebaker, Kiecolt-Glaser & Glaser, 1988) and report a reduction in days of restricted activity due to illness (Pennebaker & Beall, 1986). Further, these positive outcomes have been documented from 2 to 14 months following the time of the initial writing task (Pennebaker, 1997). Other benefits evidenced in these studies include improved grades, faster re-employment, and decreases in absenteeism rates (Francis & Pennebaker, 1992). Psychologically, the experimental groups in these studies often show an immediate increase in negative emotions, followed by a return to baseline or increased positive affect in the months following (Pennebaker et al., 1988).

Until quite recently, virtually all studies in this area examined only physically healthy subjects. Researchers recognized this shortcoming, and noted that individuals with chronic or more serious health problems may evidence a completely different outcome to written emotional expression tasks. Notably, asthma had been directly cited as an illness that warranted specific examination concerning the effects of written emotional expression tasks (Greenberg & Stone, 1992; J.W. Pennebaker, personal communication, 1998; Pennebaker et al., 1990). Asthma is one of the most common chronic illnesses of both childhood and adulthood. Thus, extension of the disclosure task

could have substantial impact should it benefit such a large population. Further, evidence for the role of emotions in asthma outcome (e.g., Lehreer, Isenberg, & Hochron, 1993; Reed & Townley, 1983) suggests that interventions targeting emotional adjustment may have a stronger impact on this illness compared to those chronic health conditions where emotions play a lesser role.

In 1999, Smyth and colleagues (Smyth, Stone, Hurewitz, & Kaell, 1999) produced the only published study examining Pennebaker's written task in a target group of individuals with a chronic health condition. These authors conducted a study examining the effects of written disclosure on the physical health of individuals with asthma or rheumatoid arthritis. As hypothesized, these researchers found clinically significant improvements in health status in these groups over a four-month period. The present study is extension of the written disclosure literature, especially upon the work of Smyth and colleagues (1998) work with individuals with asthma.

Asthma represents one of the most common chronic illnesses, affecting approximately 9-15 million Americans (O'Hara, 1995; Weiss, Gergen, & Hodgson, 1992). It is cited as the most common chronic disease in children (Hobbs et al., 1985; Patterson, 1988), affecting an estimated 4.8 million children (Adams & Marano, 1995; MMWR, 1995). Asthma is a heterogeneous illness characterized by recurrent and partially reversible, generalized obstruction of the tracheobronchial airflow (Pearlman, 1984). Temporary constriction of the bronchi results in wheezing and shortness of breath. According to Reed and Townley (1983), exacerbating stimuli include irritants, exercise, cold air, respiratory infections, allergens, aspirin and related substances, and situations and emotional responses. Although most asthma patients are affected by irritants,

exercise, cold air, and respiratory infections, a smaller number are affected by situations and emotional responses. Most research has focused on the more common eliciting stimuli, and relatively little attention has been given to situational and emotional reactions as cues to asthma attacks.

Asthma can be a dangerous disease that causes numerous problems for health care professionals, the patient and their families throughout childhood, adolescence, and into adulthood (Creer, 1994; Creer et al., 1988; Hamlet, Pellegrinin, & Hatz, 1992; Miller & Wood, 1991). Alarmingly, the morbidity and mortality rates in asthma in the United States have increased substantially for nearly three decades (Celano & Geller, 1993; Evans et al., 1987; O'Hara, 1995; MMWR, 1998; Weiss & Wagener, 1990). Between 1980 and 1994, incidence rates reportedly increased approximately 75%, regardless of age, race or gender (MMWR, 1998). More than 5,000 deaths are caused by asthma each year in the United States (National Institute of Health, 1997); a major factor in this mortality rate is hypothesized to be the patients' underestimation of the severity of acute exacerbation of the illness (O'Hara, 1995).

The total estimated cost of asthma in the United States was $6.2 billion in 1990 (Weiss et al., 1992), thus asthma exacts considerable financial burden on the families and the health care system (Hobbs et al., 1985). Asthma accounts for 11 to 17% of all pediatric hospitalizations in large population areas in the United States (Lindgren et al., 1992). In children, asthma has been cited as the leading health reason for lost school days (Celano & Geller, 1993; Hobbs et al., 1985). Thus, asthma is a much more severe and costly chronic illness than is generally believed by most people.

The role of emotions in the onset and course of asthma is a complicated question. Researchers generally agree that a subgroup of asthma sufferers have asthma attacks triggered by emotional reactions. Further, there is considerable evidence that on average, individuals with asthma manifest more negative emotions than non-asthmatic individuals. However, this increased level of negative emotion may be a result of the asthma, as much as it may cause asthma. Nevertheless, it appears that emotions play a key role in asthma.

Interventions examining the role of emotions appear logical, given the evidence for asthma attacks being triggered by emotions in a subgroup of asthma sufferers. Given the chronic and pervasive nature of asthma, and its' associated healthcare cost, research on ways to enhance health status with decreased medical utilization would be of major benefit. Research examining the benefits of written emotional expression and health, such as that conducted by Pennebaker and colleagues, may prove to be a basic behavior medicine intervention which would require little money or time by medical staff. Such an intervention would be optimal, given the shrinking health care coverage accompanying the emergence of managed care.

Prior to Smyth and colleagues' publication in 1999, all previous research in the area of written emotional expression and health had been conducted with healthy subjects only, and debate existed to the possible affects of the experimental procedure with individuals with a chronic health condition such as asthma. Indeed some researchers felt that the observed improvements in health had been small due to the fact that they had utilized healthy subjects thereby restricting the range of possible improvement. They contended that examination of individuals who had more serious health conditions would result in even greater health gains. Others proposed that the intervention was too "weak"

to affect serious medical conditions, and thus no improvement would be observed in chronically ill populations (Greenberg & Stone, 1992). Finally, asthma was of particular importance given the data showing that experimental subjects in the writing task often reported an immediate increase in negative emotions. In light of asthma attacks being triggered by emotions, there was the possibility that this intervention may be contraindicated, adding to the importance of studying the effects of this intervention in a controlled laboratory setting prior to administration in real world settings.

Thus, the current study was designed to extend Pennebaker's model of written emotional disclosure to a sample of individuals with asthma and evaluate its effect on both physiological and psychological health. In light of recent findings by Smyth and colleagues (1999) it appears that individuals with asthma may benefit from this experiment which help to support the dissertation hypotheses. The present study hopes to further these findings by examining immediate changes in psychological and physical health as well as the potential long-term effects on adjustment and health care utilization.

This dissertation consists of five chapters: 1) an introduction 2) a review of the literature, 3) methodology, 4) analyses and 5) discussion of findings. To familiarize the reader with Pennebaker's model and asthma as a disease state, the introduction addresses three primary areas. First, the history of disclosure and health is briefly reviewed, followed by a more detailed account of the results from studies utilizing Pennebaker's writing task. Second, an overview of asthma will follow, with particular attention given to the role of emotions in asthma. Finally, the specific hypotheses of the study are presented.

CHAPTER II

REVIEW OF THE LITERATURE

Early in the history of psychotherapy it has been noted that the expression of emotions has positive effects on mental and physical health (e.g., Breuer & Freud, 1895/1966, Rachman, 1980). Conversely, not expressing emotions was often regarded as having detrimental effects on health. Empirical investigations over time have typically focused on the influence of the type of relationship (i.e., mother, friend, therapist) on patterns of self-disclosure and the type of information being disclosed (e.g., Jourard 1971a; Jourard 1971b; Jourard & Laskow, 1958). Historically, self-disclosure was often examined as a means for promoting personal growth and improved relationships (e.g., Derlega; 1984; Mowrer & Vattnao, 1976). More recently, research in the area of disclosure or non-disclosure of emotions has focused on effects on physical health.

Non-Disclosure of Emotions and Health

Freud recognized that bodily symptoms may develop as a result of the conflict when emotions are not expressed (Freud 1895/1966). Later, Pierre Janet claimed that traumatic events led to strong emotions which, if not expressed, continue to return as cognitive, behavioral, and somatic experiences (van der Kolk, Brown, & van der Hart, 1989). Franz Alexander (1950) proposed specific emotional conflicts were linked with

particular physical ailments. For example, the improper suppression of rage would lead to cardiovascular disease. Although empirical evidence is still lacking for such suggested relationships (e.g., Whitehead, Fedoracicius, Blackwell, & Wooley, 1979), Alexander's theory did help to advance the notion that physical symptoms arise from the process of not properly expressing emotions.

More recently, clearer links have been observed between nondisclosure of emotion and psychosomatic symptoms. Examination of differences between those that express or repress emotions on physiological responsiveness has demonstrated that compared to those that express emotions, repressors have been found to have significantly higher blood pressure (Davies, 1970; Mann & Delon, 1995; Notarius & Levenson, 1979; Weinberger, Shwartz & Davidson, 1979), skin conductance (Buck, 1979, Gross & Levenson, 1993; Pennebaker, Berger & Tiebout, 1989; Pennebaker & Chew, 1985; Weinberger et al., 1979), forehead-muscle tension (Weinberger et al., 1979) and impaired immune functioning (Esterling, Antoni, Kumar, & Schneiderman, 1990). Individuals classified as non-disclosures or repressors demonstrate higher cancer rates (Kissen, 1966), mortality rates following breast cancer diagnosis (Derogatis, Abelof, & Melisaratos, 1979), and physical disease rates in general (Blackburn, 1965). Compared to individuals that do not inhibit, individuals who hold back secrets (Larson & Chastain, 1990), inhibit their personal strivings (Emmons & King, 1988), inhibit their power motivation (McClelland, 1979), or rely on repressive coping strategies (Jamner, Schwartz, & Leigh, 1988; Weinberg, Schwartz & Davidson, 1979) visit physicians more frequently, demonstrate impaired immune function and exhibit greater autonomic nervous system irregularities.

Similarly, examination of the effects of trauma and health has shown that individuals who report a traumatic sexual experience prior to age 17 are more likely to report having ulcers, stomach problems, kidney and bladder infections, headaches, cardiovascular symptoms, and related problems than are those who had parents who died or were divorced, or those who had not experienced one of these traumas (Pennebaker & Hoover, 1984). Later phone interviews revealed that sexual trauma subjects had often not disclosed this information beforehand, while participants in the other groups had discussed their trauma with others prior to the experiment. The authors conclude that such findings suggest that it may not be the traumatic experience per se that may influence physical health but it is the act of disclosure of emotions which is impacting the individuals physical outcome.

Verbal Disclosure

Several studies have examined the benefits of psychotherapy for individuals with medical problems. For the purposes of this paper, the efficacy of psychotherapy for physical or psychosomatic conditions will be briefly touched upon to make the reader aware of basic findings in this area.

In general, those patients given the opportunity to express their thoughts and feelings as part of their treatment plan have benefitted. In a summary of 15 studies published between 1965 and 1980, Mumford, Schlesinger, and Glass (1981) found that individuals who underwent psychotherapy evidenced a 13% decrease in medical utilization compared to a group of non-treated controls. Jones and Vischi's (1980) review of 13 studies of mental health services introduced into organizations, found that

psychotherapy was associated with a 20% drop in medical utilization. More recently, a meta-analysis of 22 studies examining emotional/behavioral psychological interventions for pediatric chronic medical conditions, published between 1990 and 1995, found an effect size of 1.03 (Kibby, Tyc, & Mulhern, 1998). Although this analysis does include some studies targeting specific management issues unique to an illness (e.g., caloric intake in cystic fibrosis), many of these interventions addressed distress associated with the patient's medical condition or treatment.

Psychotherapy has been demonstrated to be effective in reducing symptoms in a variety of illnesses including hypertension (e.g., Hoffman et al., 1982), asthma (e.g., Lehrer, Hochron, McCann Swartzman, & Reba, 1986; Morrison, 1988) and migraine headaches (e.g., Blanchard, Applebaum, & Radnitz, 1990; Holroyd & Penzein, 1990). Minuchin et al. (1975), showed that family therapy was effective in reducing medical difficulties in diabetes and asthma. For heart attack victims identified as having Type A personality pattern, patients receiving psychotherapy reduced their chances of a second heart attack by nearly one-half compared to a control group (Friedman & Ulmer, 1984). Derogatis, Abeloff, and Melasaratos (1979) found that women who were most able to be openly angry and depressed following a diagnosis of breast cancer lived longer than those less able to express such emotions. Further, Spiegel, Bloom, Kraemer, and Gottheil (1989) demonstrated that women with advanced breast cancer who were assigned to group therapy as part of their treatment regimen lived an average of 1.5 years longer than those who were in informational, non-therapeutic groups.

Pennebaker, Barger, and Tiebout (1989) demonstrated that the act of verbally expressing stressful or traumatic events can have a positive impact on long-term health.

These authors studied 33 Holocaust survivors, allowing them to talk for 1-2 hours regarding traumata experienced during the war. Those who evidenced lower skin conductance levels (SCLs) and who used the most emotional words when they disclosed experiences, demonstrated the greatest improvements in health as measured by physician visits and physical symptoms at 14-month follow-up. This finding is particularly important in providing evidence of improved long-term physical health through the act of verbal disclosure without any psychotherapeutic intervention. In addition, it demonstrated that disclosing very remote events is effective in changing health. These findings added further support to Pennebaker's hypotheses that non-disclosed trauma may act as a long-term stressor that negatively impacts physical health, and subsequent disclosure may result in physical health improvements.

In a study modeled after Pennebaker's writing task, Kelley, Lumley and Leisen (1997) asked 72 patients with rheumatoid arthritis to either talk about innocuous topics, or talk about a traumatic event with no therapist intervention. Results indicated that those participants that talked about traumatic events had immediate increases in negative mood, but at a 3-month follow-up reported less emotional disturbance and better physical functioning in daily activities compared to control participants. However, there were no group differences on measures of pain or joint condition. Thus, disclosure per se with no psychotherapeutic intervention resulted in self-reported increases in quality of life, however, there did not appear to be a significant impact on illness parameters.

In sum, it appears that verbal psychological interventions aimed at improved psychological health and adjustment have a positive impact on physical health for a number of chronic health problems including asthma, diabetes, and cancer. Further, as

demonstrated with Holocaust survivors and patients with rheumatoid arthritis, the mere act of verbally disclosing traumatic events without formal therapeutic intervention appears to have some salutary effects. Thus, it is suggested that disclosure of emotions has potential but possibly limited medical health benefits for chronic medical conditions.

Written Disclosure

Recently, a growing body of literature has examined the effect of writing about past traumatic experiences on physical health (e.g., Esterling, Antoni, Kumar, & Schneiderman, 1990; Fawzy et al., 1993; Mumford, Schlesinger, & Glass, 1983; Murray, Lamnin, Carver, 1989; Pennebaker & O'Heeron, 1984; Smyth et. al., 1999; Spiegel, Bloom, Kraemer, & Gottheil, 1989). A brief written emotional expression task has been developed by Pennebaker (e.g., Pennebaker & Beall, 1986), which has been a focus of a number of experiments. This writing task calls for experimental participants to write an essay that expresses their feelings about a traumatic experience in their life (e.g., "write about your deepest thoughts and feelings about a trauma"). Control subjects are instructed to write about innocuous topics (e.g., "write about your plans for the day"). Subjects are typically asked to write for three to four days, on consecutive days or staggered over a period of weeks. Studies utilizing this experimental paradigm have examined the differences between control and experimental participants across various outcomes, including health center visits, effect on immune functioning, academic success and employment status. These studies are summarized below.

Physiological Health

Chronic Illness – In the only published study utilizing Pennebaker's writing paradigm with individuals with a chronic illness, Smyth and colleagues (1999) studied 107 individual with asthma (n=61) or rheumatoid arthritis (n=58). Participants were assigned to write for 20-minutes over 3 consecutive days. In individuals with asthma, illness severity was evaluated via spirometry forced expiratory volume in 1 second (FEV_1), an objective measure of lung functioning similar to peak expiratory flow rates (PEFRs). Individuals with rheumatoid arthritis (R.A.) were evaluated via a structured interview conducted by a rheumatologist and ranked on a disease activity scale from 0 (asymptomatic) to 4 (very severe). Assessments were conducted at baseline, 2-week, 2-month and 4-month.

At four-month follow-up, individuals in the experimental group demonstrated a significant improvement in health status, whereas individuals in the control group did not show any improvement. Individuals with asthma showed an overall mean FEV_1 increase of 12.4% ($p < .001$). Individuals with R.A. in the experimental group showed significant improvements in overall disease activity, with a 28% mean reduction in disease severity (1.65 to 1.19, $p < .001$), whereas, participants in the control group did not change. In addition, these changes were observed to be present at 2-week, 2-months and 4-month follow-up. Thus, improvements were not time dependent and were observed at 2 weeks following the experiment and maintained for at least 4 months post-experiment.

To more closely examine clinically significant changes in illness state, participants were categorized into three groups: "improved," "no change," or "worse." To

categorize clinical changes in asthma the authors utilized a standard of 15% change in FEV_1. As mentioned, R.A. participants were ranked on a scale from 0-4; a shift of one category was considered to be clinically significant. Utilizing these cutoffs, the authors found that close to half of the participants showed improvement, while close to half did not show a significant clinical change (48.6%, n = 34) and only a small fraction had a deterioration in health (4.3%, n = 3). These changes were found to be significantly different than the changes observed in the control group (improved: 24.3%, n = 9, no change: 54.1%, n = 20, worse 21.6%, n = 8). Unfortunately, the authors collapsed across illness and thus one can not determine what percentage of these participants belongs to each illness group. However, from the previous statistic it does appear that participants in the experimental group, regardless of illness, did have statistically significant improvement in health. It also unfortunate that the authors did not report on some of the standard measures conducted in this area including changes in health care utilization or psychological health. Finally, it is also still unclear what physical changes occur during or immediately following the writing experiment.

Health Center Visits – By far, the majority of studies examining written emotional expression have utilized visits to a health center or physician as a primary outcome measure. In one of the first studies conducted in this area, Pennebaker and Beall (1986), divided 46 healthy undergraduates into 4 groups: control, trauma-emotion, trauma-fact, or a trauma-combination. The trauma-emotion group was asked to write about a past traumatic event, concentrating on only the feelings and emotions related to the event. The trauma-fact group was asked to write about all the objective facts and details regarding a

past traumatic event excluding emotional details. The trauma-combination group was asked to write about both the objective facts and the accompanying subjective emotions of a past traumatic event(all future reference to experimental groups will be trauma-combination groups unless otherwise indicated). Finally, the control subjects were assigned to write about trivial topics (a description of their living room, the shoes they were wearing, etc.). The authors examined student health center visits for three months pre- and six months post-experimental intervention. Results indicated that the trauma-combination participants had significantly better pre-post health center visits compared to all other groups. The other two experimental groups were not significantly different from control group participants on health center visits upon follow-up. Thus, the authors conclude that the optimal experimental instructional set would direct participants to write about both the subjective and objective content of traumatic memories.

