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Do the Words People Write Capture Their Process of Change

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By

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Abstract

The current study examined the use of commonly used word categories, less commonly used word categories, and change in word use over time in an expressive writing task. A sample of 250 undergraduate students from an archival study who were still experiencing unresolved feelings wrote about a targeted distressing experience for 15 minutes on each of three consecutive days. Narratives were analyzed using the Linguistic Inquiry and Word Count Program (LIWC). Results showed that six word categories predicted change in outcome, namely first-person singular pronouns, words related to causation, inhibition, certainty, past-tense verbs, and word count. Words related to cognitive processing as well as past-tense verbs changed in their usage over the three writing sessions, but their rate of change did not predict outcome. Word usage also differed by writing condition. The results confirm the importance of word categories commonly analyzed but also highlight the importance of time orientation.

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CHAPTER 1

Introduction

Expressive Writing: a Way of Coping with Trauma

Although experiencing a traumatic event has been faced by as much as 76.1 percent of the Canadian population (van Ameringen, Mancini, Patterson, & Boyle, 2008), the lifetime risk at age 75 for posttraumatic stress disorder (PTSD) is 8.7% when using the DSM-IV (American Psychological Association, 2013). Consequently, many individuals are affected by PTSD and suffer from behavioural and psychological symptoms, including intrusive memories and flashbacks, avoiding reminders or associated situations with the trauma, negative alterations on cognitions, and changes in reactivity associated with the event (American Psychological Association, 2013).

One effective method for assisting these individuals to recovery and to alleviating the psychological symptoms has been through writing about thoughts and feeling regarding the distressing experience (Sloan, Marx, Epstein, & Lexington, 2007).Writing about one's distress is an efficient and parsimonious task that has shown a small but reliable alleviation for a wide range of symptoms, including those of PTSD (Smyth, Hockemeyer, & Tulloch, 2008), depression (Gortner, Rude, & Pennebaker, 2006), and low-quality of life (Lu, Zheng, Young, Kagawa-Singer, & Loh, 2012). This efficacious tool has a wide range of implications that can be enhanced by further research. For investigators, using a writing task as a research paradigm helps to understand why disclosure may be important as well as provides a framework to analyze the underlying mechanisms that lead to change. For therapists, understanding how the writing task helps individuals can augment expressive writing's use and effectiveness in therapy.

Original Design. To better understand the effects of disclosing experiences of distress on health without the influence of the social context of a listener, Pennebaker and Beall (1986) asked participants to write about a distressing experience for 15 minutes on four consecutive days. Participants were assigned to one of four conditions: group 1 wrote solely about the facts of the distressful event, group 2 wrote solely about the feelings experienced about the distressful event, group 3 wrote about both the facts and feelings regarding the distressful event, and group 4 (a control group) wrote about a trivial, non-emotional subject. Subjects were permitted to write about the same or separate events during each writing session, but they were not permitted to change conditions. Data on participants' records from health and counseling centres were collected prior to the study and six months after. Findings from this study showed that individuals in the combined fact and emotion group visited health care centres less often than the other three groups.

Benefits of Expressive Writing. Since Pennebaker and Beall's study, an extensive literature has developed echoing the positive effects that expressive writing has on individuals (Murray & Segal, 1994; Possemato, Ouimette, & Geller, 2010). Sloan, Marx, Epstein, and Lexington (2007) studied the effects of expressive writing on individuals experiencing moderate posttraumatic stress symptoms regarding a distressing event. In the study, participants wrote about the same distressing event on three consecutive days for 20 minutes each day. Participants were assigned to either group 1, an emotionally expressive condition with instructions to focus the content of their narratives on emotion and feeling regarding the distressing event; group 2, an insight and cognitive assimilation condition with instructions to write about how the event changed their lives and what the event meant to them; or group 3, a control condition with instructions to write about how they spent their time without including emotion or opinions. After a one-

month follow up, both expressive writing groups (1 and 2) reported fewer PTSD symptoms and fewer depressive symptoms than the control group, with the emotionally expressive condition displaying significantly fewer PTSD and depressive symptoms.

The benefits of expressive writing extend beyond the alleviation of trauma symptoms. Several studies have demonstrated the beneficial effects of expressive writing on depression severity (Sloan et al., 2007; Smyth, Hockemeyer, & Tullock, 2008; Sloan, Feinstein, & Marx, 2009), somatic symptoms associated with cancer (Henry, Schlegel, Talley, Molix, & Bettencourt, 2010; Stanton, et al., 2002; Lu, Zheng, Young, Kagawa-Singer, & Loh, 2012), and asthma (Smyth, Stone, Hurewitz, & Kaell,1999; Warner et al., 2006). Some studies have investigated the impact of expressive writing on adverse work incidents, citing quicker reemployment after a job loss (Spera, Buhrfeind, & Pennebaker, 1994) and decreased anger and intentions to retaliate for workplace injustices (Barclay & Skarlicki, 2009) when individuals who wrote about their thoughts and feelings regarding the event.

Frattaroli's (2006) meta-analysis of 146 studies using expressive writing demonstrated a consistent positive effect of writing about an upsetting or distressing event across many domains, i.e., the subjective impact of the intervention, physiological functioning, psychological health, self-reported health, and general functioning and life outcomes. The meta-analysis did not show improvement in health-related behaviours, such as self-reported upper respiratory problems. Of the 146 studies, 102 studies (70%) had a positive effect size, 8 studies (5%) had an effect size of zero, and 36 studies (25%) had a negative effect size. Overall, the effect of expressive writing was $R = .075$, which although small is noteworthy nonetheless due to the task's simplicity and ease of administration.

Underlying Mechanisms of Expressive Writing

Although much literature has examined the effects of expressive writing on a range of outcomes, few studies have studied why expressive writing is beneficial, and those that have do not form a consensus as to why. Sloan and Marx (2004) stated "little attention has been paid to understanding why this procedure appears to result in physical and psychological gains" (p. 2). Originating from Freud (Baikie & Wilhelm, 2005), the theory of catharsis postulated that decreased physical symptoms and arousal were derived from the disclosure of previously undisclosed and suppressed thoughts and emotions through the reduction of negative affect and the increase of positive affect. Pennebaker and Beall's (1986) original study attempted to determine to what extent the theory of catharsis or the theory of inhibition explained the benefits of disclosing a personal trauma or distressing event, and concluded that catharsis was not the sole determinant of outcome in expressive writing. This was shown as individuals' heart rate and negative affect increased from pre- to post-writing, which runs counter to the catharsis theory, which predicts that a more relaxed state should occur after disclosure.