Consistent with these findings, Pennebaker, Kiecolt-Glaser and Glaser (1989) found a similar condition by time interaction in another study. Examining 50 healthy undergraduates, participants were divided into either control or experimental groups, and number of health center visits at four months pre- and six months post- experiment were assessed. Notably, the experimental group evidenced a significant drop in visits relative to control participants. In a later study, Pennebaker, Colder and Sharp (1990) examined 130 freshman, and asked participants in the experimental group to write about their feelings regarding coming to college. Subjects were run in four 1-month staggered waves. Results indicated that subjects in the experimental group had significantly fewer health center visits following the experiment . These effects decreased over the following 4-5 months. No significant effects were found for which experimental wave the subject

was assigned. Thus, it was not important when the subject wrote the essay, because writing at the beginning of the semester versus the end of the semester did not result in any differences in health center visits.

An important finding of this experiment was that those that had generally poorer health (as represented by a higher number of health center visits over the course of the year) gained the most benefit after the writing experiment. Thus, it appears that those who frequently seek medical attention may show the greatest benefit from the writing experiment. This also suggests a possible "floor effect" for healthy people who rarely go to the health center (i.e., beneficial effects have been attenuated since participants' health center visits are initially low).

The finding that *when* an individual writes about an event does not apparently influence outcome has important implications. It suggests that an individual may still gain health benefits regardless of the temporal relation between the traumatic event and the writing exercise. As mentioned previously, further evidence for this argument is demonstrated in a study of World War II holocaust survivors (Pennebaker et al., 1989). Whereas the previous two studies examined college freshman whose trauma experience had occurred more recently, participants in this study were addressing events that occurred over fifty years ago.

Contrary to these findings, Greenberg and Stone (1992) found no differences in health center visits among 60 healthy undergraduates who were divided into three groups: writing about a previously disclosed trauma, a previously undisclosed trauma, or control. The authors suggest one possible explanation for this contradictory finding is that compared to previous studies, this sample had significantly higher pre-experiment health

center visits. The authors hypothesize that the higher rate of health center visits is representative of an overall less healthy sample, and that perhaps the writing paradigm was not sufficiently powerful to remedy preexisting or chronic health problems. "Thus, preexisting conditions such as allergies, asthma, or acne may place an upper limit on the salutary health effects that may be achieved by disclosure" (Greenberg & Stone, 1992, p. 82). However, they also note that the instructions to write about either undisclosed or previously disclosed trauma represents a change in the standardized instructional set of previous experiments and may have resulted in inhibition of writing. It is further noted that the authors conducted analyses examining the level of personal disclosure and found that the severity of the trauma disclosed was inversely related to the number of health center visits (i.e., increased trauma severity resulted in decreased medical utilization).

In an attempt to explain differences between previous studies, Pennebaker and Francis (1996), examined 72 healthy undergraduates. As with previous studies, these authors found those in the experimental condition demonstrated a decrease in health center visits in the two months following the experiment. However, these differences were not maintained into the next semester. Analyses of subjects' written text indicated that the use of positive emotion words and changes toward essay content reflecting causal and insight thinking were linked with health change. Thus, it appears that those who disclose about trauma and demonstrate positive emotions and a trend toward more insight have the greatest health gains.

From the text analyses findings of Pennebaker and Francis (1996) it was hypothesized that writing helps individuals to cognitively process the traumatic information, and thus more effectively cope. Further, if individuals who gain more

insight over the course of the experiment show the greatest health benefit, then perhaps guiding participants towards this process should result in even greater health benefits. To test this hypothesis, Cameron and Nicholls (1998) divided 122 healthy undergraduates into three groups: control, disclosure, and self-regulation. The control and disclosure groups received instructions similar to studies previously mentioned, while the self-regulation group received instructions similar to the disclosure group, with the added instruction to try to "select and evaluate coping strategies for overcoming their problems" (Cameron & Nicholls, 1998, p. 86). Results indicated an overall reduction in clinic visits for the two experimental groups, and a slight increase in visits for the control group. There was no difference between the two experimental groups on 4-week pre- and 4-week post-experiment health center visit difference scores. Thus, overall both experimental groups did show improved health. However, attempting to guide participants to an accelerated coping process did not result in increased health benefits. Unfortunately, text analyses were not conducted to ensure that the self-regulation group did in fact show more coping-oriented essays than the written trauma group.

In a unique comparison of therapeutic intervention versus writing about past trauma, Murray, Lamnin and Carver (1989) compared Pennebaker's writing paradigm and psychotherapy. Fifty-six undergraduates were divided into one of three groups: psychotherapy, written expression, or a control group of written trivial (i.e., standard control group). Psychotherapy was generally client-centered, providing some cognitive reappraisal and problem-solving of the event. Participants were asked to talk or write for 30 minutes on two separate occasions. No significant differences on health measures were found between any of the three groups. Unfortunately, this study only allowed for

two writing episodes, thus significantly altering the original design of 3 to 4 writing sessions.

Self-Reported Health-Related Symptoms and Behaviors – The studies mentioned above used the objective measure of health center visits reported by health center staff as a means of measuring health outcome. To further assess health, many of these studies asked subjects to self-report the presence of common illnesses or illness symptoms, and engaged in health-related behaviors such as smoking, exercise, and diet. Thus, in addition to a reduction in medical utilization, these studies examined if there were a corresponding change in perceived health status change or health behaviors.

Pennebaker and Beall (1986) compared four groups: Trauma-emotion, Trauma-Fact, Trauma-Combination, and Control. They found that subjects in the control condition reported the most number of days restricted by illness and those in the trauma-combination group reported the least. Utilizing a summed health problem index (Pennebaker Physical Symptom Scale, PPSS, 1982) including eight specific health problems (e.g., ulcers, migraine headaches, colds or flu) the authors found that participants in the trauma-combination and trauma-emotion conditions reported reductions in health problems relative to those in both the control and trauma-fact group. Subjects were also asked about changes in several health-related behaviors, such as alcohol and aspirin consumption. No significant differences were obtained on any of these measures.

Examining the standard protocol of emotion-combination versus control group, Pennebaker, Kiecolt-Glaser and Glaser (1988) asked participants about health-related

behaviors such as exercise, alcohol and caffeine consumption, aspirin and sleeping pill use and cigarette smoking. Despite changes in number of health center visits, subjects did not report changes in long-term health related behaviors. In two related studies using modified versions of the same questionnaires, equivalent findings were found (Pennebaker et al., 1990; Petrie, Booth, Davison, & Thomas, 1995).

Greenberg and Stone (1992) examined health related behaviors by use of a modified version of the questionnaire used by Pennebaker and colleagues' 1988 study mentioned above, as well as the PPSS and the Southern Methodist University Health Questionnaire (SMU-HQ, Watson & Pennebaker, 1989). The authors found no significant effects for any of these measures. Examining 63 recently unemployed professionals, Spera, Buhrfeind, and Pennebaker (1994) asked subjects to complete the SMU-HQ and 70 questions regarding ailments or health complaints. The authors found that compared to control subjects, experimental subjects reported less alcohol consumption six weeks following the experiment. However, no other significant differences were found for any other health-related behaviors.

In summary, it appears that the writing paradigm may also have an effect on perceived health when measuring the number of days restricted by illness, as demonstrated by Pennebaker and Beall's (1986) study. However, overall there does not appear to be significant change in self-reported health symptoms, nor an effect on long-term health-related behaviors such as diet and exercise.

Physiological Functioning

To better understand the possible impact on physical health, experiments have also been conducted to examine what physiological changes occur when an individual participates in Pennebaker's writing task. Studies to date have examined heart rate, blood pressure, skin conductance levels, immune functioning and other physiological benchmarks of health.

As mentioned earlier, Pennebaker, Barger, and Tiebout (1989) found in a study of verbal disclosure with Holocaust survivors, those who evidenced lower skin conductance levels (SCLs) when they disclosed traumatic war-related experiences also demonstrated the greatest improvements in health as measured by physical symptoms and physician visits. Examination of short-term physiological changes such as skin conductance level (SCL) has shown that SCLs increase when subjects express negative emotions and when using denial and the passive voice. SCLs are more likely to drop when subjects use positive emotion words and self-reference, as well as at the conclusion of sentences or thought units (Hughes, Uhlman, & Pennebaker, 1994). However, these findings have not been linked with long-term health outcomes, and merely represent moment-to-moment physiological responses with regard to disclosure content. Examination of SCLs approximately one hour prior to disclosure did not correlate with health outcome as measured by health center visits or immunological functioning (Pennebaker, Kiecolt-Glaser, & Glaser, 1988). Examination of changes in SCLs during the disclosure paradigm demonstrated a significant difference between experimental and control subjects, as well as a significantly different trend over the course of the four days of writing. In general,

participants in the treatment group showed initially higher SCLs with a steady decrease in SCLs over sessions. Control participants showed initially lower SCLs with an immediate decrease in SCLs, with a gain in SCLs over sessions. Notably, it is still unclear what changes in SCLs mean with regard to overall health. In fact, Petrie and colleagues (1995) only used this measure as a check of the experimental manipulation.

Examination of heart rate has shown no significant relation to immediate writing content (Hughes et al., 1994) nor any relationships with other outcome measures such as immunological response or group assignment (Pennebaker et al., 1988). With regard to blood pressure measures, Pennebaker and Beall (1986) found decreases in systolic pressure for all groups over the course of writing periods, with the only unique trend being that trauma-combination participants demonstrated an initial large increase from before to after the session on the first session. Pennebaker et al., (1988) showed no differences in blood pressure for his experimental manipulation. However, closer examination showed that over the course of the study, high-disclosures demonstrated a greater decline in both systolic and diastolic blood pressure when compared to low-disclosures. In summary, it appears that heart rate has little relationship to measures of content analysis at least in preliminary studies. However, systolic pressure seems to decrease over the course of the experimental procedure, and blood pressure changes are greatest for those that disclose more personal information.

Given the relation of particular metabolic benchmarks and physical health, Francis and Pennebaker (1992) examined 23 separate biochemical measures of cardiovascular, liver and related metabolic functions. Examination of blood chemistry value changes in a group of 41 healthy university employees revealed significant differential improvement in

liver functioning as measured by serum glutamic-oxaloacetic transaminase (SGOT) and serum glutamic pyruvic transaminase (SGPT) for experimental participants compared to controls. However, no condition by time interactions were shown for any other measured blood metabolite including: uric acid, globulin, albumin, triglycerides, cholesterol, high-density lipoproteins or low-density lipoproteins. The authors did report that all other blood measures, except cholesterol, showed more improvement for the experimental group than the control group, but these differences did not reach statistical significance.

Pennebaker et al., (1988) found that writing about traumatic experience had a positive effect on immunological functioning. The authors found improvement of immune functioning following exposure to two different mitogens (infectious agents), concanalvalin A (ConA), which stimulates the proliferation of both helper and suppresser T-cells and phytohemaglutinin (PHA) which stimulates the production of helper T-cells.

Among psychoimmunological stress reactions, Epstein-Barr virus (EBV) antibody titres have been found to be the most consistent and significant immunological correlate of psychosocial stressors. Esterling and colleagues have published two separate studies examining the effects of disclosure on EBV antibody titres (Esterling, Antoni, Fletcher, Margulies & Schneiderman, 1994; Esterling, Antoni, Kumar, & Schneiderman, 1990). In the first study, 80 first-year undergraduate students were given the task to write for 30-minutes about a stressful event. Blood was drawn immediately following the task and essays were later rated for degree of emotional disclosure. It was found that after controlling for medication use and other physical health variables that the degree of emotional disclosure was inversely related with EBV antibody titres, indicating better immunological health for those who disclosed more. In addition, this relation appeared to

be moderated by personality characteristics regarding "emotional suppression". Individuals categorized as "repressors" had higher levels of EBV antibody titres regardless of the level of disclosure. However, those categorized as "sensitizers" or those quick to express emotions only had EBV antibody titres if they had a low disclosure rating.

In the second study (Esterling, Antoni, Fletcher, Marguiles & Schneiderman, 1994), to examine changes in EBV antibody titres response, Esterling and colleagues assigned fifty-seven healthy EBV seropositive undergraduates to one of three groups: verbal disclosure, written disclosure and controls (Esterling et. al., 1994). After four weeks, the verbal disclosure group showed significantly lower antibody titter values (indicating more positive health) after the intervention than those in the written disclosure group, who had significantly lower values than those in the control group.

Similar positive results for immune functioning were found by Petrie and colleagues (1995). Forty medical students undergoing a standard Hepatitis B vaccination were studied for immunological response to writing. Participants in the experimental group showed a small but significantly higher level of Hepatitis B antibody compared to control subjects. Further, examination of T-helper cells (CD4) showed improvement for experimental participants. However, no differences between the groups were observed for T cytotoxic-supressor (CD8), natural killer cells (CD56), natural killer cell activity, or circulating basophils.

In summary, it appears that immediate physiological responses are seen for blood pressure and SCL's, but not heart rate. With regards to indicators of long-term health, many metabolic measures reflective of health status such as cholesterol are not affected

by the writing task, however liver functioning measures appear to show positive effects. Examination of immune function in three separate studies has shown specific positive improvements as represented by antibody production. A hypothesized model of the findings is the writing task results in improvements in immune functioning which subsequently leads to decreased health center visits. However, no changes are seen in other indicators of physical health, such as blood metabolites (e.g., HDLs and LDLs). It is hypothesized that the lack of positive findings regarding other blood metabolites might be explained by the fact that these measures are reflective of dietary and behavioral choices, things shown to be unchanged by this intervention. Alternatively, immune functioning is more reactive to environmental stressors, and thus demonstrates significant changes following the experimental task. Researchers such as Pennebaker have hypothesized that the writing task is in fact based on the process of disclosing previously inhibited traumatic memories. The act of inhibiting is considered to be a long-term stressor. Thus, the act of disclosing essentially decreases the amount of stress and thus positively effects immune functioning. However, the exact nature of why findings are seen in immune functioning and not other measures of physical health needs further investigation.

Psychological Well-Being

Pennebaker et al., (1988) found experimental subjects showed a higher level of negative moods immediately following the writing exercise compared to control participants. However, when these participants were asked how they felt about the experiment at 3-month follow-up, experimental participants reported being significantly happier than control participants. Unfortunately, it is hard to draw conclusions from these

findings, since the immediate measurement was for general mood, and the 3-month follow-up was concerned with mood specifically regarding the essay.

Similar findings regarding immediate significant negative mood ratings were found by Greenberg and Stone (1992). Negative mood immediately following the writing experiment was measured by two different measures, the Positive and Negative Affective Scale - Negative Affective Scale (PANAS NA; Watson, Clark, & Tellegen, 1988) and Pennebaker's Negative Mood Scale (Pennebaker, 1982). Compared with controls, disclosed-trauma and undisclosed trauma participants reported significantly more negative mood immediately following the writing exercise. Contrary to their hypothesis, the authors found that it was participants from the disclosed-trauma group that had significantly higher negative mood ratings compared to undisclosed-trauma participants. Similarly, disclosed-trauma participants reported lower positive mood than undisclosed-trauma participants, and both experimental groups did not differ from controls on positive mood. Examining long-term effects at one-month and two-month follow-up showed no significant effects for both positive and negative mood between groups.

Cameron and Nicholls (1998) found that on immediate pretest and 7 week follow-up posttest, that controls reported significantly higher negative mood ratings. However, the disclosure task participants did not show a significant increase in negative mood, nor did a self-regulation group. Comparison of changes in negative mood rating across the three conditions revealed that control participants were significantly higher in negative mood ratings compared to self-regulation participants, but not disclosure participants.

Francis and Pennebaker (1992) found no between group differences for negative or positive mood ratings at immediate posttest or 6-week follow-up. Similarly, these

authors found no between group differences on negative or positive mood immediately following the writing task, however, long-term effects were not assessed (Pennebaker & Francis, 1996). Measurement of negative affect via a college-adjustment measure showed that compared to controls, experimental participants had significantly poorer adjustment at the end of the semester but not at end of the year follow-up (Pennebaker, Colder, & Sharp, 1990).

In summary, findings regarding the psychological effects of the writing paradigm are mixed. Some studies have found that experimental participants report immediate higher levels of negative affect compared to control subjects. However, it appears that this difference becomes non-significant over the following months, with some evidence that experimental participants report significantly more positive mood compared to controls. Other studies have not found any significant difference in emotional state across the experimental and control groups (Francis & Pennebaker, 1992; Pennebaker et al., 1990; Pennebaker & Francis, 1996). Others have actually found control subjects report increased negative mood at immediate post-test (Cameron & Nicholls, 1998). Thus, there does not appear to be any clear conclusion at this time to the psychological effects of the writing task.

College Adjustment

As mentioned above, some studies have examined adjustment to the college context following the writing paradigm. Findings by Pennebaker, Colder and Sharp (1990) indicate that experimental participants reported poorer college adjustment at end of the semester follow-up, but were similar to controls by the end of the academic year.

However, these findings were best explained by a significant difference on the negative affect scale, and not the homesick and adjustment scales of the measure utilized.

Cameron and Nicholls (1998) found college adjustment ratings over time decreased significantly for their entire sample, with a significant between group difference. Control and disclosure participants showed significant decreases in adjustment across time and a self-regulation group remained stable. Furthermore, the two groups were significantly different from the self-regulation group. However, Pennebaker and Francis (1996) did not find a significant between or within change in adjustment utilizing a single item measure of college adjustment.

In addition to self-ratings of adjustment to college, the three experiments above examined participants' college Grade Point Average (GPA). All three experiments controlled for Scholastic Aptitude Test (SAT) scores. Cameron and Nicholls (1998) found that disclosure participants achieved higher GPAs relative to self-regulation and control group participants for the Fall semester only. Comparison of Fall to Spring semester GPAs showed trends toward significantly higher GPAs for experimental participants (Pennebaker, Colder, & Sharp, 1990; Pennebaker & Francis, 1996). The combined effect size for these two experiments is considered significant (Pennebaker & Francis, 1996).

Other Relevant Studies

Examining absenteeism in university employees, Francis & Pennebaker (1992) found that comparing pre- and post-writing absentee rates that experimental participants showed a significant greater decrease in absenteeism. In an application of the writing

paradigm to recently unemployed workers, experimental participants were asked to write about their job loss. Compared to control participants, those that wrote about innocuous topics or did not write, participants who wrote about their emotions were re-employed more quickly. The effects of the experiment seemed to affect the individual's attitudes about their old jobs and about finding new employment, rather than influencing their motivation to seek employment. Thus, the experiment seemed to have an effect on more subtle behaviors that may influence re-employment (Spera, Buhrfeind, & Pennebaker, 1994).