Inhibition theory, a theory suggesting that actively inhibiting thoughts and emotions regarding a distressful event taxes the psychosomatic symptoms of the body causing psychological and physical symptoms, was supported by one study (Francis & Pennebaker, 1992) but not supported by others (Greenberg & Stone, 1992; Greenberg, Wortman, & Stone, 1996). A study by Greenberg and Stone (1992) illustrates the limits of the inhibition theory as no differences in the benefits of writing were observed between those who wrote either about an undisclosed or a previously disclosed distressful event.

Other theories also have been used to help explain various aspects of why expressive writing is beneficial. Theories of repeated exposure, habituation, and

extinction, have similarly shown mixed results: Some studies support these theories (Klein & Boals, 2001), while others have not (de Moor, et al., 2002; Lepore, 1997). Studies investigating self-regulation theories have also produced contradicting results (Frattarolli, 2006; King, 2001). Cognitive processing theories have explained some of the benefits (Pennebaker, 1993) as individuals focus on making sense, gaining insight, and organizing and integrating an upsetting experience into their self-schema. However, cognitive processing theories have demonstrated limitations. A study by Greenberg, Wortman, and Stone (1996) showed that individuals who experienced a distressful event but then were asked to write about some other imaginary distressful event (i.e., not their own) benefitted equally as those who followed the original expressive writing task of writing about their own distress. This indicates that other processes besides cognitive processing of one's personal concerns are occurring and that these other processes should be investigated in relation to writing about one's own distress instead of an imaginary one. In brief, King's (2001) statement continues to hold, namely that the answer as to why expressive writing is beneficial is still unknown, and further investigation is needed into how people change via this writing task.

Linguistic Pattern Analysis Can Discern Tacit Psychological Differences

One way to study the underlying mechanisms of expressive writing is through the analysis of the content of what individuals write. Some research on expressive writing has involved identifying linguistic categories that relate both to individual differences and to treatment outcomes.

Linguistic markers of social, demographic, and personality variables. The words people use can reveal a number of things about a speaker: sex, age, social status, education, culture, and motives, as well as convey a person's emotional state as being

close or distant, thoughtful or shallow (Pennebaker, Mehl, & Niederhoffer, 2003). As a case in point, a review by Newman, Groom, Handelman, and Pennebaker (2008) of 14,000 text files across 70 studies indicated that males discuss more external events and objects, such as their occupation or money, while females use more pronouns, more emotion words, and more words relating to social contexts. Many studies have found similar results for higher pronoun use by females and more object-reference by males when describing themselves or their daily activities (Groom & Pennebaker, 2005; Pennebaker, Groom, Loew, & Dabbs, 2004), although one study found no gender differences in word use when participants were describing their own heart failure experience or that of a spouse (Rohrbaugh, Mehl, Shoham, Reilly, & Ewy, 2008).

In regards to age, Beaudreau, Storandt, and Strobe (2006) found no difference in length of verbally-told stories regarding negative and positive events between older and younger adults, but differences in age have been associated with other linguistic aspects. Seider, Hirschberger, Nelson, and Levenson (2009) found that couples between the age of 60 and 70 used more first-person plural pronouns than couples aged 40 to 50. Pennebaker and Stone (2003) found that an increase in age was associated with the use of fewer negative affect words, past-tense verbs, self-references, and an increase in future-tense words as well as a general pattern of increasing cognitive complexity. When looking at age at time of writing, both social words (Pressman & Cohen, 2007) and activated emotion words, such as “lively,” “vigorous,” and “humorous” (Pressman & Cohen, 2012), were associated with longevity when analyzing autobiographies of influential researchers.

In terms of cultural differences, two studies Tsai, Simeonova, and Watanabe, (2004) asked participants to talk about negative life events. The first study focussed on

negative childhood experiences and the second on marital conflicts with a partner. In both studies, less acculturated Chinese Americans living in the United States used more social words and somatic words compared to more acculturated Chinese Americans and European Americans living in the United States. No differences were found in the use of negative and positive emotion words. These findings presumably reflect cultural differences when referring to emotion, as Chinese culture tends to combine body and social states as part of an emotional experience.

Word use has been further used to differentiate between the Big Five personality dimensions (Baddeley & Singer, 2008; Lee, Kim, Seo, & Chung, 2007; Mehl, Gosling, & Pennebaker, 2006; Pennebaker & King, 1999). These findings highlight the utility of word use as markers of age, sex, and other characteristics.

Linguistic markers of internal or hidden processes. Word usage can go beyond identifying demographics and explain some aspects involved in the internal processes of individuals. Freud (1901) acknowledged the importance of speech when referring to parapraxes as indicators of deeper motives. Lacan (1968) treated language as a bridge to reality, where the unconscious asserts itself. From a linguistic perspective (Pennebaker & Francis, 1996), cognitive processes and emotional states should be reflected in word choice. Word choice should mirror the thought process of an individual, thus using words such as “because,” “reason,” and “cause” should indicate an investigation into meaning and causality while using the words such as “realise,” “understand,” and “reconsider” should indicate an attempt to gain understanding. A study by Davis and Brock (1975) found that individuals sitting in front of a mirror used more first-person words, such as “me” and “I,” than when completing a questionnaire without a mirror in view. Word choice reflects internal emotional states, such that a person experiencing an increase in

negative affect uses words reflecting that state. Moreover, articulating affect helps budding emotional experience develop into conscious verbally labelled experiences (Pascual-Leone, Paivio, & Harrington, 2015; Pennebaker & Francis, 1996).

Linguistic markers of psychological wellbeing. In a review of studies looking at satisfaction in relationships experienced by couples, the frequency of certain pronouns was associated with a distressed relationship or marital satisfaction. When engaging in a problem solving interaction regarding their relationship, partners in non-distressed relationships used “we” more frequently while partners in distressed relationships used “you” and “me” more often (Williams-Baucom, Atkins, Sevier, Eldridge, & Christensen, 2010). Further support for the importance of pronouns in dialogue between couples was seen in a study by Seider, Hirschnerger, Nelson, and Levenson (2009), who found that greater use of “me” and “you” in conversations of couples who have a conflict was related to dissatisfaction in relationship while the use of “we” was associated with lower negative emotion by both partners and lower physiological arousal for the partner that was listening. Similar results were obtained by Simmons, Gordon, and Chambless (2005), indicating that a higher use of first-person plural pronouns was related to positive problem solving with couples. These studies highlight the negative outcomes associated with a greater use of first-person singular pronouns.

When psychiatric outpatients with either psychotic symptoms, intellectual disabilities, or alcohol and drug dependence were compared to nonclinical controls based on the way that they described themselves and how their situation was affecting them, the psychiatric patients used fewer words relating to exclusion (e.g., “but,” “without,” “exclude”), discrepancy (e.g., “should,” “would,” “could”), inhibition (e.g., “block,” “constrain,” “stop”), tentativeness (e.g., “maybe,” “perhaps,” “guess”), and future-tense

verbs than the nonclinical sample (Arntz, Hawke, Bamelis, Spinhoven, & Molendijk, 2012). These differences suggest that psychiatric outpatients process information differently than nonclinical populations.

The observation that the words one utters, sometimes even unintentionally, may be a glimpse into the psyche has influenced psychological measures. Subjective assessment tests were developed with the notion that individuals' thoughts, intentions, and motives are reflected in how they describe ambiguous stimuli and that this could provide information with regard to mental health. The Rorschach (Rorschach, 1942) and the Thematic Apperception Test (TAT; McClelland, 1979) are two such tests that interpret individuals' explicit word choice (semantics) as well as context (pragmatics) to uncover indicators of motives, affiliation, power, and achievement. From psychotherapy process research, measures such as the Client Experiencing Scale (Klein, Mathieu-Coughlan, & Kiesler, 1986) indicates to what extent individuals engage their thoughts and feelings regarding an event. The measure's levels are determined by individuals' content (what individuals talk about) and style (how they talk about it). As such, first-person singular pronouns, emotion words, and cognitive words are indicators of one's state of experiencing. How individuals use their vocabulary has been an integral part in psychology, for clinicians and researchers alike.

The ability to articulate one's thoughts and feelings has many benefits, including health improvements, when working through distressing content. Pennebaker (1997, 2003) surmised that one's pattern of language use influences health through the organization of emotions and cognitions into a coherent narrative. The first study to attempt to isolate the mediating processes of the health benefits of expressive writing took an innovative approach by looking at the link between linguistic patterns of the written

narratives and both long-term physical health and academic performance (Pennebaker & Francis, 1996). Within the expressive writing group, those participants who were found to use more insight-related, causation-related, and positive emotion words displayed greater health improvements. In a later study, women in treatment for breast cancer who were rated as talking more about their emotions (i.e., using a higher proportion of emotion words) were associated with improved health self-perceptions and lower psychological distress (Stanton et al., 2000). In regards to affect, the intensity of an emotion can be diminished simply by verbally labelling the emotion (Berkowitz & Troccoli, 1990; Keltner, Locke, & Audrain, 1993; Schwarz, 1990).

Linguistic Markers as Process Variables that Describe Psychological Change

Commonly explored linguistic predictors of change. Since the work of Pennebaker and Francis (1996) other studies have identified other mediating linguistic categories. The linguistic categories that are most often associated with positive change are a greater use of words relating to cognitive processing, relatively high frequency of positive emotion words, moderate frequency of negative emotion words, and a varied use of first-person pronouns (Pennebaker, Chung, Ireland, Gonzalez, and Booth, 2007). In a study by Boals and Klein (2005), individuals wrote once for 20 minutes regarding a breakup of a romantic relationship in the last 12 months and completed a questionnaire regarding the intrusiveness of thoughts and avoidance coping mechanisms related to a stressful experience. Results indicated that greater avoidance of the breakup was associated with more negative emotion and positive emotion word use as well as a greater use of first-person singular and fewer first-person plural pronouns in the narratives. Higher levels of intrusive thoughts and grief about the event were related to a higher proportion of negative emotion words and first-person singular pronouns. In a study by

McCullough, Root, and Cohen (2006), the number of positive and negative emotion words used in trauma narratives written over three occasions were negatively correlated with motivations for revenge at someone for an offence, according to self-reports. Words relating to cognitive processing were negatively correlated with motivations for revenge and avoidance behaviours. Affect word use has been analyzed in expressive writing since the first study on this topic, which related higher levels of positive words use with improved health (Pennebaker & Francis, 1996). Hoyt and Pasupathi (2008) rated trauma blogs for degree of recovery and found that a change to a more positive affect tone predicted greater extent of recovery.

Among individuals with rheumatoid arthritis who wrote at home for 15 minutes for four weekly sessions regarding an emotional event, higher use of positive emotion words was related to an improvement in depressed and cheerful moods one-week and three-months after writing, while negative emotion words use was unrelated to any changes (van Middendorp & Geened, 2008). A higher frequency of cognitive processing word use was related to the same psychological improvement but only at the one-week follow-up. An increase in positive emotion and anxious words were related to better physical quality of life at a three-week follow-up for individuals with leukemia or lymphoma who wrote once for 20 minutes regarding their cancer (Morgan, Graves, Poggi, & Cheson, 2008).

With an eye to design the current study, a methodological aside seems important at this point, for the interpretation of “emotion words” as a variable. Some of the abovementioned studies that examined emotion word use created a “change in affect” variable by subtracting the number of negative emotion words used from the number of positive emotion words used (see for example, Hoyt & Pasupathi, 2008; Pennebaker,

Mayne, & Francis, 1997), but this integration assumes that the relationship between positive and negative affect is bipolar. However, elsewhere emotion researchers have found that a two-factor model (Diener, Smith, & Fujita, 1995) as well as a four-factor model (Gregg & Shepherd, 2009; Huelsman, Nemanick, & Munz, 2003) of affect fit the data significantly better than a one-factor (bipolar) model. As a case in point, the widely used self-report measure, Positive and Negative Affect Schedule (PANAS; Watson & Clark, 1994), was predicated on a two-factor model of affective experience. Such findings indicate that the relationship between positive and negative affect should not be viewed as bipolar but either as separable or orthogonal, indicating that positive and negative emotions words would probably be better examined separately.