Summary

This developing line of research seems particularly important given that a simple and brief written task can potentially have an impact on overall health, both physical and psychological, over a number of months following the experiment. Furthermore, given the relatively small number studies investigating this paradigm, further exploration utilizing the writing task is in order to determine the efficacy of this program. This paradigm is particularly important given its low cost, and being a mechanism of emotional expression in circumstances where interpersonal expression is not viable. A natural extension of the previous research would be to examine a group of ill individuals. As mentioned earlier, researchers have directly suggested that individuals with asthma may be a worthwhile population to investigate. Indeed, there are a number of reasons asthma appears to be an optimal disease to examine, and they will be highlighted in the following section.

Asthma

Asthma is a heterogeneous illness characterized by recurrent and partially reversible, generalized obstruction of the tracheobroncial airflow (Pearlman, 1984). Temporary constriction of the bronchi results in wheezing, dyspnea (shortness of breath) and coughing. Additional symptoms that may be associated with asthma include allergic reactions of the eyes, nose, or skin. Asthma may be precipitated by a variety of factors, including changes in air temperature or humidity, exposure to environmental allergens, exercise, upper respiratory infections, or emotional expression such as crying or laughing

Asthma can be a dangerous disease that causes numerous problems for health care professionals, the patient, and their families throughout childhood, adolescence, and into adulthood (Creer, 1994; Creer et al., 1988; Hamlet, Pellegrinin, & Hatz, 1992; Miller & Wood, 1991). Representing one of the most common chronic illnesses, it affects approximately 9-15 million Americans (O'Hara, 1995; Weiss, Gergen, & Hodgson, 1992). It is cited as the most common chronic physical illness in children (Hobbs et al., 1985; Patterson, 1988), affecting an estimated 4.8 million children (Adams, & Marano 1995; Centers for Disease Control and Prevention, 1995). Prevalence rates range from 3.6% to 12% depending on the definition used to diagnosis asthma (Burr, Butland, King, & Vaughan-Williams, 1989; Gergen, Mullally, & Evans 1988; Hobbs, Perrin, & Ireys, 1985). Asthma is more prevalent among males than females (Evans et al., 1987; Gergen, Mullally, & Evans, 1988) with the age of onset being somewhat earlier for males. The age of onset of the disorder can vary from infancy to adulthood (Young, 1994). Approximately, two thirds of boys and half of girls experience their first asthma episode

by 3 years of age (Gergen et al., 1988). More than 90% of all children and adolescents with asthma have had their first episode of asthma by age 10 (Gergen et al., 1988). Incidence rates are higher for African American children (Gergen et al., 1988), with accompanied increase in mortality rate (Evans et al., 1987) than Caucasian children.

Alarmingly, the morbidity and mortality rates in asthma in the United States have increased substantially for nearly three decades (Evans et al., 1987; Celano & Geller, 1993; O'Hara, 1995; Weiss & Wagener, 1990; MMWR, 1998). Between 1980 and 1994, incidence rates reportedly increased approximately 75% regardless of age, race or gender (MMWR, 1998). There are more than 5,000 deaths caused by asthma each year in the United States (National Institutes of Health, 1997); a major factor in this mortality rate is hypothesized to be the underestimation of severity of acute exacerbations of the illness (O'Hara, 1995). Epidemiological data demonstrate that mortality from asthma is lowest in individuals under age 14 years, and that approximately only 100 children per year die from asthma (Evans et al., 1987). Thus, most asthma-related deaths occur in adults, who have presumably lived with asthma for a number of years. Although the reasons for the changing epidemiology of asthma are not clear, hypotheses have included factors such as changes in the environment, changes in the diagnostic criteria, or changes in the natural history of the disease (O'Hara, 1995).

Asthma and its subsequent treatment exacts considerable financial burden on the families and the health care system (Hobbs et al., 1985). Reflective of the increasing morbidity and mortality rates of asthma, health care costs have had similar increases. The total estimated cost of asthma in the United States in 1985 was approximately $4.5 billion, whereas this figure rose to $6.2 billion in 1990, with 43% of this cost associated

with emergency room visits, hospitalization, and death (Weiss, Gergen, & Hodgson, 1992). Asthma accounts for 11 to 17% of all pediatric hospitalizations in high population areas in the United States (Lindgren at al., 1992). In children, asthma has been cited as the leading health reason for lost school days (Celano & Geller, 1993; Hobbs et al., 1985) Weiss and colleagues (1992) reported that in children ages 5-17 years, asthma accounted for approximately 10 million missed school days, and 3 million work days among adults 18 years of age or older. Collectively individuals with asthma are estimated to have 100 million days of restricted activity and 470,000 hospitalizations annually (National Institutes of Health, 1997). Thus, health-related absenteeism may lead to decreased academic performance and work-related difficulties (Celano & Geller, 1993). Thus, asthma is a more severe chronic illness than is generally believed.

As mentioned earlier, the prevalence rate of asthma varies greatly according the diagnostic definition utilized. Although no single definition of asthma has been universally accepted (Creer, Renne, & Chai, 1982) a number of features considered hallmarks of the disease add to its complexity. These hallmark characteristics of asthma include its' *intermittent*, *variable* and *reversible* nature (Creer & Bender, 1995). *Intermittency* of attacks refers to the frequency of attacks; attacks generally occur on an aperiodic basis, and can vary from individual to individual. For example, a person may have seasonal asthma where the probability of having an asthma attack increases during a particular time of the year. During this time, they may have frequent attacks over a period of several days, weeks, or months and then go several months (or years) with no attacks. Even within this classification of seasonal asthma, a given person may be most susceptible to attacks in the spring due to sensitivity to pollen, whereas another individual

is more sensitive to cold and thus has increased attacks during the winter season. In contrast to seasonal asthma, a person may have what is considered perennial asthma and experience attacks most days throughout the year (Creer & Bender, 1995).

Variability of attacks refers to both the severity of a patient's asthma and to the intensity of discrete attacks. Thus, this label can sometimes be confusing as to whether one is referring to the overall stability of a person's asthma, to the severity of their attacks, or to a discrete asthmatic attack. Attacks range in severity from intermittent mild forms of bronchospasm to severe life-threatening episodes known as "status asthmaticus" (Boroch, Rahlfs, & Nilsestuen, 1989, Thompson & Gustafson, 1996). Due to the lack of a standard way of classifying asthma, it is understandable that there is a subsequent lack of agreed upon criteria for classifying either a given attack or the overall asthma presentation of a patient as mild, moderate, or severe (Creer & Bender, 1995).

Asthma is also characterized as *reversible*, in that the airways return to their previous condition spontaneously or following treatment (Creer et al., 1982). Reversibility is a critical characteristic of asthma. It helps to distinguish it from other types of respiratory disorders, particularly emphysema, in which reversibility does not occur. However, the reversibility of the disease creates a number of problems for the patient, clinician, and researcher. First, it may lead to the misnomer that all persons diagnosed with asthma as a child will "outgrow" their illness, when in fact this is not always true. Secondly, reversibility is a relative condition. Although the majority of asthma patients show complete reversibility of airway obstruction, others do not attain total reversibility of their asthma, even with intensive therapy (Loren et al., 1978). Third, the spontaneous remission of some attacks makes it virtually impossible to prove with

certainty a cause-effect relationship between changes in a patient's asthma and a given treatment for the disorder (Creer, 1982). Finally, it is hypothesized that in some cases the reversibility of symptoms leads to underestimation of severity of critical attacks. This underestimation leads to proper preventive steps not being taken, resulting in more intensive medical intervention that would not have been necessary.

Manifestation and Course

There is no one universally accepted diagnostic method for assessing the presence or absence of asthma. The diagnosis of asthma is often based on patient report, clinical observations that the patient is experiencing symptoms thought to be asthma, or provocation challenge testing to induce an asthmatic reaction in the presence of a health care provider (Creer, Harm, & Marion, 1988). Even more variation is present regarding assessment of asthma severity. Experts have proposed different operational definitions of asthma to help define and better diagnose the illness. These definitions range from simple statements (Canny & Levison, 1990) to more complex or long checklists such as that given by the Allergy Foundation of America or the American Thoracic Society (Busse & Reed, 1988; Reed & Townley, 1983). Creer and Bruce (1995) caution that although complex criteria are beneficial for research purposes, these provide little value to clinicians who concentrate on treatment issues. In addition, simple statements (e.g., Canny & Levison) may lead to overdiagnosis or be of little utility in research endeavors.

Several pathophysiologic processes are evident in asthma, including bronchial obstruction, bronchial and pulmonary inflammation, and increased bronchial and pulmonary mucous secretions. Thus, the course of the disease can be summarized in to a

number of stages. First is the presence of stimuli which may help to trigger an attack. According to Reed and Townley (1983), stimuli include irritants, exercise, cold air, respiratory infections, allergens, aspirin, and related substances, and situations and emotional responses. Whereas most asthma patients are affected by irritants, exercise and cold air, and respiratory infections, fewer are affected by aspirin and related substance, and situations and emotional responses. Despite the common nature of reactivity to stimuli in most asthmatic patients, there is still considerable variability with regards to types of triggers. Most research has focused on common environmental stimuli, and thus little attention has been given to situational and emotional reactions as cues to asthma attacks.

The second stage is the physiological response to the stimulus trigger. According to Reed and Townley (1983), there are two major physiological responses to stimuli: inflammation and bronchial hyperactivity. Research has increasingly supported the importance of inflammation as an essential component in the development of asthma and represents individual's with asthma increased sensitivity to stimuli compared to non-asthmatic individuals. Inflammation can lead to one of two pathways: bronchial hyperreactivity, or to a number of physiological responses more closely linked to the experience of an asthma attack. These physiological responses include edema, cell infiltration, gland secretion, and epithelial damage. These responses may then lead to airway obstruction. Bronchial hyperactivity may occur as a unique physiological reaction to stimuli or as a result of inflammation. Bronchial hyperactivity is believed to lead to bronchospasms and then to airway obstruction. Thus, two main paths lead to airway obstructions, one through bronchial hyperreactivity and the other from tissue

inflammation. It is the airway obstruction which then results in the expression of asthma symptoms such as wheezing and shortness of breath (Reed & Townley, 1983)

The asthma response is composed of two phases: the early asthmatic response (EAR) and the late allergic response (LAR) (Dulovich, Ruhno, O'Byrne & Hargrave, 1988; Young, 1994). The EAR occurs within a few minutes of exposure to the precipitant, reaches a peak within approximately 20 - 30 minutes, and subsides over one to three hours. The EAR is characterized by bronchospam, edema, and increased mucous secretions. The LAR occurs 4 to 12 hours after exposure to the precipitant, reaches a peak with 4 to 8 hours, and may last for 24 hours or more. The LAR is characterized by an inflammatory reaction of the airway passage and lung tissue damage. The airways are hyperactive to allergic stimulation during this period, potentially resulting in further inflammation and bronchoconstriction (Dulovich et al., 1988).

Treatment of Asthma

Medical – Medical management of asthma involves three primary methods of treatment: environmental control, immunotherapy, and pharmacological treatment. Environmental control is a critical treatment component and refers to reducing exposure to allergens in one's environment (i.e., dust, animal dander, etc.). If escape from allergens is not possible, than immunotherapy may be necessary. Immunotherapy involves desensitizing the individual to allergens that trigger asthma attacks. Finally, pharmacological treatment is often indicated and involves the administration of prescription medication to alleviate or prevent asthma exacerbations. Common

medications include $beta_2$-adrenergic agonistic, theophylline, mast cell stabilizers, and corticosteroids.

Psychological – A review of the psychological and medical literature reveals that psychological interventions for asthma have typically focused on increasing the ability to control symptoms. These treatments include relaxation therapy, biofeedback and family therapy. The aim of these techniques have been to promote self-management and reduce the anxiety that often accompanies an asthma attack. These approaches have shown improvement in various aspects of functioning including improved pulmonary functioning, increases in peak expiratory flow rate, and decreased utilization of health care resources (Lehrer, Sargunaraj & Hochron, 1992).

Recent psychologically-related empirical investigations have sought to increase self-management and adherence (e.g., Bailey, Davies, & Kohler, 1998; Fishwick, D'Souza, & Beasley, 1997). The importance of self-management has become an ever salient treatment component of asthma given the fact that despite improvements in asthma related medicine, morbidity and mortality rates continue to rise (Dahl, 1998) Attempts have been made to increase self-management and adherence to the medical regimen by changing the included educational components (e.g., Holzheimer, Mohay, & Masters, 1998) different types of educators (e.g., peer, pharmacist, or primary care physician) (e.g., Gibson, Shah, Mammon, 1998; Hunter, & Bryant, 1994), and individualized treatment plans (e.g., Kotses, Stout, McConnaughy, & Winder, 1996). In general, these studies have found that increased education and intervention can improve adherence to the medical regimen and improved long-term health in patients with asthma.

Asthma and Emotions

The role of emotion in the etiology and cause of asthma has been a complicated question, which still remains under investigation. In fact, the etiology of asthma was once viewed as being psychological in nature (Creer, 1982). Although this causal theory is now generally unsupported, psychological variables are considered to play a significant role in asthma in several ways. There is considerable evidence that, on average, individuals with asthma manifest more negative emotions than non-asthmatic individuals. However, this increased level of negative emotion may be the result of the asthma as much as it may cause asthma. It is also important to note that the presence of psychological difficulties poses significant problems in treating asthma, because psychological/emotional maladjustment has been associated with poor control and compliance (Miller, 1987; Badoux & Levy, 1994). For example, higher levels of anxiety may influence steroid usage regardless of pulmonary function (Priel, Heimer, Rabinowitz, & Hendler, 1994). In the following section, attention will be given to the role of emotions in asthma, focusing on past findings related to negative emotions as a cause or effect of asthma and hypothesized physiological pathways.

Many studies have found evidence for more negative emotions or psychopathology among individuals with asthma when compared to healthy individuals. Children with asthma have been found to show greater facial emotional expression than normal children during exposure to a psychological laboratory stressor (Marx, Zofel, Linden, Bonner, Franzen, & Florin, 1986). Content analysis of interviews conducted with children with asthma and healthy children suggested that children with asthma

demonstrate increased expression of direct and indirect hostility, increased helplessness, and decreased competence (Viney & Westbrook, 1985). Similarly, children with asthma demonstrated aggressive content similar to non-asthmatic children classified as aggressive (Beech & Nace, 1965). Hambley, Brazil, Furrow, and Chua (1989) found a higher rate of behavioral and school-related problems among children with asthma, as well as increased social competence problems in boys and lower self-esteem in girls. Greater maladjustment was found among a group of asthmatic children than a normal group, but not between children with asthma and a group of children with chronic cardiac disorder (Neuhaus, 1958). In adults, Knapp and Nemetz (1957) found a positive correlation between asthma severity and personality disturbance.

Global distress prevalence in college age students with asthma has been reported at up to 40% (Mullins et al., 1997). Compared to age-matched physically ill control subjects, adults with asthma demonstrated relatively higher anxiety and depression, more "inhibited hostility" and lower dominance, (Lyketsos, 1984). Badoux and Levy (1994) found that individuals with asthma scored significantly higher on a variety of psychological constructs including anxiety, depression and hostility. In fact, the presence of increased rates of depression have been repeatedly documented in asthmatic individuals (e.g., Lyketos, 1984; Mullins et al., 1997; Silverglade, Tosi, Wise & D'Costa, 1994; Viney & Westbrook, 1985). Prevalence rates of depression in asthma have been reported as high as 21% (Chaney et al., 1997) and 25% (Miller, 1987), significantly higher than rates observed in the general population.

Anxiety is also an important factor in asthma management (Lyketsos et al., 1984; Viney & Westbrook, 1985). Among hospitalized asthma patients, self-reported negative

emotions including panic, fear, and irritability have been positively related to asthma (e.g., Carr, Lehrer & Hochron, 1992; Dirks, Kinsman, Staudenmayer & Kleiger, 1979; Kinsman, Luparello, O'Banion, & Spector, 1973). Shanmugan and Kaliappan (1982) found individuals with asthma had higher levels of anxiety compared to healthy or ulcer patients, but lower than individuals considered "anxious neurotics." In a study with adult women, individuals with asthma were found to have higher neuroticism scores compared to healthy individuals, but neuroticism was not correlated to allergic reactivity (Dekker, Barendregt, & DeVries, 1961).

Notably, some studies have found the opposite pattern, in that individuals with asthma have less expression of negative emotion. Following a laboratory manipulation task, college students with asthma reported lower expression of anger than non-asthmatic students (Mathe & Knapp, 1971). Speech content analysis with the same subjects showed that asthmatic individuals expressed more "anger in" and non-asthmatics showed more "anger out." Hollander and Florin (1983) found that compared to healthy participants, participants with asthma demonstrated lowered frequency and reduced duration of emotional facial expression during a stress test. They also found a significant negative correlation between duration of expressed emotion and peak expiratory flow rate (PEFR) reduction following the stress task. These same researchers found no correlation between emotional expression and broncho-constriction, as measured by changes in forced expiration value (FEV_1) (Florin, Freudenberg, & Hollaender, 1985).

These conflicting findings suggest that the relationship between asthma and emotionality is not a direct one-to-one relation and is quite complex. However, as Lehreer, Isenberg, and Hochron (1993) point out, significantly more studies have found a

positive relationship between asthma and increased emotional problems. In addition, although methodologically sound, two of the three contrary findings come from the same laboratory (Florin, Freudenberg, & Hollaender, 1985; Hollander & Florin, 1983) and all three were written from a psychoanalytic perspective. Furthermore, two of the three papers were from a series of three studies, the most recent of which showed a positive association between asthma and emotionality. However, the studies cited above only demonstrate that increased emotional difficulties and asthma are related, and speak little to the direction of causality. Thus, there are unanswered questions regarding the findings of this body of work, and most researchers and clinicians conclude that there is a positive relation between asthma and emotional difficulties.

To help further elucidate the directional cause of asthma and negative emotion, researchers have sought to establish the temporal relationship between asthma episodes and stress. Although this does not ascertain causation per se, it can shed light on causal relationships. Field studies of asthma and emotionality have found a consistent relationship between the occurrence of negative emotions and asthma exacerbation (Lehrer et al, 1993). In a study of home self-monitoring, Steptoe and Holmes (1985), found an association between ratings of mood scales and PEFR's. Goreczny and colleagues (1988) have also found a positive relationship between asthma sufferer's self-reported symptoms and perceived impact of daily stressful events.

Findings which help clarify the directional relationship between asthma and emotions have examined non-asthma triggered emotional states and the onset of asthma symptoms. These studies provide evidence that, for at least some individuals with asthma, asthma symptoms are linked to the occurrence of stressors such as emotions. Indeed,

approximately half of asthma patients recognize and monitor emotional triggers such as laughing and crying (Renee & Creer, 1985). Kussak (1987) reported a case study of an individual with frequent nocturnal asthma attacks apparently triggered by nightmares. Weinstein (1984) found that 40% of a sample of 268 mothers of children with asthma reported an increase in their child's wheezing when the child was crying. Similarly, Graham (1977) found that 35% of parents of children with asthma indicated that some of the children's attacks were brought on by emotions, such as fear, anxiety, anger and excitement. Miklich and colleagues (Miklich, Chai, Purrel, Weiss, & Brady, 1974) found in a group of boys with asthma drops in PEFR during various emotional states. This association was with the emotional state per se, not just with the concomitant vocal and respiratory behaviors associated with them (e.g., shouting, laughing). Thus, it appears that the behavioral concomitants of the emotional state such as changes in breath rate due to emotion affect asthma, but in addition, the emotional state separate from the behavior may contribute unique changes in respiration.