Cognitive processing words have been sub-divided into categories relating to causality, tentativeness, discrepancy, certainty, inhibition, inclusivity, as well as exclusivity (Tausczik & Pennebaker, 2010) and have be examined in in various studies. Schwatrz and Drotar (2004) conducted a study of caregivers who were responsible for hospitalized youth with chronic illness. Caregivers were organized into either an expressive writing condition or a condition that wrote about summer activities. The study found that an increase use of cognitive-related words predicted better health-related quality of life, and that caregivers in the expressive writing condition used more cognitive-related words than the control group. The use of words indicating causality in expressive writing tasks have been linked to higher grades, better health, and improved immune functioning among students who wrote about their thoughts and feelings regarding coming to college compared to students who wrote about a trivial topic (Klein & Boals, 2001; Petrie, Booth, & Pennebaker, 1998), while insight, self-discrepancy, and tentative words were related to individuality (Burke & Dollinger, 2010).

Finally, the use of first-person pronouns was related to greater levels of depression as well as physical and emotional pain when currently-, formerly-, or never-depressed college students wrote a single essay regarding coming to college (Rude, Gortner, and Pennebaker, 2001). Similar relations between the use of first-person pronouns and depression have been found by others as well (Stirman & Pennebaker, 2001; Weintraub, 1981).

Lesser known linguistic predictors of change. Although many studies have examined word usage, the majority of studies have studied a small range of linguistic categories, focussing on positive and negative emotions, words relating to cognitive processing and its various sub-categories, and the use of first-person pronouns. These categories have proved insightful in providing information regarding how individuals work through writing about a distressing event. But there are more linguistic categories that exist that can provide meaningful information about what has already been observed.

Verb tense has been an indicator of symptoms in some studies, with some evidence that focussing on the future relates to better outcomes while focussing on the past relates to poorer outcomes. In a study by Manne (2002), parents of children who successfully completed cancer treatment mailed a narrative to the researchers about their deepest thoughts and feelings, memories, and worst aspect of their child's treatment and a completed trauma symptom self-report measure. Parents also completed a structured interview over the phone. From the analyses of the written accounts, the inclusion of fewer past-tense words was associated with more avoidance symptoms and total trauma symptoms; and more future-tense words were related to greater re-experiencing, avoidance, hyperarousal, and total trauma symptoms. When analyzing narratives regarding a break-up, a greater number of present-tense words were associated with a

higher amount of grief and intrusive thoughts (Boals & Klein, 2005). In a study by Guastella and Dadds (2006), individuals were randomly assigned to five expressive writing conditions: group 1 was an exposure group that recounted the distressful event in great detail, group 2 was a devaluation group that identified what was still upsetting regarding the event, group 3 was a benefit-finding group that focussed on the benefits gained from the experience, group 4 was a standard control group that focussed on the thoughts and feelings of the event, and group 5 was a control group focussed on a trivial topic. The benefit-finding group used the highest proportion of present-tense and future-tense verbs, as well as more positive emotion and insight-related words and also reported the lowest levels of distress compared to the other experimental groups. Alternatively, the exposure group used the greatest number of past-tense verbs and used a greater proportion of negative emotion words while reporting the greatest amount of anxiety-related body symptoms.

Another study has looked at negations (Arntz, Hawke, Bamelis, Spinhoven, & Molendijk, 2012) and found that the use of negations accounted for more than 80% of themes focussed on what the writers did not have, could not do, or was missing from their life. These examples reinforce the notion that thus far nonconventional linguistic categories have the potential to offer additional insights into why expressive writing is beneficial. Additional markers that have received a moderate amount of attention are first-person plural and third-person pronouns. As mentioned earlier, studies have indicated that first-person plural is linked to better satisfaction in relationships than first-person singular (Seider, Hirschnerger, Nelson, & Levenson, 2009; Simmons, Gordon, & Chambless, 2005). A review of Mayor Giuliani's press conferences (Pennebaker & Lay, 2002) from 1993 to 2001 demonstrated changes in his usage of pronouns with the onset

of crises. During his personal upheaval earlier in life and during the attacks on the World Trade Centre, Mayor Giuliani's usage of first-person plural (e.g., we, us) increased significantly, a switch also captured by Stone and Pennebaker (2002) in analyzing chat rooms discussions after the wake of Princess Diana's death. This change in word usage exemplifies how a change in circumstances of one's life can affect the manner in which one speaks and can be noticed by looking at lesser known word categories.

Temporal patterns of change in use of linguistic markers. The focus of linguistic markers thus far has been centered on what categories are meaningful. Another integral part of studying word use is understanding the temporal aspect: the effect of the linguistic categories changes depending on when they are used. When writing once a week for three weeks regarding an upsetting experience, participants shifted in what they wrote from the first to the last session (Guastella & Dadds, 2006). Earlier narratives used more past-tense words while later narratives contained more present- and future-tense words. There was also an increase in positive, causation, and insight related words from the first to the last session. A review of six trauma-writing studies (Pennebaker, Mayne, & Francis, 1997) indicated that an increase in the number of causal and insight words from the first to the last day of writing was linked to a decrease in the frequency of physician visits and the number of physical symptoms reported. This increase in words relating to cognitive processing was further linked in the study to students' higher grades and faster re-employment for engineers. When the researchers examined affect, an increase in negative emotion words and a decrease in positive emotion words were associated with increased physical symptoms and physician visits. In a study by Hamilton-West and Quine (2007), individuals suffering from ankylosing spondylitis (a chronic inflammatory disease affecting the joints and spine) wrote about a stressful

experience. Participants completed questionnaires assessing depression and ability to function with ankylosing spondylitis at baseline and at one-month and three-month follow-up session. Their results indicated that an increase in positive emotion word use and a decrease in sadness word use as sessions progressed were related to individuals rating their disease as less debilitating. Moreover, an increase in words relating to tentativeness and a decrease in words relating to certainty (e.g., always, never) from the first writing session to the last were associated with improvement in depression scores.

Combined analyses of word use. Margola, Facchin, Molgora, and Revenson (2010) conducted a thorough analysis of word use in written narratives after inviting adolescents who witnessed a classmate's sudden and unexpected death in class, to write about it. The classmates who participated in the study wrote for 15 minutes on three consecutive days, with the first writing session occurring 15 days after the boy's death. Classmates completed measures on the first day of writing, one week following the final writing session, and four months following the final writing session. The researchers found that those whose symptom reports revealed they still found the event distressing four months after writing had used during and after completion of the study more first-person pronouns, causation words, inhibition words, and negative affect words in their narratives as compared to students who were no longer symptomatic. Moreover, those who reportedly were no longer distressed by the event used more future-tense and cognitive words, especially tentative and discrepancy words.

Through the use of two statistical techniques, the researchers were able to determine similarities and differences between linguistic categories as well as between sessions using correspondence analysis (similar to factor analysis). They were also able to identify when word categories in a particular segment were overused or underused using

the specificity analysis that is based on the chi-squared technique. The content of the first writing session compared to the second and third used more words relating to the body (i.e., in reference to the student falling down) as well as the student's name more often. The first writing session also included an overuse of words relating to death and an underuse of future-tense and positive emotion words, indicating a preoccupation with the passing of the classmate. The second writing session appeared to be a transition in that there were still a high proportion of words relating to death but also an overuse of positive emotion words and future-tense words in comparison with the other writing sessions, indicating an increase in emotional processing. This change persisted to the third writing session as it contained few words relating to death and a high proportion of positive emotion, negative emotion, and future-tense words when compared to the first two writing sessions. Moreover, the third writing session had an overuse of words relating to causation, family, and school. The change in the third writing session is indicative of greater emotional and cognitive processing with a clear change in topic from the event of the death to the significance of the event in social and personal spheres. Margola and colleagues' (2010) study is one of the few to examine a wide range of linguistic patterns over time, However, despite that strength, results from their study may not be generalizable to other populations as the study was based on a small sample ($N = 26$) of adolescents with a mean age of 15 years.

Another study that investigated many linguistic categories was conducted by Arntz, Hawke, Bamelis, Spinhoven, and Molendijk (2012) that tracked the progress of individuals with personality disorder through treatment. Individuals were assessed at intake, one-year, and two-years after beginning treatment. During each assessment, individuals wrote about their lives – who they were, how they became like that, how they

experience life currently, and where they see themselves in the future. Participants also completed questionnaires regarding personality disorders, general symptoms, and quality of life. Participants were randomly assigned to one of three treatments: schema therapy, clarification-oriented psychotherapy, and treatment as usual. A non-clinical control group – individuals without a personality disorder – was also included in the study. These participants wrote about the same topic but only wrote at intake (no follow-up sessions).

The analysis of the essays across the three assessment periods demonstrated important changes in how participants wrote as participants significantly decreased from one assessment to the next in self-reported personality disorder symptoms, personality disorder beliefs, and psychiatric symptoms while increasing in self-reported quality of life. Across all treatments, the essays decreased in the use of first-person singular pronouns, negative emotion, and causation words as well as past and future-tense verbs. Furthermore, essays increased in the use of positive emotion words and present-tense verbs. The majority of these changes in word use occurred between baseline and the one-year follow up assessment. In an exploratory analysis, the researchers found twelve additional linguistic categories that changed over the two-year time period, namely the change in the number of unique, social, metaphysical, hearing, death, optimism, and negation (e.g., no, not, didn't) words as well as articles, pronouns, words greater than six letters, the number of sentences, and the word count. The researchers also compared each assessment period to the control group and found that while positive emotion words increased over time, they remained significantly lower than word counts for the control group. When comparing conditions on negative emotion word use, the proportion of negative emotion words by the experimental condition was higher than control condition's at all three time periods. Two other linguistic categories showed distinction

from controls during the first writing session: narratives from individuals with personality disorders showed greater baseline use of causation words and lower use of present-tense verbs.

When controlling for baseline scores, two linguistic categories predicted changes in outcome measures. A reduction in negative emotion words predicted a reduction in personality disorder beliefs and a reduction in negative emotion and negation words both predicted a reduction in general distress and diagnostic criteria as well as an increase in quality of life. Although these findings demonstrate the value of analysing word use, the study differs from expressive writing tasks as the study tracked the treatment of a personality disorder, not a distressing event, and asked the participants to describe their life's progress, not to describe their thoughts and feelings regarding a specific event.

Methods for Discerning Patterns in Linguistics

Linguistic categories have been analyzed through two approaches: by way of ratings by expert judges (typically clinical psychologists or psychiatrists part of the study), or through computer programs. Historically, judges' ratings have been a preferred method as text is multilayered and was previously considered too complicated for computer interpretation (Tausczik & Pennebaker, 2010). Initially, judges' ratings were highly qualitative and were used to determine broad impressions of a text based on previously agreed dimensions. In the 1950s, judges scored phrases looking for Freudian themes, such anxiety, hostility towards others, and various psychological and interpersonal topics (Gottschalk, Gleser, Daniels, & Block, 1958). Over time, judges' impressions were categorized and statistically interpreted, known as thematic content analysis. Judges' ratings determined the presence of a critical theme or concept and have been used to study motive imagery (e.g., Atkinson & McClelland 1948; Heckhausen

1963; Winter 1994), psychiatric syndromes (Gottschalk, 1997), goal structures (Stein et al., 1997), arousal patterns associated with cultural shifts (Martindale, 1990), and levels of thinking (Pennebaker et al., 1990). In an attempt to perform text analysis via judges' rating, Weintraub (1981, 1989) hand counted everyday words people used. Throughout the decade that he analyzed political and medical speeches, he reported that first-person singular pronouns were reliably linked to people's levels of depression (Tausczik & Pennebaker, 2010). Although judges' ratings integrate complex information and coding schemes, there are still several limitations (see Tauszkik & Pennebaker, 2010). Judges do not always have inter-observer agreement on key dimensions when rating the content of deeply personal stories. Moreover, the training for this can be extensive and the research costs can be expensive.

In an effort to address these limitations, computer programs were developed to minimize the reliability problems of ratings while reducing the time otherwise required to manage a large volume of open-ended responses (Tov, Ng, Lin, & Qiu, 2013). Considered the forerunner of subsequent computer text analysis programs, the "General Inquirer" was developed by Stone and colleagues (1966) for the purpose of replacing the method of complex scoring conducted by judges of achievement imagery in the TAT. The program analyzed homographs, or ambiguous words with context dependent meanings, and then clarified the homographs using disambiguation rules. This two-step analytic process gave the General Inquirer a unique flexibility because a user-defined dictionary allowed it to perform word counts that took some context into account. The obvious limitation to this program was the length of time required to create a custom dictionary and in creating the user specific disambiguation rules.