Further evidence of emotions leading to asthmatic episodes is found in case studies described by Levitan (1985), in which asthma episodes occurred for six individuals during a period of mourning. Hyland (1990) found a positive correlation between mood ratings and evening (but not morning) PEFR's in six of ten participants with asthma. Therefore, various stressors encountered during the day which affected mood also exacerbated asthma symptoms. Contrary to the above, Northrup and Weiner (1984) found that rehospitalization for asthma was related only to the stress caused by asthma per se, not to the occurrence of other psychosocial stressors. However, this finding was with regard to rehospitalization of asthma patients. Thus, emotions may

represent an asthma trigger, but one not strong enough to require hospitalization. Nonetheless, a majority of studies do report an association between negative emotion and asthma symptoms.

Thus, it appears that for many individuals, asthma symptoms can be triggered or exacerbated by emotion, while in others, asthma may elicit a high frequency of negative emotions. Lehrer and colleagues (1993) present support for five different mechanisms through which asthma symptoms can be triggered by or exacerbated by emotions: 1) the effects of emotions on the autonomic nervous system and its effect on bronchoconstriction, 2) a predisposition among individuals with asthma to respond to stressors with bronchoconstriction, 3) specific effects of emotional facial expression on asthma, 4) the effects of hyperventilation on bronchoconstriction and 5) the effects of emotions on medication and health care utilization. In addition, these authors provide three proposed mechanisms by which asthma may effect emotional adjustment: 1) the general unpleasantness of having a chronic illness and its subsequent management represent long-term stressor, 2) possible effects of medications on emotions, and 3) the associated increased respiration may lead to hyperventilation and hence panic symptoms.

Summary

The effects of emotions and health has a rich history in psychology. Historically, psychologists have long recognized a link between emotions and health. Research has documented that the act of disclosing emotions, particularly negative or traumatic related emotions has beneficial effects on health. Particularly, a written emotional expression task has been developed over the past 15 years which has shown increased salutary

effects as measured by decreased health care utilization and improved immune functioning. However, this experimental writing task has mainly been studied in healthy individuals and only one published study to date has examined the effects of the writing task with individuals with a chronic medical condition. Smyth and colleagues (1999) found that the writing task resulted in improved lung functioning and disease state for individuals with asthma.

Asthma is a common chronic illness which has evidenced increased mortality, morbidity and health care costs over the past couple of decades. Asthma appears to increase the likelihood that one may experience psychological difficulties. In addition, psychological and emotional difficulties may be triggers to asthma attacks. Research examining the use of psychological interventions via psychotherapy has proven to be efficacious in reducing asthma symptoms. Therefore, interventions targeting emotional and cognitive components in individuals with asthma have proven to be helpful in reducing asthma symptoms, as well as increasing psychological health.

The current study was designed to assess the efficacy of the Pennebaker writing paradigm in a group of college students with asthma and extend the findings of Smyth and colleagues work with individuals with asthma.. Although Smyth and colleagues' work with individuals with asthma was pioneering in its effort to demonstrate the potential effects of Pennebaker's writing task with a chronically ill population, many of the typically measured variables in this area were not reported. Therefore the proposed study will explore a number of these variables in attempt to gain a better understanding of the effects of the writing task in individuals with asthma

First, this study will examine immediate and long-term changes in mood and lung functioning. Second, the study will examine the immediate relational pattern of mood and lung functioning which may help to elucidate the causal relation of these variables. Third, the present study will examine the relation of mood and lung functioning with essays ratings, in essence examining if the level of emotional expression is related to mood and lung functioning. Fourth, the effects on long-term health care utilization will be examined. Although Smyth and colleagues' (1999) study indicated clinical changes in disease state, they did not report if this resulted in any subsequent change in medical care use. If the writing paradigm does prove to be an effective intervention and reduce health care use, it would represent a simple treatment which can both increase physical health as well as decrease health care cost for individuals with asthma. Finally, the present study will examine long-term effects on adjustment as measured by college GPA.

Hypotheses

Immediate Pre-Post Test Hypotheses

1. Compared to participants in the control group, participants in the experimental group will rate their essays as more personal.
2. Compared to participants in the control group, participants in the experimental group will report higher immediate adverse physical responses as measured by peak expiratory flow rates (PEFRs).

3. Compared to participants in the control group, participants in the experimental group will report higher immediate adverse psychological responses as measured by self-report on the PANAS.
4. Control and experimental participants' immediate pre-post experiment PEFR differentials will be related to immediate pre-post experiment changes in mood ratings.
5. Participants' immediate pre-post experiment PEFR differentials will be related to post-experiment essay ratings. Specifically, those reporting more personal essay ratings will demonstrate the greatest changes in lung functioning as measured by PEFRs.
6. Participants' immediate pre-post experiment essay ratings will be related to immediate pre-post experiment mood ratings. Specifically, those reporting higher essay ratings will demonstrate the greatest increase in negative affect.

Long-Term Follow-Up Hypotheses

7. Experimental condition participants will not evidence adverse long-term mood ratings.
8. The experimental group, relative to the control group and controlling for baseline levels of disease, would show improvements in lung functioning as measured by long-term follow-up PEFRs
9. Compared to participants in the control group, participants in the experimental group will evidence better long-term physical health as

measured by objective records of the number of University health center visits.

10. Compared to participants in the control group, participants in the experimental group will not evidence significant changes in self-reported health-related behaviors.

11. After controlling for ACT / SAT scores, compared to participants in the control group, participants in the experimental group will evidence significantly higher GPAs.

CHAPTER III

METHOD

Overview

Participants were volunteers with asthma recruited from undergraduate psychology courses at a southwestern university in the Spring and Fall 1999 semesters. Participants were administered baseline questionnaires including demographic information, and measures of psychological and physical health. Participants were later randomly assigned to one of two writing conditions. Both groups were instructed to write in a specified manner for four 20-minute sessions over a course of two weeks. Condition 1 (experimental) participants were instructed to write about a traumatic event in their life, fully expressing the emotional content of the trauma. In Group 2 (control), participants were instructed to write about time management in an emotionally neutral manner. Immediately prior and following the writing period participants were given self-report measures of mood and a clinical measure of lung functioning. Approximately seven weeks later, participants were given follow-up questionnaires similar to baseline measures, as well as a clinical measure of lung functioning. At the end of the semester, participants' number of visits to the Student Health Center and grades for the semester were collected. See Appendix A for an outline of the methodology.

Study Population

Participants were recruited from undergraduate psychology classes at a southwestern university during the Spring and Fall 1999 semesters. Prior to enrollment in the study, potential participants completed a brief information sheet designed to determine if they met qualifications for inclusion (see "Screener Questionnaire" below or Appendix B). To be eligible for the study participants had to meet the following criteria: 1) be between the ages of 18 and 25, 2) had experienced their first asthma episode or were diagnosed with asthma prior to the age of 12, 3) currently receiving treatment for their asthma, 4) absence of other major chronic illnesses except allergies, 5) have the ability to write, and 6) have English as their primary language.

Incentives

Participants were offered an hour of extra credit for every hour or partial hour of participation to apply to their psychology course, resulting in a maximum of 7 hours of extra credit. In addition, all participants completing sessions 1, 5, and 6, were placed in lotteries for the opportunity to win monetary awards of $25-50. All participants completing the study were given a free peak flow meter.

Procedure

Recruitment of potential participants took place during the second and third weeks of the semester (for an outline of procedures see Appendix A). The Screener Questionnaire (SQ) was administered to all attending students to determine qualification

for inclusion in the study. To reduce the number of false reporters, individuals were not informed at recruitment time that the study was specifically seeking individuals with asthma.

Potential participants who met SQ criteria were contacted by telephone to insure that inclusion criteria were met. They were then further informed of the study, and if interested, scheduled for their first appointment. Participation involved coming to the laboratory for a total of six sessions spread across the semester: a baseline assessment session, four writing sessions occurring over two consecutive weeks (two sessions per week), and a follow up session. Sessions averaged under 60 minutes in length. Session 1 (baseline) occurred two weeks into the semester. Session 2 and 3 occurred approximately five weeks into the semester. Sessions 4 and 5 occurred in the following week. Session 6 occurred approximately seven weeks later. The number of writing sessions, duration of session and intersession spacing was determined by previous recommendations outlining optimal experimental conditions (Smyth, 1998). In order to control for idiosyncratic daily fluctuations in lung functioning and LAR, sessions were scheduled at approximately the same time of day with at least 24 hours spaced between each session. Participants were randomly assigned to groups upon attendance of the second session.

Session One

Upon arriving at the laboratory for session one, participants were asked to sign three informed consent forms and given copies of each form to keep. Consent Form A is a general consent form reviewing the overall study design (Appendix C). The second consent form, Consent Form B, is the standard Student Health Center "Request for

Release of Medical Records" form. The form allowed for release of the number of health center visits with indication of when the visit occurred and whether the visits were asthma related and if it was an emergency visit. The "Request of Release of Medical Records" form was later given to the Director of the Student Health Center , or an assistant of his choosing, with an attached summary form to report the participants use of the student health center during the semester. Consent Form C allowed for release of the participants' GPA for the semester.

Participants were instructed to complete a questionnaire battery including: Demographics Questionnaire, Health Care Utilization Questionnaire, Health Behavior Questionnaire, and PANAS - immediate and one month. Participants then made an appointment for the first writing session (session 2) which occurred during the fifth week of the semester.

Session Two

At Session 2 participants were escorted to a private writing room, allowed to rest briefly, and administered a pre- post-writing battery (PPWB). The PPWB was administered immediately prior and following each writing period. The PPWB consists of three consecutive PEFRs and the PANAS - immediate (see "Measures" section below for a detailed description of each instrument). Following the administration of the PPWB, the experimenter provided group specific instructions regarding the writing assignment (see below). Participants were provided a blank lined essay book to write in and a selection of pens and pencils.

General Instructional Script for All Participants –

This is extremely important study looking at writing. Over these first four days of the study, you will be asked to write about one of several different topics for 20 minutes during each session. The only rule that we have about your writing is that you write continuously for the entire 20 minutes. If you run out of things to say, just repeat what you have already written. In your writing, do not worry about grammar, spelling, or sentence structure - just write. Different people will be asked to write about different topics. Because of this, I ask that you not talk with anyone about the experiment. Because we are trying to make this a very controlled study, I can't tell you what other people are writing about or anything about the nature or predictions of the study. When you come back for the end of the experiment follow-up session, however, you will be told everything.

Another thing is that sometimes people may feel a little sad or depressed after writing. If that happens, it is completely normal. Most people say that these feelings go away in an hour or so. If at any time over the course of the experiment you feel upset or distressed, please contact one of the experimenters immediately. Further, if you start experiencing an increase or exacerbation of asthma symptoms and wish to stop the experiment please contact one of the experimenters immediately. If for any reason you feel you may require immediate medical attention please contact one of the experimenters and they will assist you in obtaining proper medical attention.

It is important that you know that your writing is completely confidential. The content of your writing will not be shared with your physician, instructor, or any other person not a member of the research team. Each essay booklet is coded with a participant number. We do NOT ask for your name on these booklets to help insure confidentiality. Upon completion of your essay we ask that you deposit your essay in the box provided. If you feel uncomfortable returning your essays you may choose not to, however, since this study is examining writing your essays are important to us and we would appreciate all essay which you are able to turn in.

Following your writing period. You will be asked to complete a few follow-up measures much like the ones you just completed.

Experimental Condition-Specific Instructions: Session Two –

What I would like for you to write about over the four days of the study is a negative or upsetting issue or event in your life that you find troubling. This could be any type of issue or event that has been bothersome to you, but it should be one that you are currently experiencing

or have recently experienced. In your writing, I want you to really let go and explore your deepest emotions and thoughts. You can write about the same experience on all four days or about different experiences each day. Whatever you choose to write, however, it is critical that you delve into your deepest emotions and thoughts related to the issue. Ideally, we would like you to write about significant current or recent negative or upsetting experiences that you have not discussed a great deal with others. Remember that you have four days to write. You might tie this personal experience to other parts of your life. For example, how is the issue or event related to your childhood, your parents, the people you love, who you are, or who you want to be? Again, try to examine your deepest emotions and thoughts when you write about the negative or upsetting issue or event.

Control Condition-Specific Instructions: Session Two –

What I would like for you to write about over the next four days is how you use your time. Each day, you will get different writing assignments on the way you spend your time. In your writing, I want you to be as objective as possible. I am not interested in your emotions or opinion related to how you spend your time. Feel free to be as detailed as possible, but I want you to try to be as objective as you can be. In today's writing, I want you to describe what you did yesterday from the time that you got up in the morning until the time that you went to bed. For example, you might start when your alarm went off and you got out of bed. You could include the things that you ate, where you went, or which building or objets you passed by as you walked from place to place. The most important thing in your writing, however, is for you to describe your day as accurately and objectively as possible.

All participants were instructed to open their essay books and write at this time. After 20 minutes of writing, participants were instructed to stop writing. Participants were then administered the PPWB. The experimenter gave reminder cards to participants with the time of their next session and a sheet including laboratory telephone numbers, so they may contact the experimenter in the event that they became upset or distressed following participation. This same follow-up protocol was conducted following each of the four separate writing sessions.

Sessions Three Through Five

During the three succeeding writing sessions participants were administered the PPWB before and after each writing period. Following completion of the pre-writing PPWB participants received condition-specific instructions.

Experimental Condition-Specific Instructions: Session Three

> Today, I want you to continue writing about a negative or upsetting issue or event that is troubling you. It could be the same topic that you wrote about in session two, or it could be something different. Today I really want you to explore your very deepest emotions and thoughts.

Experimental Condition-Specific Instructions: Session Four

> You have written now for two days. You only have today and one more day to finish your writing. As with the first two days, I want you to really explore your deepest emotions and thoughts about the troubling issue or event.

Experimental Condition-Specific Instructions: Session Five

> Today is your last day to write in the laboratory. In your writing today, I again want you to explore your deepest thoughts and feelings about your current or recent negative, upsetting event. Remember that this is the last day and so you might want to wrap everything up. For example, how is this experience related to your current life and your future? But feel free to go in any direction you feel most comfortable with and delve into your deepest emotions and thoughts.

Control Condition-Specific Instructions: Session Three

> Today, I would like you to describe what you have done today since you woke up. Again, I want you to be as objective as possible in describing exactly what you have done up until coming into this session.

Control Condition-Specific Instructions: Session Four

> Today I would like you to describe in detail what you will do as soon as the experiment is over until you go to bed tonight. For example, you might start by noting that you will walk out of the door, go down the stairs, walk to your car, and so forth. Remember, I want you to be as objective as possible in your description.

Control Condition-Specific Instructions: Session Five

> Today is your last day to write in the laboratory. In your writing today, I would like you to describe what you will be doing over the next week. Remember, I want you to be as objective as possible in your description.

Following the fifth session, a preliminary debriefing was conducted and the experimenter addressed questions or concerns that participants may have related to the study without revealing the exact nature of the study.

Session Six

Approximately six weeks following the fifth session, each participant was contacted by telephone and scheduled to come into the laboratory for a follow-up assessment. Upon arriving at the laboratory, participants were escorted to a room, allowed to rest and administered a PPWB. Participants completed a questionnaire battery including the Assessment of Illness Severity, Health Care Utilization Questionnaire, Physical Symptom Inventory, Health Behavior Questionnaire, PANAS - immediate and one-month prior, and Essay Evaluation Measure. The experimenter then fully debriefed participants about the purpose of the study. Participants were informed of which condition they participated in, as well as the nature of the alternate condition. Following debriefing, participants in the control group were offered participation in the

experimental task to insure that every participant had an equal opportunity for possible improvements in health and psychological well being. Only one participant was interested in enrollment in the experimental group, but upon phone follow-up the participant had changed her mind.

Participants' Student Health Center visits for the corresponding semester and GPA were collected upon conclusion of the semester, allowing for a total of 16 weeks of Student Health Center data and a complete GPA report.

Measures

Screener Questionnaire (SQ) – Potential participants completed a brief SQ (see Appendix B). The SQ includes information regarding age, gender, whether they have asthma, time of first asthma episode or age of diagnosis, if they are currently receiving treatment for asthma, presence of another chronic illness, and contact information. This measure was administered to undergraduate students enrolled in psychology courses to assess if they met inclusion criteria.

Demographics Questionnaire (DQ) – The DQ includes information regarding age, gender, ethnicity, education level, occupation, marital status, spouse's occupation, living arrangement, family income, and self-reported Scholastic Aptitude Score (SAT) or American College Testing score (ACT) (see Appendix D). The DQ was administered at baseline only.

Asthma Severity Assessment Interview (ASAI) – Asthma severity was assessed via the ASAI, a semi-structured interview (See Appendix E). This interview includes a series of questions designed to determine the asthma severity stage (i.e., mild, moderate, severe, or respiratory failure) of the individual (e.g., O'Hara, 1995). A subset of items were selected from the ASAI to match the guidelines published by the World Health Organization for diagnosing asthma severity. Subjects were then given a rank of "mild," "moderate" or "severe" based on the following symptoms: number of exacerbations in week, frequency of wheezing episodes, asthma symptom affect on activity level, work performance and sleep, exercise tolerance, and episodes of nighttime coughing. There are no known published psychometric properties regarding the ASAI. The ASAI was administered at baseline and follow-up.

Health Care Utilization Questionnaire - Asthma (HCUQ-A) – The HCUQ -A (see Appendix F) was designed for the present study to qualitatively and quantitatively assess health care use. The questionnaire includes information regarding prescription medication, current treatment status, asthma-related counseling, age at diagnosis, type of asthma (i.e., seasonal or perennial), health care utilization, self-assessment of control over asthma, and interference of asthma. The HCUQ -A was administered at baseline and follow-up.

Health Behavior Questionnaire (HBQ) – The HBQ (see Appendix G) was designed to assess potential changes in health behaviors such as diet, exercise, or smoking. Items for this scale were adapted from the multiple risk factor portion of the Lifestyle Appraisal Questionnaire (LAQ), an instrument developed to assess multiple

health risks and stress (Craig, Hancock, & Craig, 1996). These risk factor items were modified for the present study to create an instrument sensitive to changes in health behaviors. Respondents answer 13 health behavior items along scales of frequency (e.g., "How often do you exercise or go for a walk?"). Individual items from the HBQ were analyzed as well as a sum composite score of all 13 items. The HBQ was administered at baseline and follow-up. As expected interitem correlations for this measure are low (baseline $\alpha = .43$) reflective of the variety of health behaviors measured by this instrument.