The General Inquirer was the first computer program to work with text analysis, and many computer programs have been developed since its introduction for a wide variety of purposes. A text analysis program known as TAS/C was another system for linguistic analysis developed by Mergenthaler (1996) for the identification of words related to emotional tone and conceptual abstraction in transcripts from psychotherapy sessions. In this method, "emotional tone" referred to the extent to which emotion words were used throughout a text, and "abstractions" referred to the use of abstract nouns (i.e., nouns with –ity, -ness, -ment, -ing, or –ion suffixes). The TAS/C has been used in verbatim transcripts of psychotherapy from a number of treatment orientations (Mergenthaler, 1996; Pfäfflin, Böhmer, Cornehl, & Mergenthaler, 2005) as well as in attachment interviews (Buchheim, Mergenthaler, 2000; Pennebaker, Mehl, & Niederhoffer, 2003), but is limited by its focus on a small subset of linguistic styles. Analyzing political speeches, Hart (2001) developed a text analysis program called DICTION that reveals the verbal tone of a text by determining the extent of five independent categories: activity, optimism, certainty, realism, and commonality. The program creates a profile on the five categories using either absolute values or norm scores based on 20,000 samples of verbal discourse. Analysis using DICTION focuses on the style of writing and has been used in analysis of presidential and campaign speeches, political advertising, public debates, and media coverage (Hart, 2001).

In an attempt to understand trauma narratives, a text program was developed by Tausczik and Pennebaker (2010) to quantify the use of basic linguistics (pronouns, verbs, affect) and those developed from theory (inhibition, discrepancy). The Linguistic Inquiry and Word Count (LIWC) determines the extent that various linguistic or word categories exist within a text. These categories include basic grammar (articles, verbs, verb tense),

psychological processes (words referring to affective or cognitive processes), personal concerns (words referring to work, achievement, religion), and nonfluencies ("Um," "uh"). The intended use of the program was to predict subsequent health improvements from writing about trauma. Use of the program has since been linked to a wide range of outcomes (as described above). The LIWC has not only been applied to understanding links between word categories and outcome measures, but has been used to distinguish between distressed and non-distressed individuals who experienced the same upsetting event (Margola et al., 2010). The LIWC has shown its utility in studying trauma and stress via the expressive writing framework (Nazarian & Smyth, 2013; Margola, et al., 2010), online chat room communications (Stone & Pennebaker, 2002), press conferences (Pennebaker & Lay, 2002), everyday conversations (Mehl, Gosling, & Pennebaker, 2006), or transcribed oral descriptions (Graves, et al., 2005). The software may even be amenable to examining responses from some projective assessment methods, including the Rorschach and the TAT (Burke & Dollinger, 2005). As such, this method is a promising way of identifying the linguistic markers that predict the benefits of expressive writing.

The Current Study and Hypotheses

The goal of this study was to analyze the presence of linguistic markers in positive changes and recovery from psychological distress. Unlike previous studies that have used only a few linguistic aspects, such as affect words, words referring to cognitive processing, and specific pronouns, the current study aimed to include a greater range of linguistic categories. The purpose of doing this was to provide a more enriched description of what word categories are used in a written narrative that is most predictive of outcome, in the hope of providing a basis for future instructional guidelines on optimal

journaling. Moreover, this research project examined word usage and writing patterns in a large adult sample to further clarify what processes are related to recovery from a distressing event.

In order to analyze linguistic markers, a framework where individuals could disclose their experience and undergo treatment was required. Pennebaker and Beall's (1986) seminal work on expressive writing offered a paradigm for conducting the study of linguistic processes as predictors of outcome. Expressive writing involves individuals writing about a distressing event for 15 minutes on each of three consecutive days. The 15 minutes are reserved to write about one's thoughts and feelings in a confidential and private setting. With the use of computers, narratives can easily be typed and submitted electronically.

Linguistic markers have been used as an additional tool when investigating many of the theories that address why expressive writing works and therefore may allow one to interpret findings from a broad range of psychological frameworks. This is important for furthering research within the scope of expressive writing, to help researchers identify key factors that bring about change when writing about a distressful event. These key factors can eventually lead to improved treatment services, tools, and therapies. In the current study, word use was investigated in two ways: (1) to determine which linguistic categories predict outcome and (2) to understand how the influential linguistic markers change over time to effect outcome.

Hypothesis 1: Change in use of linguistic categories predicts outcome of expressive writing. Linguistic categories (See Table 1) were hypothesized to predict changes in the impact of the distressful event. As identified by the literature, the use of positive emotion words and most words related to cognitive processing were

hypothesized to predict positive changes in outcome while the use of negative emotion words, words relating to inhibition, and first-person singular pronouns were hypothesized to predict negative changes in outcome. The use of additional word categories were expected to have an influence on changes of outcome, but since this was an exploratory hypothesis, no valence of change (i.e., positive or negative) could be stated with confidence.

Hypothesis 2: Linguistic patterns change over time. It was hypothesized that influential linguistic categories (those that predicted changes in the impact of the distressful event) would change in expected patterns over the course of the three writing sessions. These patterns would reflect change in emotional and cognitive processes, such that difference would be apparent from the first writing session to the last. This will be tested using two sub-hypotheses. **H2.1.** The first writing session, as compared to the third writing session, was expected to include a higher frequency of words in each of the word categories that have been identified from H1 as relating to negative change in outcome. **H2.2.** The last writing session, as compared to the first, was expected to include more words that have been identified from H1 as relating to positive change in outcome.

Hypothesis 3: The pattern of change (slope) for linguistic categories over time will predict changes in outcome. Word categories that significantly changed in usage across the three writing session (as found in H2) were retained for the current hypothesis. This was an exploratory hypothesis with the aim to understand the effect of the rate of change (i.e., possibly with a linear or quadratic slope) of word categories on outcome. **H3.1.** A decrease in trauma symptoms was hypothesized to be related to an *increasing rate* of use of words that have been identified from H1 as relating to improved outcome.

H3.2. A decrease in trauma symptoms was hypothesized to be related to a *decreasing rate* of use of words that have been identified from H1 as relating to poorer outcome.