Positive and Negative Affect Schedule (PANAS) – (Watson, Clark, & Tellegen, 1988). The PANAS is designed to be a brief self-report measure of mood. The PANAS consists of 20 mood descriptors (e.g., excited, active, hostile). Respondents rate on a 5-point Likert scale ranging from 1 (very slightly or not at all) to 5 (extremely) the extent to which they experienced each mood at a specified point in time (e.g., at this present moment, during the past month). Ten of the items assess negative affect and 10 items assess positive affect. Summed scores for each set of 10 items yields positive affect (PA) and negative affect (NA) subscores. The PANAS has been found to have sufficient internal consistency based on the time instructions (Watson, Clark, & Tellegen, 1988) with alpha coefficients ranging from .86 to .90 for the PA subscale, and from .84 to .87 for the NA subscale. The PANAS shows significant test-retest stability for both subscales, which tends to increase as the rated time length increases.

Two forms of the PANAS were used in the current study. Prior to and following the essay writing on each of the four writing sessions, participants completed an

"immediate" version assessing their mood at the present moment (see Appendix H). During the baseline and follow-up assessment sessions, participants completed "immediate" versions as well as "past month" versions assessing their mood during the past month (see Appendix I).

For the current study, alpha coefficients for baseline measures of "immediate" (PA α = .86, NA α = .89) and "past month"(PA α = .88, NA α = .87) positive and negative affect scales were consistent with previous findings.

Essay Evaluation Measure (EEM) – (Pennebaker & Beall, 1986). The 6 item EEM asks participants to rate on a seven-point Likert scale (ranging from 1 = not at all, to 7 = a great deal or extremely) how personal and emotionally revealing they considered their essay to be, and the degree to which they had previously told others about the events or topics contained in their essays. This measure (see Appendix J) has been directly adapted from Pennebaker's protocol (M. McLaughlin, personal communication, August, 1998). The EEM was administered at follow-up assessment only. For the present study, inter-item correlation revealed acceptable internal consistency (α = .84).

Apparatus

Peak Expiratory Flow Meter (PEFM) – The PEFM is a simple and portable device which measures the peak expiratory flow rate (PEFR) that occurs during the first few hundred milliliters of volume expired of a full lung forcible exhale (National Institutes of Health, 1992). The PEFMs utilized were the *Personal Best full range peak flow meter*

(60-810 L/min), Model number 755, by HealthSCAN Products Inc. Cedar Grove, New Jersey.

PEFR readings were recorded to the nearest ten L/min. All PEFR data points consist of three readings utilizing the highest PEFR as the observed PEFR for that data point. Utilizing both the National Asthma Education and Prevention Program (1995) recommendations and Nunn and Gregg's (1989) predicted average peak expiratory flow charts based on age, height and gender, participants asthma severity were calculated (PEFR Severity) to match World Health Organization rating system of asthma severity (i.e., mild, moderate, severe).

CHAPTER IV

RESULTS

The results section has been divided into the four major parts: examination of attrition rate, demographic characteristics of the sample, preliminary analyses, and analyses of the major hypotheses. Overall, this study examined six general classes of dependent variables: essays ratings, mood, lung functioning, health care utilization, health behavior and school grades. Eleven separate hypotheses were proposed regarding the effects of the experimental task on these different classes of dependent variables; they can be divided into short- and long-term hypotheses. Short-term hypotheses generally were examinations of immediate changes during the writing sessions. These set of analyses focused on group differences on essay ratings, mood, lung functioning and the interrelationship of these variables. Long-term hypotheses evaluated the follow-up assessment results and potential long-term effects of the experiment. Of major interest here were long-term group differences in mood, health care utilization, health behaviors, and grades. For ease of reading and quick identification of the specific hypothesis and subsequent analyses, hypotheses will be stated in italics prior to each analyses.

Attrition

Of the 1192 individuals who completed the Screener Questionnaire, 65 met eligibility criteria and expressed interest in the study. Fifty-nine individuals completed the first session and scheduled for session two. Fifty-five individuals attended session 2, and were subsequently randomized into one of two conditions. Forty-four participants completed all six sessions. For a summary of attrition for the total sample and by data collection wave see Table 1. Demographic information is provided on the final sample size only.

Table 1

Number of Individuals at Stages of Study by Total Sample and Data Collection Wave

Stage of Study	Total N	Spring 99	Fall 99
Screening questionnaires	1192	431	761
Contacted to confirm eligibility	148	76	72
Met criteria and agreed to participate	65	37	28
Completed first session	59	36	23
Attended session two, point of randomization	55	33	22
Completed all 6 sessions	44	27	17

Demographic Characteristics

Forty-four undergraduate students with asthma completed the study. Forty-five percent of participants were male with a mean age of 19.4 years (SD = 1.2 years). Fifty-

five percent of the students were freshman. The majority of the participants were Caucasian (91%). Sixty-eight percent of the participants still lived with their parents on at least a part time basis. A mean annual family income of $48,000 was reported. Ninety-one percent of the participants stated they were aware of their physicians rating of asthma severity. Of these participants, forty-seven percent reported a mild level of asthma, forty-three percent reported a moderate level, and ten percent reported having a severe level of asthma. For a summary of demographic characteristics, for the entire sample and by condition see Table 2.

Table 2

Demographic, Baseline Illness Severity and Health Behaviors by Total Sample and Condition

Characteristic	Overall Sample		Experimental		Control	
Number of Participants	44	(100%)	21	(48%)	23	(52%)
Fall Semester	17	(34)	8	(39)	9	(39)
Spring Semester	27	(61)	13	(62)	14	(61)
Age	19.4	(1.2)	19.3	(1.2)	19.4	(2.3)
Female	24	(55)	10	(48)	14	(61)
Ethnicity						
Caucasian	40	(91)	20	(95)	20	(87)
African-American	1	(2)			1	(4)
Native American	2	(5)			2	(9)
Hispanic	1	(2)	1	(5)		
Live with Parents	30	(68)	15	(71)	15	(65)
Single	44	(100)				
Have Children	2	(5)			2	(9)
Grade						
Freshman	24	(55)	12	(57)	12	(52)
Sophomore	10	(23)	3	(14)	7	(30)
Junior	9	(21)	5	(24)	4	(17)
Senior	1	(2)	1	(5)		
Family Income	48,000	(2,200)	51,000	(1,800)	46,000	(2,100)
Father's Education, in years	15.1	(2.3)	15.5	(2.0)	14.7	(2.6)
Mother's Education	14.8	(2.2)	15.0	(1.9)	14.5	(2.4)
Physician Rated Illness Severity	40	(91)	16	(76)	19	(83)

Table 2 – Continued

Characteristic	Overall Sample		Experimental		Control	
Mild	19	(43)	9	(43)	10	(44)
Moderate	17	(39)	8	(38)	9	(39)
Severe	4	(9)	2	(10)	2	(9)
PEFR Based Illness Severity						
Mild	29	(66)	16	(76)	13	(57)
Moderate	12	(27)	3	(14)	9	(39)
Severe	3	(7)	2	(10)	1	(4)
AIS Based Illness Severity						
Mild	14	(32)	6	(29)	8	(35)
Moderate	30	(68)	15	(71)	15	(65)
Severe						
Regular Exercise (3 x week or more)	25	(57)	12	(57)	11	(57)
Smoke (1 x week or more)	9	(20)	5	(24)	4	(17)

Note: Number of participants or mean is presented with percentage of sample or standard deviation in parentheses.

Preliminary Analyses

Baseline Comparisons

To examine potential between-group differences, preliminary analyses were conducted on demographic characteristics and baseline measures of major dependent variables. In addition, characteristics measured in previous studies that could be potential contaminants in the analyses were assessed (e.g., Smyth et al. 1999). First, a Pearson's Chi-square was conducted between condition (experimental versus control) and data collection wave (Spring versus Fall Semester) to assess if the two data collection waves were equivalent with regards to the number of participant in each condition; no significant between group differences were found (χ^2 [1, 44] = .005, $p > .2$).

Next, a series of Pearson's Chi-squares and 2 x 2 (Condition x Semester) General Factorial ANOVAs were conducted to compare the two groups on demographic variables (age, gender, ethnicity, grade level, marital status, family income, father's and mother's education level), health behaviors (composite health behavior score, smoking and exercise), academic performance (ACT/SAT), psychological measures (immediate and past month positive and negative affect) and illness severity (number of exacerbations per week, baseline peak expiratory flow rate [PEFR], PEFR based rating of illness severity, physician rating, asthma symptom based illness severity). Control and experimental groups did not differ on any of these measures ($p > .05$). Thus, it was safe to assume the two conditions were similar with regards to baseline measures and demographic characteristics. Only one significant difference was found for the semester analyses. Although not of concern for subsequent analyses, a significant difference was found for the physician severity and semester analyses. Closer examination indicated that four participants from the Fall data collection reported a "severe" level of asthma, whereas no participants from the Spring group reported this severity level.

Power Analyses

Power analyses were conducted to see if the collected sample was adequate in size. A recent meta-analysis suggested that the effect size for the writing task with healthy individuals was $d = 0.47$ (Smyth, 1998). However, Smyth (Smyth et al., 1999) suggested a stronger effect size, $d = 0.68$, for his work with FEV_1 and individuals with asthma. For a conservative estimate the current sample size was reduced by three to reflect the smaller number of participants in the experimental group ($n = 21$). Utilizing a total sample of 42,

$\alpha = .05$, a two group One-way ANOVA power analysis was conducted. Entering either effect size resulted in adequate power ($d = .47$, power = .86; $d = .68$, $p = .99$). Thus it appears that the current sample size results in sufficient power to conduct analyses.

Primary Analyses

Immediate Pre-Post Test Analyses

Hypothesis One – Compared to Participants in the Control Group, Participants in the Experimental Group Will Rate Their Essays as More Personal.

To address hypothesis 1, a between-subjects General Factorial ANOVA was conducted examining the Essay Evaluation Measure composite score. This test was found to be significant ($F(1,41) = 44.01$, $p < .001$) and a subsequent between-groups General Factorial MANOVA was conducted on individual items of the Essay Evaluation Measure. The omnibus F-test for the MANOVA was found to be significant ($F(6,37) = 9.18$, $p < .001$) as well as all individual main effects (F range = 4.59 - 42.39, p range < .05 - .001). For a summary of these results see Table 3.

Participants in the experimental condition rated their essays as more personal than participants in the control condition on every item measured This analysis was primarily meant to be a validity check of the experiment's instructional set and to see whether participants complied with instructions. Given the significant results it is assumed that in general, participants did follow directions and that experimental condition participants wrote about more personal and emotionally-based topics than control participants.

Table 3

Between-Subjects Multiple Analysis of Variance

For Essay Evaluation Items

Variable	F	p
1. How personal was the topic?	23.77	.000
2. Prior to study, amount talked about topic with others?	4.59	.038
3. How much did you include your emotions?	22.29	.000
4. How difficult was it to write about?	9.16	.004
5. Since the study, how much have you thought about topic?	37.59	.000
6. Before the study, how much did you think about the topic?	42.39	.000

Note: for all items df = 1.

Hypothesis Two – Compared to Participants in the Control Group, Participants in the Experimental Group Will Report Higher Immediate Adverse Physical Responses as Measured by Peak Expiratory Flow Rate (PEFR).

To address hypothesis 2, a 4 x 2 x 2 (Session x pre-post x condition) between-within subjects repeated measures ANOVA was conducted for PEFRs assessed during the writing sessions. All main effect and interaction tests were found to be non-significant ($p > .05$). The pre-post main effect approached significance ($F(1, 42) = 3.15$, $p = .08$) and subsequent post-hoc analyses were conducted to examine possible data trends (see Table 4). Two separate 4 x 2 (session x pre-post) between-subjects repeated measures ANOVAs were conducted for each condition. For the experimental condition, a significant main effect was found for the pre-post factor ($F(1, 20) = 5.21$, $p < .05$). However, all interaction and main effects tests were found to be non-significant for the control

condition ($p > .1$). Thus, although not found in the between-groups ANOVA, separate with-in group analyses showed that the experimental condition did have a significant pre-post experiment change in their PEFRs while control subjects did not. In addition, it is noted from preliminary analyses of between group differences, that the two conditions did not significantly differ on baseline PEFRs. Therefore, the observed difference cannot be explained merely by differences in initial PEFR readings. Examination of the pre-post between group mean PEFRs revealed that participants in the experimental condition had a larger reduction in PEFRs from pre-post than did participants in the control. It is noted that participants in the experimental condition started at a higher pre-experiment PEFR, however, even after a drop in PEFRs they still did not reach a reading as low as participants in the control condition.

Table 4

Pre-Post Experiment PEFR Mean and Standard Deviation

By Total Sample and Condition

	Pre		Post	
Group	M	SD	M	SD
Overall Sample	439.43	103.68	435.34	106.81
Experiment	447.62	111.26	440.12	108.52
Control	431.96	98.16	430.98	107.48

Hypothesis Three – Compared to Participants in the Control Group, Participants in the Experimental Group Will Report Higher Immediate Adverse Psychological Responses as Measured by Self-Report on the PANAS.

To address hypothesis 3, two separate 4 x 2 x 2 (session x pre-post x condition) between-within subjects repeated measures ANCOVAs were conducted on immediate PANAS positive and negative affect scores, covarying out corresponding baseline scores (i.e., session 1 PANAS PA or NA). For both the positive and negative affect ANCOVAs, no main effects were found to be significant, however, significant interaction terms were found for both pre-post by condition interactions (positive: $F(1, 41) = 5.45$, $p < .05$; negative: $F(1, 41) = 30.61$, $p < .001$). Thus, pre- and post-writing immediate affective ratings significantly differed according to condition. For positive affect, examination of the means and corresponding graph indicates that participants in the control condition had lower pre-writing positive affect scores and had a small decrease upon post-experiment. The experimental group had much higher pre-writing positive affect scores with much larger reduction on post-writing scores, yet still above scores observed for the control group (see Figure 1). For negative affect, a disordinal interaction was observed. Participants in the control condition had slightly higher pre-writing negative affect scores than the experimental group with a small decrease in negative affect on post-writing scores. Participants in the experimental group had a very large increase in negative affect post-writing scores (see Figure 1).

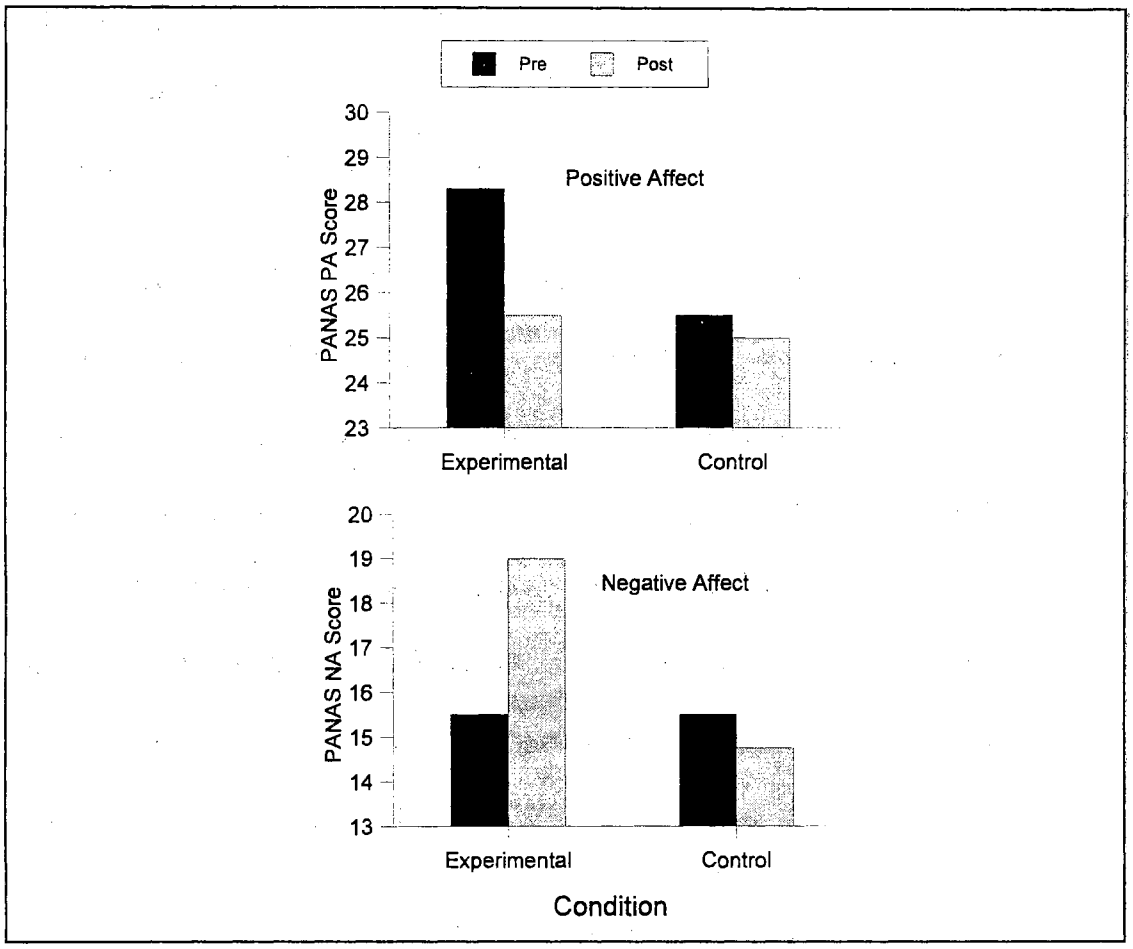

Figure 1. ANCOVA Pre- and Post-Writing Means for PANAS Positive and Negative Affect Scores for Each Condition, Controlling for Respective Baseline Measures. There is a significant interaction for pre-post by group for both positive and negative affect.

Post-hoc analyses were conducted to examine possible differences in between condition changes. Four separate between-subjects repeated measures ANCOVAs examining pre-post PANAS positive and negative affect scores, covarying session 1 scores, were conducted for each condition. Results for all four tests were non-significant. Thus, it appears that the significant findings are best explained by the significant pre-post by condition interaction tests.

Hypothesis Four – Control and Experimental Participants' Immediate Pre-Post Experiment PEFR Differentials Will Be Related to Immediate Pre-Post Experiment Changes in Mood Ratings.

To address hypothesis 4, PEFR and PANAS positive and negative affect change scores were computed and a series of Zero-order Pearson Product Moment Correlations were conducted. Of the eight comparisons, two tests were significant. A significant relationship was found between changes in PEFR and changes in positive affect for session 4 ($r = .34$, $p < .05$), and between changes in PEFR and changes in negative affect for session 5 ($r = -36$, $p < .05$). Thus, for session 4, improvement in pre- to post-writing PEFRs was associated with an increase in positive affect. For session 5, improvement in pre to post PEFRs was associated with a decrease in negative affect.

Hypothesis Five – Participants' Immediate Pre-Post Experiment PEFR Differentials Will Be Related to Post-experiment Essay Ratings. Specifically, Those Reporting More Personal Essay Ratings Will Demonstrate the Greatest Changes in Lung Functioning as Measured by PEFRs.

To address hypothesis 5, Zero-order Pearson Product Moment Correlations were conducted on pre-post PEFR changes per session and essay ratings. Only session 4 was found to be significantly related to essay evaluation sum scores ($r = .32$, $p < .05$). Post-hoc analyses to examine individual essay evaluation items were conducted. A significant test for session 4 was found on essay questions assessing how personal the essays were

($r = .36$, $p < .05$) and to what degree they had thought about the topic before the experiment ($r = .39$, $p < .05$).

Thus, for three of the four overall correlations, there were no significant relationships between changes in PEFR and essay ratings. However, on session 4, the second to last writing session, a significant relationship was found, revealing that participants who rated their essays as more personal and had thought more about the topic prior to the experiment evidenced increased lung function from pre- to post-experiment.

Hypothesis Six – Participants' Immediate Pre-post Experiment Essay Ratings Will Be Related to Immediate Pre-post Experiment Mood Ratings. Specifically, Those Reporting Higher Essay Ratings Will Demonstrate the Greatest Increase in Negative Affect.

To address hypothesis 6, Zero-order Pearson Product Moment Correlations were conducted on pre-post PANAS positive and negative affect changes per session and essay ratings. Essay Evaluation Sum Scores were found to be significantly related to positive affect differential scores for session two only ($r = .40$, $p < .01$), with a decrease in positive affect being associated with higher essay ratings. Post-hoc analyses to examine individual essay evaluation items revealed that session 2 positive affect scores were significantly related to essay ratings of how difficult it had been to write about the topic ($r = .45$, $p < .01$) and how much they had thought about the topic since the writing task ($r = .47$, $p < .01$) (see Table 5).

Negative affect changes were related to Essay Evaluations Sum Scores for session two ($r = -.57$, $p < .001$), three ($r = -.52$, $p < .001$) and four ($r = -.43$, $p < .01$). Post-hoc

Table 5

Correlations Between Pre-Post Differences in Positive and Negative Affect for Writings Sessions' "Immediate" and Long-Term Follow-Up "Past Month" and Essay Evaluation Measure Scores

	ESSAY EVALUATION MEASURE						
PANAS	Sum	EEM 1	EEM 2	EEM 3	EEM 4	EEM 5	EEM 6
I. Positive							
Session 2	.40**	.25	.12	.25	.45**	.47**	.30
Session 3	.20	.13	.23	.17	.08	.18	.13
Session 4	.24	.24	.11	.27	.11	.23	.14
Session 5	-.03	-.00	.19	-.03	-.29	-.13	.06
I. Negative							
Session 2	-.57**	-.41**	-.21	-.38*	-.44**	-.53***	-.55***
Session 3	-.60**	-.38*	-.28	-.42**	-.30	-.42**	-.45***
Session 4	-.43**	-.23	-.15	-.26	-.36*	-.34***	-.56**
Session 5	-.15	-.16	-.14	-.00	.12	.08	-.34*
Past month							
Positive	.37*	.34*	.35*	.28	.26	.29	.24
Negative	.14	.06	-.13	.06	.25	.36*	.04

Note: "Sum" is the EEM composite score, "EEM1" = "How personal was the topic?"; "EEM2" = "Prior to study, amount talked about topic with others?"; "EEM3" = "How much did you include your emotions?"; "EEM4" = "How difficult was it to write about?"; "EEM5" = "Since the study, how much have you thought about topic?"; "EEM6" = "Before the study, how much did you think about the topic?" "I. Positive" is the Immediate Positive Affect Score, "I. Negative" is the Immediate Negative Affect Score.
* $p < .05$ ** $p < .01$ *** $p < .001$

analyses to examine individual essay evaluation items revealed 14 of the 24 tests were significant, with none of the tests being significant for how much they had talked about the topic prior to writing; but all of the significant sessions were associated with how

much they have thought about the essay since the last writing session (see Table 5). For the significant findings, higher essay ratings were associated with increasing negative affect. In sum, for significant test of immediate pre- to post-session ratings of affect, more personal essays were associated with increases in negative affect and decreases in positive affect.

To examine potential long-term effects on mood, follow-up PANAS past month scores were examined in relation to essay sum scores. Positive but not negative affect for the past month was found to be significantly related to the composite essay summary score ($r = .37$, $p < .05$). Analysis of individual items revealed that significant relationships existed between session 6 past month positive affect scores and essay ratings of how personal ($r = .34$, $p < .05$) and how much they had talked about the topic with others prior to the study ($r = .35$, $p < .05$). The direction of the correlations indicated that higher levels of positive affect at follow-up were associated with more "personal" essays.

Thus, personal essay were strongly associated with increase in immediate negative affect and slight decrease in positive affect. However, at long-term follow-up more personal essays were associated with higher levels of positive affect, but not shown to be related to negative affect.

Long-Term Follow-Up Analyses

Hypothesis Seven – Experimental Condition Participants Will Not Evidence Adverse Long-term Mood Ratings.

To address hypothesis 7, two separate 2 x 2 (pre-post x condition) between-within subjects repeated measures ANOVAs were conducted, comparing session 1 and session 6 "past month" PANAS negative and positive affect scores. The negative affect test was found to be non-significant for both main effects and the interaction terms ($p > .05$). For positive affect, the main effect tests were non-significant ($p > .05$), however, the pre-post by condition interaction test was significant (F (1, 42) = 4.37, $p < .05$). Thus, experimental and control participants significantly differed in past month ratings of positive affect from pre-experiment to post-experiment. Examination of the means revealed that for the experimental condition, pre- to post-experiment positive affect scores slightly increased. Whereas, the control group's pre- to post-experiment positive affect scores decreased more. In other words, the participants in the control condition generally reported a decrease in positive affect and participants in the experimental condition reported an increase in positive affect (see Table 6).

Post-hoc analyses were conducted to examine possible differences in between condition changes. Two separate within-subjects repeated measures ANOVAs examining pre-post PANAS positive affect scores, were conducted for each condition. Results for the experimental condition were found to be non-significant ($p > .1$). Results for the control condition were found to be significant (F [1, 22] = 4.27, $p < .05$). Thus, the observed significant pre-post by condition interaction might be explained by a significant decrease in positive affect in the control condition.

Table 6

Pre-Post Experiment PEFR Mean and Standard Deviation by Total Sample and Condition

	Pre		Post	
	M	SD	M	SD
Positive Affect				
Overall Sample	34.76	6.84	33.64	8.29
Experiment	34.00	7.58	35.33	8.11
Control	35.52	6.17	32.09	8.32
Negative Affect				
Overall Sample	24.77	7.85	22.80	7.17
Experiment	26.43	6.82	23.52	5.75
Control	23.26	8.56	22.13	8.33

Hypothesis Eight – The Experimental Group, Relative to the Control Group and Controlling for Baseline Levels of Disease, Would Show Improvements in Lung Functioning as Measured by Long-Term Follow-Up PEFRs.

To address hypothesis 8, a 2 x 2 (pre-post x condition) between-within repeated measures ANOVAs were conducted comparing baseline (Session 2 pre-writing) and 7-weeks follow-up PEFRs. Analyses indicated non-significant results for both the main effect (pre-post: $F [1, 42] = .12$, $p = .73$) and interaction test (pre-post x group: $F [1, 42] = .01$, $p = .94$). Thus, contrary to hypothesis there were no between group differences in long-term PEFR measures.

Hypothesis Nine – Compared to Participants in the Control Group, Participants in the Experimental Group Will Evidence Better Long-Term Physical Health as Measured by Objective Records of the Number of University Health Center Visits.

The number of health center visits for illness were tabulated by the student health center over two time periods: from the beginning of the school year until the beginning of the study (covering a 5-week interval) and from the beginning of the first writing session until the follow-up assessment period (a 7-week interval). As conducted in previous studies, the number of health center visits were adjusted to reflect visits per week (cf. Pennebaker et al., 1988), and subjected to a 2 x 2 (pre-post x condition) between-within subject repeated measures ANOVA. Main effects were found to be statistically non-significant, however, the interaction term for pre-post by condition was found to be significant (F (1, 42) = 4.23, $p < .05$). Thus, the pattern of health center visits differences for participants in the two conditions significantly varied from pre- to post-experiment. Examination of the graph and means revealed a disordinal interaction where participants from the experimental group had a slight decrease in health center visits and control group participants had an increase in visits (see Figure 2).

Post-hoc analyses were conducted to examine possible differences in between condition changes. Two separate within-subjects repeated measures ANOVAs examining pre-post PANAS positive affect scores, were conducted for each condition. Results for the experimental condition were found to be non-significant ($p > .1$). Results for the control condition were found to be significant (F [1, 22] = 7.21, $p < .05$). Thus, the

observed significant pre-post by condition interaction might be explained by a significant increase in health center visits in the control condition.

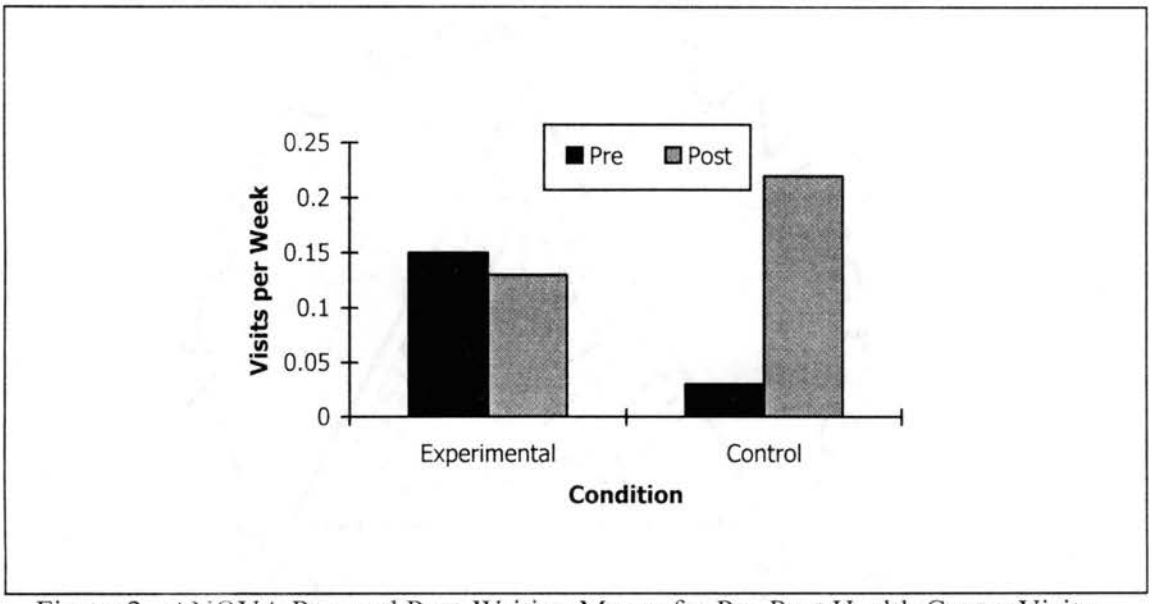

Figure 2. ANOVA Pre- and Post-Writing Means for Pre-Post Health Center Visits per Week. There is a significant interaction for the pre-post by group test. Post-hoc analyses demonstrate a significant change in the control group, but not the experimental group.

Hypothesis Ten – Compared to Participants in the Control Group, Participants in the Experimental Group Will Not Evidence Significant Changes in Self-reported Health-related Behaviors.

To address hypothesis 10, a 2 x 2 (pre-post x condition) repeated measures ANOVA examining session 1 versus session 6 health behavior sum score was conducted.

This test was found to be significant for the pre-post main effect only (F [1, 37] = 8.77, p <.01). Thus, health behavior did not differ by group, but rather the entire sample had a change in health behaviors. To ascertain which specific behaviors changed from baseline to follow-up a 2 x 2 (pre-post x condition) repeated measure MANOVA examining the individual items on the Health Behavior Questionnaire was conducted. Of the thirteen items, it was found that pre-post main effects were significant for smoking (F [1, 42] = 13.63, $p < .001$), use of other drugs and medications (F [1, 41] = 10.49, $p < .01$) and use of relaxation (F [1, 42] = 9.81, $p < .01$). Examining pre-post means for each item it was found at follow-up that participants smoked more, reduced the use of non-asthma medications and reduced the use of relaxation exercises.

Hypothesis Eleven – After Controlling for ACT / SAT scores, Compared to Participants in the Control Group, Participants in the Experimental Group Will Evidence Significantly Higher GPAs.

To address hypothesis 11, a between-group general factorial ANCOVA was conducted on end of the semester grade point average, covarying ACT/SAT scores. No significant differences were found between the two conditions on their grade point average ($p > .05$). However, examination of the mean showed that the experimental condition (M = 3.14, SD = .63) had a GPA .23 points higher than the control condition (M = 2.91, SD = .93), despite preliminary analyses demonstrating no between condition differences on ACT / SAT scores.

CHAPTER V

DISCUSSION

Overview

A growing body of research supports the idea that expression of thoughts and feelings about upsetting events is generally beneficial to physical and psychological health. A brief but apparently powerful written emotional expression task has been developed by Pennebaker (e.g., Pennebaker & Beall, 1986) which has been the focus of a large number of experiments. However, most of these studies have been conducted with healthy individuals. To date, there is only one published study that examined the effects of Pennebaker's writing task with individuals with a medical condition, that of asthma or rheumatoid arthritis (Smyth et al., 1999).

The current study was an extension of this literature; it was designed to examine the immediate and long-term affects of written emotional expression on the physical and psychological health of individuals diagnosed with asthma. Specifically, between group differences were examined for short- and long-term differences in mood and lung functioning and the interrelation of these variables with essay evaluations. Additionally, long- term effects were examined for differences in health center visits, health behaviors and grade point average.

The discussion section is divided into three sections. First, the results of the study will be discussed in relation to previous research. Next, the limitations of the study will be discussed, followed by concluding statements.

Discussion of Specific Hypotheses

Hypothesis one was essentially proposed as a manipulation check for the effectiveness of the experimental task. As predicted, individuals in the experimental condition rated their writing topics as more personal and emotional across all indices. These findings are consistent with previous research on written disclosure demonstrating that participants generally adhere to the writing instructions (e.g., Pennebaker & Beall, 1986; Greenberg & Stone, 1992). As with previous studies, it appears that the participants engaged in their assigned writing task as instructed and wrote about emotionally upsetting events, disclosing personal and emotionally difficult topics, while the control group generally reserved emotional expression and disclosed only objective information.

In the present study, significant changes in mood were observed in both short- and long-term assessment. Past research regarding the writing task and short- and long-term effects on mood have been mixed (e.g., Francis & Pennebaker, 1992; Pennebaker et al. 1988). However, the majority of studies have found an increase in negative mood immediately following the writing task (Cameron & Nicholls 1998; Greenberg & Stone 1992; Pennebaker et al., 1988). Consistent with these findings, the present study found that measures of immediate post-test mood reflected worsened mood. It was found that the two groups both had a decrease in positive affect, with a much larger decrease for those in the experimental condition. With regard to negative mood, a significant

interaction was found, with the control participants demonstrating a decrease in negative affect and the experimental group showing an increase in negative affect.

Taken together, it would appear that the experimental group experienced a general worsening of mood, with a decrease in positive affect and an increase in negative affect. The control group appeared to have decrease in both positive and negative affect. This later finding may be a product of the control group instructional set to not express emotions during the writing task, which resulted in an overall decrease in emotional expression, even on post-writing assessment of mood. However, these results need to be interpreted in light of post-hoc analyses showing that there were no main effects for mood when the two groups were separated. Thus, participants' mood changes must be interpreted with respect of the between group differences rather than independent group changes in mood.

As hypothesized, participants in the experimental condition did not report adverse long-term mood effects at the follow-up assessment. Analyses showed no significant differences from baseline to follow-up on negative affect ratings for the past month. For pre- to post- long-term follow-up ratings of positive affect, results showed a slight decrease in positive affect for control participants and an increase in positive affect for experimental participants.

Past studies in the area have typically reported only long-term effects on negative affect, ignoring positive affect ratings. The present results demonstrating no significant changes in negative affect are similar to findings reported by Greenberg and Stone (1992). In addition, similar to our findings for long- term differences in positive affect

changes, Pennebaker and colleagues (1988) found experimental condition participants to be significantly happier than control condition participants at three month follow-up.

Given the immediate and long-term differences in affect ratings for the present study, it appears that participants in the experimental condition may psychologically benefit from the disclosure task on a long- term basis. At short- term assessment, control condition participants showed a slight decrease in positive and negative affect, whereas experimental participants showed a large decrease in positive affect and an increase in negative affect. However, at long- term follow-up control condition participants showed a decrease in positive affect and experimental condition participants showed an increase in positive affect. Thus for the experimental participants, although psychologically distressing in the moment, the writing task may result in an increase in positive affect at long- term assessment.

Given literature indicating mood related changes in lung functioning, (e.g., Goreczny et al., 1988; Hyland, 1990; Lehrer et al., 1993; Steptoe & Holmes, 1985; Weinstein, 1984), it was believed that the writing task could potentially affect immediate measures of lung functioning. It is known that some individuals with asthma have exacerbation in asthma symptoms when they experience strong emotions, such as crying. However, there is a lack of experimental research demonstrating this effect in the laboratory. Further, given Smyth and colleagues' (1999) findings that the writing task resulted in changes in long-term lung functioning, the current study hoped to reveal potential short-term changes in lung functioning. It was hypothesized that the writing task might serve as a trigger for emotionally induced asthma changes, and thus changes in PEFRs from pre- to post-writing for individuals in the experimental condition.

Assessment of pre- to post-writing PEFR changes for between condition differences were non-significant for the overall analyses. However, post-hoc analyses examining the conditions separately revealed significant pre- to post-writing PEFR changes for the experimental condition, but not for the control condition. Caution is taken in interpreting these post-hoc analyses since the overall analyses were not significant. Given the significant findings on the separate experimental group ANOVA, a possible interpretation of these results is that the experimental group did experience changes in lung functioning. However, these changes were not large enough in magnitude to differentiate it from the control group. To gain a better understanding of this experiment and its potential utility, future research might target ways to increase the differences between the groups.