Hypothesis 4: The pattern of change of linguistic categories for the expressive writing condition will be different from that of the control condition. The pattern of the control condition for each of the word categories was expected to be no change, such that the amount of use of each word category will not vary across the three days (not increase or decrease). This acted as a baseline measure for comparison with the expressive writing condition. The pattern of the expressive writing condition was hypothesized to either decrease for word categories relating to negative outcome or increase for word categories relating to positive outcome. This was tested using two sub-hypotheses. **H4.1.** The expressive writing group was expected to use a greater number of words relating to poorer outcome as identified in H1 than the writing-control condition, but this difference would be negligible by the third writing session. **H4.2.** The expressive writing condition was expected to use fewer words associated with improved outcome as identified in H1, but this difference would be expected to be negligible by the third writing session. See Table 2 for a summary of hypotheses.

CHAPTER 2

Methods

Participants

A sample of undergraduate students (*N* = 250; Pascual-Leone, et al., 2012) came from a secondary source and were recruited from the Psychology Participant Pool at University of Windsor from October 2010 to December 2012. The sample consisted of mostly female (*n* = 213) participants, with the dominant ethnicity being Caucasian (56.3 %), with other ethnicities reported (African Canadian, South Asian, Middle Eastern, Hispanic, east Asian, and Aboriginal). Most participants reported being single (52.5%) or partnered (33.0%). Although participants' age was not asked for, the average age in the psychology participants pool at the University of Windsor while the study was running was 21.13 years (*SD* = 4.20) and ranged from a minimum of 18 years to a maximum of 53 years. Students were recruited from all years of undergraduate experience.

Although the requirements to enter the study stipulated that individuals must have experienced a stressful event, a few participants indicated that they had not experienced a trauma (9.2%) or were not sure (21.8%). When asked how upsetting the trauma was, most (83.6%) rating the experience at least as a level 5 with almost half (42.9%) rating the trauma a 7 (very upsetting) on a 1-7 Likert scale. In querying about participants' trauma, some participants were receiving therapy or counselling (10.3%) during the study or were taking medication, including antidepressants (8.0%).

Measures

The study involved generating a secondary data set from the set of expressive writing narratives collected from the study by Pascual-Leone et al. (2012). The second generation data set, which was original to this study, entailed a number of new

independent variables. Outcome measures were previously established and as such represented data inherited directly (unmodified) from the archival data.

Process measure: Linguistic Inquiry and Word Count (LIWC). The LIWC is a word count program, developed by Tausczik & Pennebaker (2010), to analyze the frequency of word categories in narratives. Originally developed in 1992 and 1994, the program underwent revisions in 1997 and 2007 to update its dictionaries and provide a broader range of analysis. These dictionaries contain over 4,500 words and word stems, with each category referring to a collection of words. In an analysis of 24,000 writers totalling over 168 million words from over 72 studies of emotional writing, writing about a trivial topic, science journals articles, blogs, or novels demonstrated that the LIWC dictionaries captured approximately 86 percent of the total words used (Pennebaker, Chung, Ireland, Gonzales, & Booth, 2007). This is in part due to the use of function words, which account for 55 percent of the words spoken, heard, or written (Tausczik & Pennebaker, 2010). Function words include prepositions, articles, prepositions, conjunctions, and auxiliary verbs – a collective list of about 500 words.

Some of the dictionaries are hierarchically organized, such that a word may be counted as part of multiple dictionaries. For example, the word “annoyed” will be counted under the dictionaries of “anger,” “negative affect,” and “overall affect,” as well as “past-tense verb” and “common verb.” If desired, user-defined dictionaries can also be created. The program generates 80 output variables per text analysis, including total word count, words per sentence, percentage of words captured by the dictionary, percent of words longer than 6 letters, and the percentage of each of the 76 word dictionaries. The dictionaries have been translated into multiple languages, including Spanish, German, Dutch, Norwegian, Italian, Portuguese, Arabic, Korean, Turkish, and Chinese.

To create the dictionaries, various steps were undertaken to assign words appropriately. For all subjective categories, an initial selection of word candidates was gleaned from dictionaries, thesauruses, questionnaires, lists made by research assistants, and from common rating scales (e.g., Positive Affect and Negative Affect Scale). Groups of three judges then independently rated whether each word should be included into its intended category. The various dictionaries were updated based on three rules: (a) a word remained in a dictionary if two judges agreed on its inclusion; (b) a word was deleted if at least two judges agreed on its exclusion; and (c) a word was added if at least two judges agreed on its inclusion (Pennebaker, Chung, Ireland, Gonzales, & Booth, 2007). This entire process was then repeated a final time by a separate group of three judges that focused on the hierarchical dictionaries. The final percentages of judges' agreement for this second rating phase ranged from 93% to 100% agreement. Some dictionaries did not undergo a rating process due to their objectivity (e.g., pronouns, articles, verbs). In the 1997 revision, an analysis of 8 million words from several dozen studies was used to determine base rates of the dictionaries. Some of the original dictionaries were omitted from the program if they had been used infrequently (base rates lower than 0.3 percent of total word count) or had poor reliability or validity. Internal reliability was determined by the degree to which the words in a dictionary were used across a select number of texts (Pennebaker, et al., 2007). Intercorrelations of the word use were then calculated via a binary method (presence or absence) and an uncorrelated method based on percentage of total word counts. Both methods were employed as the binary method, which can overestimate reliability due to essay length while the uncorrelated method can underestimate due to variable base rates. The majority of the reliability rates were above .60. Validity for the LIWC was recorded by Pennebaker and Francis (1996) where

judges' ratings were compared with the LIWC categories and resulted in strong relationships in the predicted directions, with Pearson correlations ranging from .35 to .75.

One common criticism of the LIWC is that it fails to regard the context or implied meaning of a word, as the LIWC will identify the word "happy" in the sentence "I am not happy" as a positive emotion, indicating that there is some measurement error. Pennebaker and Francis (1996) found that such changes in meaning due to context resulted in only a minimal amount of miscalculation, and thereby did not detract from the integrity of the program in any substantive way. Moreover, context-independent analysis may provide information that context-dependent interpretations cannot give, as found in a study conducted by Pennebaker, Mayne, and Francis (1997). Closer examination of word contexts indicated individuals were more likely to increase in self-reported happiness when they wrote, "I am not happy," rather than writing, "I am sad," in discussing a personally distressing event. Findings like this provide some reassurance to skeptics about the validity of this method which reduces the rich meaning in prose to simply number crunching the raw counts of word usage.