Despite the lack of strong positive results on PEFRs, a number of important observations can be made. First, the experiment did not result in such drastic decreases in lung function that the experiment would be counterintuitive for individuals with asthma. Prior to Smyth and colleagues' (1999) study, there was concern that the experiment could result in asthma attacks for individuals who experienced emotionally-induced asthma symptoms. Fortunately, although a change in pre- to post-writing lung functioning was witnessed in the experimental group, the change was not drastic enough to disrupt participants or result in significant symptom exacerbation. Therefore, it appears that in general this task is safe to administer to individuals with mild to moderate asthma.

Given that only a sub-population of asthma sufferers report emotionally-induced asthma symptoms, it is interesting that the overall experimental condition did show short-term changes in lung functioning. Given the small number of individuals who experience

emotionally-induced asthma exacerbations, an alternative hypothesis is that any experiment relying on manipulating emotions to effect lung-functioning would not be effective with a *general* sample of individuals with asthma. Thus, stronger findings might be seen if the participants were selected on the basis of identifying themselves as having experienced emotionally-induced asthma exacerbations.

In light of the significant changes in the experimental group, the writing task represents a potential laboratory paradigm for studying emotionally-induced changes in lung functioning. Such an experiment could lead to a greater understanding of the temporal relation of emotions and lung functioning and a better understanding of those individuals that have immediate changes in lung functioning under strong emotions. However, given the lack of between group differences, the task would need to be further studied, potentially increasing the level of emotion solicited in order to produce more reliable results.

Contrary to hypotheses, long-term measures of lung functioning did not show significant between group differences. The present findings were surprising given Smyth and colleagues' work (1999) demonstrating that experimental participants with asthma demonstrated significant improvement in FEV_1 compared to controls, and had clinically relevant changes in disease status. It was expected given Smyth's previous positive findings of changes in FEV_1 at 2-week, 4-week, and 4-month follow-up, that the present study would witness similar findings in long-term measures of PEFR.

A possible explanation for the contrary and non-significant findings of the present study may have been the selection of PEFR and not FEV_1. Although these two measures are highly correlated clinical measures of lung functioning (Linn, 1998), there are

qualitative differences between the two measures which must be recognized. The PEFR is considered a simple and useful index of expiratory flow and reflects the caliber of upper and large airways. Although this test is an efficient, affordable, and useful measure of lung functioning, it is also considered to be the most variable and difficult to reproduce. Variations in PEFRs can vary from 8% in normal subjects to as great as 50% in individuals with asthma. The FEV_1 is more sensitive, reliable and is considered to be the "single most important pulmonary test" (Kaminsky & Irvin, 1997, p. 1280). The FEV_1 is the volume of air expired in the first second of a forced expiratory exercise and is considered to be an indirect measure of airflow. The FEV_1 is considered to be the most useful test for following the course of an individual's asthma as well as clinical research (Kaminsky & Irvin, 1997).

Underlying the previous hypotheses examining changes in PEFR and affect ratings, a series of correlational analyses were conducted to examine the relationship of these variables and essay ratings. It was hypothesized that a reliable relationship would be witnessed when comparing essay ratings, changes in mood and changes in lung functioning. However, results showed a more complicated interrelationship of these three groups of variables.

The role of emotions and asthma is well recognized, however, the exact relationship is still uncertain. It is estimated that approximately half of asthma patients recognize and monitor emotional triggers such as laughing and crying (Renee & Creer, 1985) and there has been some evidence that mood ratings are related to asthma symptoms (Goreczny et al., 1988; Hyland, 1990; Lehrer et al., 1993; Steptoe & Holmes, 1985; Weinstein, 1984). Contrary to hypotheses, however, there was not a reliable

relationship between lung functioning and affect scores. Of the eight comparisons it was found that only two tests were significant. For one session, significant results showed that improved lung functioning was correlated with increase positive affect, and for another session an increase in lung functioning was associated with decreases in negative affect. These two findings are consistent with each other, demonstrating that improved mood results in improved lung functioning. However, given the majority of the results in this family of analyses, it appears that lung functioning was not reliably related with mood ratings in this study.

It is noted that the relationship of emotion and lung functioning are typically observed for only a subset of individuals with asthma. Previous studies regarding individuals with asthma report a positive relationship between emotions and changes in lung functioning in only 35% (Graham, 1977) to 60% (Levitan, 1985) of the population. Thus, there may be a subset of individuals with asthma that qualitatively, rather than quantitatively, differ from those who do not show this relationship. Therefore, further work examining the effects of emotional disclosure tasks with individuals with emotionally induced asthma changes is important because they may represent a significantly different outcome than individuals whose asthma does not respond to emotional expression.

Hypothesis five examined the relation of PEFRs to essay ratings. First, examining the overall essay rating with pre-post PEFR change scores showed a significant relationship for session four only. Further analysis of the essay evaluations showed significant correlations between PEFR and ratings of how personal essay were, and the degree to which the individual had thought about the topic before. It is unclear why a

significant relationship was found for the third writing session, and as seen with the between group differences in PEFR changes, it appears that further examination is needed to clarify the relationship between essay writings and lung functioning.

To examine the relationship between mood and essay ratings, pre-post changes in PANAS positive and negative affect scores were tested with overall essay writing scores. For positive affect scores, a significant relationship was observed for the first writing session only, with higher levels of positive affect being associated with higher essay ratings. Thus, contrary to predictions, the essays did not have a reliable relationship with positive affect. In fact, for the one significant test, higher levels of positive affect were associated with higher ratings of the degree to which participants thought about the topic before and after writing. One would suspect that such ratings would actually be negatively related, with lowering of positive affect as individuals write about topics that are a source of possible rumination.

However, as hypothesized, a more predictable pattern between essay ratings and changes in negative affect was observed. For the first three of the four writing sessions, higher essay ratings were associated with increases in negative emotions. Thus, more personal essays were associated with increases in negative emotions. Therefore, taking hypotheses 4, 5 and 6 together, there appears to be a strong relationship between essay ratings and emotions, particularly negative affect. However, only a small and questionable relation was observed between PEFRs with essay ratings and emotions.

As mentioned previously, the majority of the studies examining written emotional expression have utilized visits to a health center or physician as a primary outcome measure. Most of these studies report that the written disclosure task results in

improvements in health care utilization. These findings are witnessed as either a decrease in health care use by experimental condition participants, or an increase in health care visits by control condition participants (e.g., Pennebaker & Beall, 1986; Pennebaker et al., 1989; Pennebaker et al., 1990; Pennebaker and Francis, 1996).

For the present study, results showed that there were significant differences in between-groups pre- to post-experiment health center visits at 7-weeks follow-up. Examination of health center visits indicated that the experimental group had a decrease in visits, while the control group had an increase in visits. However, closer examination revealed that it is perhaps the increase in health center visits by the control group that best explains the between-group differences. Regardless, it appears that the written emotional disclosure task is beneficial and has a significant long-term impact on health care visits.

These findings are very similar to many of the studies previously conducted in the area. For example, Cameron and Nicholls (1998) reported a reduction in clinic visits for experimental condition participants and an increase in visits for control participants. However, it is important to note that the present study is the first to show a reduction in health center visits for individuals with a chronic illness. This is particularly important since individuals with a chronic medical condition presumably have more health center visits; thus, a non-medical intervention to reduce health center visits represents an important potential advancement in self-care and health care cost reduction.

Hypothesis 9 examined changes in health behaviors from baseline until follow-up assessment. Although the two groups were not significantly different from each other as hypothesized, there was an unexpected change in behaviors for the entire sample. Analyses revealed that in general the entire sample had an increase in smoking, with a

reduction in the use of other drugs and medications and the use of relaxation techniques. This finding is contrary to previous work examining the same type of health behaviors (Greenberg & Stone, 1992; Pennebaker et al., 1988, 1990; Petrie et al., 1995; Watson & Pennebaker, 1989). However, given no between group differences, these results represent overall group trends and probably represent a cohort effect rather than changes due to the experiment per se.

Hypothesis 11 addressed potential between group differences on end of the semester GPA after controlling for ACT / SAT scores. Contrary to the study's hypothesis and previous findings (Cameron & Nicholls, 1998; Pennebaker & Francis, 1996; Pennebaker et al., 1990) no between condition differences were observed for GPA. Examination of mean differences revealed a promising trend, however, it still remains non-significant.

In previous work, GPA was assessed across two semesters, rather than one, and scores were adjusted for prior semester GPA. Unfortunately, access to two semester grades for the first data collection wave was not possible because for a majority of these participants the experiment was conducted in their first semester of attending college. Thus, for the current study it may be unfair to draw conclusions on the effects of the writing task on GPA in students with asthma. It is suggested that re-examination of between semester changes for individuals with asthma needs to be conducted before it is concluded that the experiment differentially affects school performance.

Limitations of the Current Study

Although this study has shown that writing about upsetting events generally produces positive results, there are a number of limitations. Although data collection was extended in order to collect more participants and these participants were randomized, the sample is still a convenient sample of moderate size. The final sample of forty-four subjects is well within the sample size often used by studies in this area, with analyses demonstrating adequate power based on previous estimates of effect size. However, given Smyth's sample size of 61 participants with asthma, it is possible that increasing the number of participants may improve results. This notion is particularly salient given the analyses conducted on immediate PEFR between-group differences where the overall analyses were non-significant but separate by conditions analyses were significant for the experimental group.

Although the current study extends Smyth and colleagues' (1999) work, results of the present study would be enhanced if further replications had been built into the study design to more closely mirror Smyth's work. For example, rather than PEFRs, Smyth's study was able to use FEVs, which is a more reliable and accurate indicator of lung functioning. Unfortunately, funding was not available to supply FEVs and less expensive, but also less accurate PEFRs were utilized in the present study. However, the study may be useful in providing preliminary data on PEFRs, a more frequently used measure of lung functioning, particularly by patients at home. These data may be a helpful starting point to a larger scale study of individuals with asthma utilizing a home based treatment design.

Another potential improvement of the current study would be the incorporation of a physician to help diagnose participants' illness severity. In the present study, illness severity was assessed via self-report of physician ratings. Not only does this rely on patients' self-report but may represent a number of physicians utilizing very disparate diagnostic criteria. Smyth and colleagues' study had physicians available to diagnosis participants' illness severity at pre- and post-writing which allowed for the important finding that a portion of their sample evidenced clinically significant improvements in disease status . However, the present study did include pre- and post- PEFRs and self-reported asthma symptoms, which will be analyzed at a later point to determine change in illness severity ratings.

Similarly, the present study may have been strengthened if the selected follow-up period was of longer duration. The duration of the study was short, based on the length of the school semester, but is similar to a number of previous studies in the area that examined student samples. Smyth's study utilized a four-month follow-up period, but did not show a difference in results when comparing 2-week, 2-month and 4-month follow-up assessment. Thus, despite the present study and Smyth's work, it is still unclear how long the written task may result in benefits for individuals with asthma.

Although findings were significant for group differences in student health center visits, such visits may underrepresented some participants' actual use of medical care. Seven (16%) of the student participants reported they had accessed the health care system outside of the student health center at some point in time during the follow-up period. It is hypothesized that individuals who have a family care physician or pulmonologist caring for their asthma may more frequently access the use of outside providers.

However, examination of self-reported and actual health center records showed a high level of discrepancy, and thus the more objective measure of health center records is deemed more accurate for this study. In addition, since the group is likely to access the same healthcare system and health center visits were evaluated in terms of change from baseline, their pattern of physician visits should not have influenced overall results.

Finally, Smyth and colleagues' 1999 JAMA article received a lot of publicity at the time of its publication, being featured in such places as Newsweek magazine (1999). Although the publication came after the completion of the first wave of data collection, participants collected from second wave may have been exposed to these findings and been sensitized to issues about the relationship between expressing feelings and how they influence health. However, the small sample size in each data collection wave does not allow for adequate power to conduct between group analyses to ascertain if the later group did differ on the effects of the writing task.

Summary and Conclusions

Results generally supported the majority of the proposed hypotheses, particularly for psychological health and physical health as measured by health care utilization. As hypothesized, the writing task resulted in significant between group differences in essays, with the experimental group rating their essays as more personal and emotional. Significant changes in mood were observed in both short- and long - term assessments. In immediate pre- to post- changes, both groups had a decrease in positive affect. However, for the measure of negative affect the experimental group evidenced an *increase* in negative mood and the control group evidenced a *decrease* in negative mood.

Examination of long-term mood ratings showed no between group difference in negative affect, but there was a significant difference in positive affect, as reflected by a slight increase in positive affect for the experimental group and a decrease in positive affect for the control group. Similarly, correlational analyses of writing sessions showed that personal essays were strongly associated with an increase in immediate negative affect and slight decrease in positive affect. However, at long- term follow-up, more personal essays were associated with higher levels of positive affect but not related to negative affect.

Notably, overall analyses did not show between-group differences in short- or long-term lung functioning. However, separate analyses by condition showed the experimental group had a significant decrease in immediate lung functioning. Therefore it if the experimental group is examined in isolation, the experience of disclosing about an upsetting event has an immediate effect on lung functioning in individuals with asthma. Contrary to hypotheses, there were no significant changes in long-term lung functioning, nor was there a predictable significant relationship between mood and lung functioning on immediate pre-post measures.

Long-term assessment revealed significant between group differences in health care utilization, with the experimental group having a decrease in health center visits and the control group demonstrating an increase in visits. Post-hoc analyses revealed that this between group difference might best be explained by a significant increase in health care use by the control group. Contrary to predictions, between group differences were not found for college GPA and the overall sample reported a change in health behaviors.

The results of the study suggest that Pennebaker's writing task is an exercise able to produce significant changes in the psychological and physical health of individuals with asthma. Psychologically, although writing about upsetting events may result in increased negative and decreased positive affect, this mood state appears to be temporary. In fact, it appears that over time this experience may reverse and result in long-term increases in positive affect for individuals in the experimental group.

With regard to physical health, it appears that the writing task has a significant impact on health care visits for individuals with asthma. These results help to answer questions regarding the effectiveness of the writing task with individuals with a chronic illness. From Smyth's work indicating that the writing task resulted in improved disease state for individuals with asthma and rheumatoid arthritis, the question remained if this would translate into decreased health care need. The current study indeed shows a significant change in health care need for individuals with asthma, and it is hypothesized that similar improvements in health care use may been seen in other such chronic illnesses.

The results from the present study indeed suggest that the writing task may be beneficial in improving the health of individuals with asthma. It is hoped that this experimental task is further investigated to develop it as a potential behavioral medicine intervention as well as to see if similar benefits are witnessed with other illness groups. It is suggested that such research programs develop interventions with a focus on minimizing hospital cost, while maximizing patient benefit. It is already recognized that the task represents a non-pharmacological intervention, requiring minimal therapist contact. Results from previous studies using tape recorders at home indicate that this

intervention could be conducted in a non-medical setting, requiring even less therapist contact. As David Spiegel (1999) poignantly discussed in his in editorial response to Smyth's findings, if a new drug produced similar results it would certainly gain widespread use. However, with the healthcare communities hesitancy regarding this form of "alternative medicine," it is up to researchers and practitioners to advocate for the use of such a simple, yet powerful, tool.

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APPENDIXES

APPENDIX A

OUTLINE OF STUDY PROCEDURES

Outline of Procedures

I. Screening Questionnaire

II. Phone Contact
   - A. confirmation of qualification criteria
   - B. brief overview of study
   - C. confirm interest in participating and set first appointment

III. Session 1
   - A. General Instructional Set 1
   - B. Consent Form & Release of Information Form
   - C. Questionnaire Battery
     1. Demographics
     2. HCUQ
     3. Health Behavior Questionnaire
     4. PANAS - one month prior

IV. Session 2-5
   - A. Randomized at the beginning of session 2.
   - B. Pre/Post-writing measures:
     1. PEFR
     2. PANAS - Immediate
   - C. Group Specific Instructions
   - D. Write for 20 minutes
   - E. Pre/Post-writing measures:
     1. PEFR
     2. PANAS - Immediate

V. Session 6 (7-weeks Follow-up)
   - A. Pre/Post-writing measures:
     1. PEFR
     2. PANAS - Immediate
   - B. Follow-up Questionnaire Packet
     1. Demographics

2. HCUQ
3. Health Behavior Questionnaire
4. PANAS Last month
5. Essay Evaluation Measure

C. Debriefing

VI. GPA and Health Center Visits collected at the end of the semester

APPENDIX B

SCREENER QUESTIONNAIRE

SQ

This information will be held confidential. This information will be used to see if you qualify for certain research projects being conducted. If you qualify for a research project you will be contacted by phone and be given more information regarding the study and if you would like to participate.

Name: _____

Telephone #: (_____) _____

Age: _____ Sex: ___ Male ___ Female

Year in College:

___ Freshman

___ Sophomore

___ Junior

___ Senior

___ Other (please Specify)

Do you have a chronic health condition or illness (e.g., Asthma, Diabetes, etc.)?

___ Yes ___ No

If "Yes", please specify illness _____

_____

_____

How old were you when you were diagnosed? _____

Do you still receive treatment for this condition ___ Yes ___ No

Is English your primary language? ___ Yes ___ No

APPENDIX C

CONSENT FORM A

Consent Form

Study: "Written disclosure and asthma".
Researchers: Benjamin Balderson, M.S. & Larry L. Mullins, Ph.D.

I, _____, hereby authorize and direct Benjamin Balderson, M.S., and Larry L. Mullins, Ph.D., or associates of their choosing, to perform the procedures listed here:

1. Purpose: This study is designed to examine the relation between writing and health in individuals with asthma.

2. Procedures: For research purposes you will be randomly assigned to one of two writing programs. Each program will require six visits to the Health and Psychology Laboratory of OSU. You will be asked to come in for a session (today's session) to complete a series of questionnaires. Then four sessions occurring over two consecutive weeks (two sessions per week) to take place two weeks from today. Finally, a fifth session occurring at the end of the semester.. Each session will take approximately 45 minutes. The experiment will involve you completing questionnaires and writing for 20 minutes about a recent event or sequence of events in your life. In order for us to assess changes in your physical functioning related to the study, you will be asked to sign a waiver allowing medical records pertinent to your asthma to be released to the experimenters as well as OSU GPA for the 1998-99 academic year. These records will be limited to the Fall 1998 and Spring 1999 semesters. The information from the Health Center will be limited to the date of the visit and whether the visit was related to your asthma, no other information will be obtained from the Health Center.
   During each of your visits to the lab you will be asked to complete very brief questionnaires, and we will measure your lung functioning via the use of a Peak Expiratory Flow Rating (PEFR) meter. A PEFR is a standard clinical measure of lung functioning. It requires that you forcefully exhale into a tube. There is considered no risk involved in completing a PEFR.
   In addition between your first session and second session you will be contacted by phone and asked some brief questions regarding medical utilization. This will also take place on weekly basis for four weeks following session 5.
   At the end of the study, the purpose of the study will be fully discussed with you and any questions that you have will be answered. Also, at any time, you will be given the option of participating in the alternate writing program.

3. Duration of Participation: It is estimated that your participation in this study will require 30-45 minutes per session for a total of 6 sessions as well as 5 brief phone contacts that will take approximately 5 minutes each. The sessions 2-5 will take place over a two week period, with sessions two and three occurring in the first week and sessions four and five occurring in the second week with a minimum of 24 hours

between each session. The sixth session will occur at the end of the semester approximately 6 weeks following the fifth session. Total estimated time spent in the lab is 3 to 4.5 hours.

4. Confidentiality: All information gathered during study participation, including questionnaires, writing samples, PEFRs, medical records and GPA will be identified only by a coded subject number, which will not be associated with your name in any way. Complete confidentiality will be maintained except under specified conditions required by law. For example, current Oklahoma law requires that any ongoing child abuse (including sexual or physical abuse, or neglect) of a minor must be reported to state officials. Additionally, if an individual reports that he/she intends to harm himself/herself or others, legal and professional standards require that the individual must be kept from harm, even if confidentiality must be broken. Confidentiality could also be broken if materials form this study were subpoenaed by a court of law. Lastly, the results of the study may be published in a scientific journal, however, your personal identity and your individual responses would not be revealed.

5. Risks: Some people find that writing about particular life events can be somewhat difficult, fatiguing, or uncomfortable. However, participants in other similar studies found that this discomfort is relatively short-term. There are no risks involved in participation in this study. If at any point in the study you experience discomfort or have questions or concerns, myself or my assistants will be available to discuses these with you. If at any time during your participation in the study you experience physical discomfort or any other physical symptoms, such as an asthma exacerbation, please inform one of the research assistants immediately so that a medical referral may be made at that time. Discontinuation of participation any session, such as missing a session, may constitute disqualification to participate in any subsequent sessions..

6. Benefits: As a research participant in this study, you may receive insight into your life. Participants enrolled in psychology courses will receive one (1) research credit for each hour or discrete partial hour of participation (i.e., each lab visit will grant a minimum of 1 credit hour regardless of length of visit). You will also receive one extra credit point for completing the phone contact interviews mentioned above. Thus, you have the potential of earning up to 7 or more research credit hours if you complete the study. In addition to research credit, each participant will be enrolled in a lottery for the chance to win $25 for completing session 1, $50 for completing session 5, and $25 for completing session 6 (discontinuation of participation at any session may disqualify participation for future sessions). Finally, information about services available in the community will be made available to all participants

****

I have been fully informed about the procedures listed here. I am aware of what I will be asked to do and of the risks and benefits of this study. I also understand the following statements:

- I certify that I am 18 years old or older.
- My participation is part of an investigation entitled: Written disclosure and asthma.
- The purpose of the procedures is to investigate the relation of written disclosure and health in persons diagnosed with asthma.
- I understand that participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time with out penalty. However, that withdrawal of participation may constitutes ineligibility to participate in any subsequent sessions.
- I may contact Benjamin Balderson or Larry L. Mullins at 744-6027 should I wish further information regarding the study. I may also contact Gay Clarkson, IRB executive secretary, 203 Whitehurst, Oklahoma State University, Stillwater, OK 74078; (405) 744-5700 if I have concerns regarding the study.

I hereby and fully understand this consent form. I consent to allow the Oklahoma State University Registrar's Office of to release my grades for Fall 1998 and Spring 1999 to Benjamin Balderson M.S., Larry L. Mullins, Ph.D. or research assistant to their choosing for purposes of this study. I consent to allow the Oklahoma State University Student Health to release medical records regarding visits to the health center for the 1998-1999 academic year (August 1998-May 1999) to Benjamin Balderson M.S., Larry L. Mullins, Ph.D. or research assistant to their choosing for purposes of this study. I sign this consent freely and voluntarily. A copy of this consent form has been given to me. I hereby give permission for my participation.

Name of Participant (PLEASE PRINT)	Signature of Participant
OSU ID #	Date
Signature of Witness	Date

I certify that I have personally explained all elements of this form to the participant before requesting the participant to sign it.

Signed: _____
(Project director or his authorized representative)

APPENDIX D

DEMOGRAPHIC QUESTIONNAIRE

Demographic Questionnaire (DQ)

Age? _____ years

Gender? _____ Male _____ Female

What is your primary race or ethnic origin? (please circle one)

Caucasian African American / Black

Native American Hispanic

Asian Other (specify)

How would you best describe your current marital status (please circle one)

___ Single, no current relationship ___ Divorced

___ Unmarried, in a committed ___ Other (specify)

relationship

___ Married

Do you have any children _____ Yes _____ No

If so, how many children do you have? _____ children

What is your current student status? (please check one)

_____ Freshman _____ Sophomore

_____ Junior _____ Senior _____ Other

(please specify)

What is your highest reported ACT score _____

Do you live with your parent(s), even part-time? _____ Yes _____ No

Parent's Highest Level of Education

Father: _____ Mother: _____

Please indicate your total family income: (This information will be held strictly confidential).

____ 0-4,999

____ 5,000-9,999

____ 10,000-14,999

____ 15,000-19,999

____ 20,000-29,999

____ 30, 000-39,999

____ 40,000-49,999

____ 50,000-59,000

____ 60,000 or greater

APPENDIX E

ASTHMA SEVERITY ASSESSMENT INTERVIEW

Participant # _____

Asthma Severity Assessment Questionnaire

1. Has a physician informed you of the severity of your asthma 1 Yes 2 No
2. If "Yes" what was the severity level were you told?
   ___ Mild
   ___ Moderate
   ___ Severe

3. How many asthma exacerbations do you have in a given week? This may be qualitatively different from what you consider to be an "attack". _____

4. How long does an average exacerbation lasts (e.g., 10 minutes, 2 hours etc.)
   _____

5. How many episodes of nighttime coughing do you have in a given month? _____

6. Would you characterize your exercise tolerance level as:
   1 Good
   2 Lower than normal
   3 Limited
   4 Unable to exercise

7. Do you experience symptoms between asthma exacerbations? 1 Yes
   2 No

8. Do typical asthma exacerbations respond to bronchodilators? 1 Always
   2 Not always

9. Do you feel that asthma symptoms affect your sleep, activity level, or work performance?
   1 Yes
   2 No

10. Do you sometimes experience chest tightness or coughing? 1 Yes
    2 No

11. How many times per year do you seek urgent or emergency care? This does not necessarily refer to the number of visits to a hospital emergency room. _____

12. How often do you experience wheezing?
    1 Daily
    2 Weekly
    3 Monthly

13. Would you characterize your exacerbations as sudden and/or severe? 1 Yes
2 No

14. Do you require steroids in the medical management of your asthma? 1 Yes
2 No

15. Would you characterize your work/school attendance as: 1 Poor
2 Somewhat affected
3 Not affected

16. To what extent do you experience excessively rapid heartbeat that cannot be attributed to the influence of adrenaline?
1 Mild
2 Moderate to severe

17. To what extent do you experience excessively rapid breathing (not during an exacerbation)?
1 Mild
2 Moderate to severe

18. Do you sometimes have difficulty speaking in complete sentences? 1 Yes
2 No

19. Would you characterize your air exchange as reduced or poor (e.g., difficulty taking deep breaths)?
1 Yes
2 No

20. Do you sometimes require accessory muscles (e.g., arms) to sit up? 1 Yes
2 No

21. Do you experience at least occasionally:

increased perspiration?	1 Yes	2 No
confusion?	1 Yes	2 No
lethargy?	1 Yes	2 No
altered consciousness?	1 Yes	2 No

22. Peak Expiratory Flow Rate (PEFR) = 1) _____ 2) _____ 3) _____

Stage I: Mild asthma
One or two exacerbations a week; as many as two episodes of nocturnal cough a month; good exercise tolerance; patient is asymptomatic between exacerbations; bronchospasm responds to bronchodilator; PEFR or FEV_1 is usually normal.

Stage II: Moderate asthma
More than two exacerbations a week; patient is symptomatic between exacerbations; symptoms affect sleep, activity level, or work performance; bronchospasm responds to bronchodilator; exercise tolerance is lower than normal; coughing; chest tightness; patient seeks urgent or emergency care more than three times a year; inspiratory and prolonged end-expiratory wheeze PEFR or FEV_1 is 60%-80% of predicted normal value.

Stage III: Severe asthma
Daily wheezing; sudden severe exacerbations; limited exercise tolerance and activity level; sleep is disrupted; bronchospasm does not always respond to bronchodilator; patient may be steroid-dependent; poor work attendance; mild tachycardia (rapid heartbeat); tachypnea (rapid breathing); patient has difficulty speaking in complete sentences; patient seeks urgent or emergency care more than three times a year; PEFR or FEV_1 is $< 60\%$ of predicted normal value.

Stage IV: Respiratory failure
Increased tachycardia; tachypnea; wheezing; reduced, poor air exchange; patient sits up using accessory muscles, with diaphoresis (excessive sweating); confusion; lethargy; altered consciousness or mentation; PEFR is < 100 L/min or FEV_1 is < 0.7 L/sec; pulsus paradoxus > 10 mmHg.

APPENDIX F

HEALTH CARE UTILIZATION QUESTIONNAIRE - ASTHMA

Health Care Utilization Questionnaire - Asthma

Please indicate the number of outpatient clinic visits you have scheduled and attended in the last year _____

How many of these visits were asthma related _____

Please indicate the number of days of hospitalizations you have had over the last year __

How many of these visits were asthma related _____

Please indicate how many visits you made to the emergency room in the past year _____

How many of these visits were asthma related _____

How do you pay for your medical care and medical supplies?

___ Private Insurance ___ Self-Pay

___ School/Student Insurance ___ Other

___ HMO/PPO

___ Medicaid

Please estimate the dollars per month you or your parent(s) spent this year on health insurance premiums $ _____ per/month.

Please estimate the dollars per month you spent this last year on out-of-pocket expenses for the care of your illness. $ _____ per/month.

Do you regularly attend physician check-ups in regards to your asthma?

Yes No

Are you currently prescribed any medications for the treatment of your asthma

Yes No

What medications are you prescribed (please indicate if you are prescribed these medication but do not currently take them).

_____ _____

_____ _____

_____ _____

Do you purchase or use over-the-counter asthma medication (e.g., medication purchased at the supermarket)?

Yes No

How much do you worry about financial stress placed on the family because of your illness?

1	2	3	4	5	6	7
not worried			moderately worried			constantly worried

How worried are you about covering your medical costs for your illness

1	2	3	4	5	6	7
not worried			moderately worried			constantly worried

Please indicate how well you adhere with the illness treatment team recommendations

1	2	3	4	5	6	7
do not comply			moderate adherence			complete adherence

Have you ever received any type of psychological counseling/therapy?

Yes No

If yes, was this counseling related to your asthma

Yes No

Are you currently taking any psychoactive medications (e.g., antidepressants, anti-anxiety)?

Yes No

APPENDIX G

HEALTH BEHAVIOR QUESTIONNAIRE

Health Behavior Questionnaire (HBQ)

Please mark the appropriate answer

1. Have you ever regularly smoked tobacco (e.g., cigarettes, cigars, or a pipe)?

Yes _____ No _____

2. Do you *presently* smoke tobacco (e.g., cigarettes, cigars, or a pipe)?

Yes _____ No _____

If "No", then skip to question 4.

3. How frequently do you smoke?

_____ Once a week or less
_____ Once or twice per day
_____ 3 to 5 times a day
_____ 6 to 10 times a day
_____ More than 10 times per day

4. Do you drink Alcohol

_____ No, or up to 2 drinks per month
_____ About one drink per week
_____ About 2 to 4 drinks per week
_____ About 5 to 10 drinks per week
_____ More than 11 drinks per week

5. Do you take any drugs or medication other than your asthma medication, tea, coffee, alcohol or nicotine (such as sleeping tablets, anti-anxiety drugs such as Value, anti-depressants, hallucinogens, barbiturates, painkillers, etc.)?

_____ No
_____ Once or twice per year
_____ Once or twice per month
_____ Once or twice per week
_____ Every day

6. How often do you exercise or go for a walk? (For at least 15 minutes each time)?

_____ Daily
_____ 3 or more times per week
_____ Once or twice per week
_____ Once or twice per month
_____ Rarely

7. How frequently do you participate in an activity or recreation that you enjoy (e.g., gardening, reading, hobbies, sports, etc.)?

_____ Daily
_____ 3 or more times per week
_____ Once or twice per week
_____ Once or twice per month
_____ Rarely

8. How often do you do any relaxation exercises?

_____ Daily
_____ 3 or more times per week
_____ Once or twice per week
_____ Once or twice per month
_____ Rarely

9. How often do you eat a serving of fruits and/or vegetables?

_____ 3 to 5 times per day
_____ 1 to 3 times per day
_____ 3 times per week
_____ Once per week
_____ Rarely

10. How often do you eat fatty or sweet foods (such as fats on meat, pies, fried foods, cheeses, full cream products, chocolate, etc.)?

_____ 3 to 5 times per day
_____ 1 to 3 times per day
_____ 3 times per week
_____ Once per week
_____ Rarely

11. How often do you give and receive affection?

_____ Frequently each day
_____ Occasionally each day
_____ Once or twice per week
_____ Once or twice per month
_____ Rarely or never

12. How often do you have a good nights sleep?

_____ Most nights
_____ About every other night
_____ About once per week
_____ About once per month
_____ Rarely

13. Do you drink tea or coffee?

_____ Rarely
_____ 3 to 5 cups per week
_____ 2 to 3 cups per day
_____ 4 to 6 cups per day
_____ 7 or more cups per day

APPENDIX H

PANAS IMMEDIATE

Subject Number _____

Session: 1 2 3 4

Pre _____ Post_____

PANAS (Immediate)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way right now, that is, at the present moment. use the following scale to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____ interested

_____ distressed

_____ excited

_____ upset

_____ strong

_____ guilty

_____ scared

_____ hostile

_____ enthusiastic

_____ proud

_____ irritable

_____ alert

_____ ashamed

_____ inspired

_____ nervous

_____ determined

_____ attentive

_____ jittery

_____ active

_____ afraid

APPENDIX I

PANAS PRIOR MONTH

Subject Number _____

Session: 1 2 3 4

Pre _____ Post_____

PANAS (Prior Month)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you feel this way during the past month, that is, at the present moment. use the following scale to record your answers.

1	2	3	4	5
very slightly or not at all	a little	moderately	quite a bit	extremely

_____ interested

_____ distressed

_____ excited

_____ upset

_____ strong

_____ guilty

_____ scared

_____ hostile

_____ enthusiastic

_____ proud

_____ irritable

_____ alert

_____ ashamed

_____ inspired

_____ nervous

_____ determined

_____ attentive

_____ jittery

_____ active

_____ afraid

APPENDIX J

ESSAY EVALUATION MEASURE

Essay Evaluation Measure

In answering the following questions, consider all four days of your writing. Please circle the most appropriate number on the scale of 1 to 7

1). Overall, how personal was the topic that you wrote about?

Not at all Personal			Somewhat Personal			Extremely Personal
1	2	3	4	5	6	7

2). Prior to your participation in this study, how much had you talked with other people about what you wrote?

Not at all			Somewhat			Extremely
1	2	3	4	5	6	7

3) Overall, how much did you include your emotional reactions in what you wrote?

Not at all			Somewhat			Extremely
1	2	3	4	5	6	7

4) Over the four days of your participation, how difficult has it been for you to write?

Not at all			Somewhat			Extremely
1	2	3	4	5	6	7

5) Since the beginning of the study, (but not during hours that you were here participating) to what degree have you thought about the topics that you wrote about?

Not at all			Somewhat			Extremely
1	2	3	4	5	6	7

6) Before the study ever began, to what degree did you think about the topics that you wrote about?

Not at all			Somewhat			Extremely
1	2	3	4	5	6	7

APPENDIX K

INSTITUTIONAL REVIEW BOARD

APPROVAL FORM

OKLAHOMA STATE UNIVERSITY
INSTITUTIONAL REVIEW BOARD

Date: April 5, 2000 IRB #: AS-99-032

Proposal Title: "THE EFFECTS OF WRITTEN DISCLOSURE ON PHYSICAL AND METAL HEALTH IN INDIVIDUALS WITH ASTHMA"

Principal Investigator(s): Larry Mullins
Benjamin Balderson

Reviewed and Processed as: Continuation

Approval Status Recommended by Reviewer(s): Approved

Signature:

Carol Olson

Carol Olson, Director of University Research Compliance

April 5, 2000
Date

Approvals are valid for one calendar year, after which time a request for continuation must be submitted. Any modification to the research project approved by the IRB must be submitted for approval with the advisor's signature. The IRB office MUST be notified in writing when a project is complete. Approved projects are subject to monitoring by the IRB. Expedited and exempt projects may be reviewed by the full Institutional Review Board.

VITA

Benjamin H. K. Balderson

Candidate for the Degree of

Doctor of Philosophy

Thesis: THE EFFECTS OF WRITTEN DISCLOSURE ON PHYSICAL AND MENTAL HEALTH IN INDIVIDUALS WITH ASTHMA

Major Field: Psychology

Biographical

Personal Data: Born in Hilo, Hawaii, November 21, 1970, the son of Mr. And Mrs. Harlow Balderson

Education: Graduated from Lakes High School, Tacoma, Washington, in June 1988; received Bachelor of Science degree in Psychology with a minor in Business from Washington State University in May, 1992; received Master of Science in Psychology from Oklahoma State University in May, 1996; completed requirements for the Doctor of Philosophy degree in Psychology, specializing in Clinical, Health Psychology and Child Psychology at Oklahoma State University in December, 2000.

Professional Experience: Graduate Assistant for Oklahoma State University Psychology Diversified Student Program, August 1994 to July 1995; Graduate Research Associate for Oklahoma State University Adolescent Decision-making Research Laboratory, August 1994 to August 1998; Graduate Research Associate for Oklahoma State University Pediatric and Health Psychology Research Laboratory 1996 to 2000; Graduate Psychology Instructor at Oklahoma State University, August 1995 to May 1996; Psychology Associate for Oklahoma State University Psychological Services Center, August 1996 to June 1997, and August 1995 to August 1996; Behavior Medicine/Neuropsychology Intern at Health South Rehabilitation Hospital of Oklahoma City, July 1996 to November 1996; Assistant Graduate Director for Oklahoma State University Psychology Services Center, August 1996 to July 1997; Marriage and Family

Therapist for the Oklahoma State University Marriage and Family Clinic, June 1996 to May 1997 and August 1997 to August 1998; Assistant Director of Oklahoma State University Psychological Services Center, June 1997 to July 1998; Research Assistant II at Children's Hospital of Oklahoma , December 1997 to August 2000; Psychology Practicum Student at University of Oklahoma Health Sciences Center, July 1998 to August 1999; Internship at the Boston Psychology Consortium, Boston Veterans Administration Medical Center, Boston Medical Center, and New England Medical Center, 1999-2000; Research Associate II at Center for Health Studies, Group Health Cooperative of Puget Sound, September 2000 to present.