Treatment outcome measure (from archival data; Pascual-Leone et al., 2012). A battery of self-report measures was administered in the study by Pascual-Leone et al. (2012) at three time points: prior to the first expressive writing task, two weeks after, and five weeks after. Based on preliminary results from Pascual-Leone et al., only the Impact of Events Scale-Revised (Weiss & Marmar, 1997; -- described below) was used for the current study since, on theoretical grounds, as it most related to the symptoms under investigation and was expected to have the potential to reveal differences in analysis. This measure was administered to assess participants' distress in relation to their distressing

event, and was used in the current study as the indices for psychological well-being following the expressive writing task. Additional measures administered in the study by Pascual-Leone and colleagues (2012) but not proposed for use in this research are Anger Rumination Scale (ARS; Sukhodolsky, Golub, & Cromwell, 2001), The State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983), the Center for Epidemiologic Studies Depression Scale (CESD; Randloff, 1977), the Current Assessment of Somatic Symptoms Inventory (CASSI; Sirois & Gick, 2002) & Global Health rating, the Post-Traumatic Growth Inventory-SF (Tedeschi & Calhoun, 1996), the Resolution Scale-adapted (Singh, 1994), and the Satisfaction with Life Scale (SWLS; Diener et al., 1985; Pavot & Diener, 2009).

The Impact of Events Scale-Revised (Horowitz, Wilner, & Alvarez, 1979; IES-R). The IES-R is widely used within the trauma literature, recording the self-reported subjective distress in relation to a trauma, focusing on intrusion, avoidance, and hyperarousal. These areas are evaluated by having individuals indicate to what extent they experience each of 22 symptoms over the past week and rate their response on a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely). Examples include “I had trouble falling asleep” and, “I felt irritable and angry” (See Appendix A). The IES-R has demonstrated adequate internal consistency (Cronbach’s alpha = .84 to .94), high concurrent validity (ranging from .71 to .86), and high test-retest reliability (ranging from .89 to .94; Beck, et al., 2008). Pre-test and post-test scores were taken as part of the parent-study.

Procedures

Recruitment in archival study. Participants were given access to sign up for the study by Pascual-Leone et al. (2012) by admission to two criteria, that they had

experienced a distressing event and reported that they still had troubled feelings in regards to the incident. Participants signed up for three visits either in the morning or afternoon. During the initial visit, participants signed a consent form, were assigned a numerical code, completed base line measures, and were given 15 minutes to write about the distressing event.

Expressive writing task. Participants wrote for 15 minutes on three consecutive days. The basic writing instructions were modified from Pennebaker and Beall (1986) and given to the participants in the expressive writing condition (n = 208) as follows:

> "During the next 15 minutes, please write down your deepest thoughts and feelings about the most upsetting or traumatic experience of your entire life (i.e., the topic you have chosen for this study). In your writing, we'd like you to really let go and explore your very deepest thoughts and feelings. You might tie your topic to your relationships with others, including parents, lovers, friends, or relatives. You may also link this event to your past, present, or your future; or to who you have been, who you would like to be, or who you are now. Once you begin writing, continue to do so without stopping for the entire 15 minutes without regard to spelling, grammar, or sentence structure. All of your writings will be completely confidential."

Participants in the control condition (n = 53) also wrote for 15 minutes on three consecutive days. Their writing instructions were designed to limit writing to a mundane and non-emotive topic as follows:

> "During the next 15 minutes, please write down in as much detail as possible what you did in the last 24 hours. This account should be from memory and should be

as objective as possible. So, try to avoid adding personal thoughts and feelings as you describe the last 24 hours.

Outcome data collection. Measures were given during the initial visit before writing as well as four weeks after completing the last writing session.

CHAPTER 3

Results

Preliminary Analyses: Data Cleaning

Before the narratives could be analyzed using the LIWC program, the narratives were cleaned for spelling and punctuation errors as well as other rules necessary for compatibility with the software (see Appendix B). A third of the narratives (33%) were cleaned by the author with the other narratives (66%) were cleaned by a trained research assistant. Data cleaning by the author and assistant were done in parallel and procedures conducted by the assistant were spot-checked to ensure accuracy and adherence data cleaning directions. Some of these rules were straight forward, such as writing out the complete word for an abbreviation, but limitations of the program require adjustments in the text for writing that is otherwise correct. For example, the LIWC program requires the researcher to remove all instances when an apostrophe is used in a contraction (e.g., he's) as the program counts all uses of an apostrophe as indicating possession. All narratives were cleaned using the same guidelines before analyses were conducted.

Data was checked for missing information, and 19 cases were removed for not completing the study (n = 17) or having extensive missing data (n = 2). The data included less than 1% of missing data and was analyzed with Little's MCAR test, which was not significant, $\chi^2(1790) = 1549.57$, $p > .999$, meaning the missing data was completely random and not due to any systematic bias or error. No outliers or influential observations were found.

Assumptions of hypothesis 1. Several assumptions are required to be met for a hierarchical regression. The assumption of adequate sample size was met as the number of participants to the number of predictors did reach the minimal level of 15 predicts per

participant (N = 242; 16 predictors; Field, 2013). The assumption of independence of errors was met as individuals worked separately from each other and were asked not to discuss the study with others. Multicollinearity was not indicated from the VIF and tolerance values or correlations between predictors (see Table 3). The assumption for the normal distribution of errors was met from viewing a histogram of the standardized residuals as well as observing the q-q plots for each predictor. The assumptions of linearity and homoscedasticity were not met according to visual inspection of residuals plotted against predicted values. However, the model is robust against violation of these assumptions as the normality of errors was satisfied as well as meeting the required 15 participants per predictors. For linearity, an observation of the bi-variate scatter plots indicated that the majority of predictors had a linear relationship.

Assumptions of hypothesis 2. The assumptions for a repeated measures ANOVA include the assumption of normality as well as sphericity. Normality was checked by using the Shapiro-Wilk's test and inspections of skewness and kurtosis. Shapiro-Wilk's test indicated that most variables were not normally distributed, but very few variables had skewness or kurtosis values outside the acceptable range of +1 to -1. The repeated measures test is robust to any violations of normality. Sphericity was measured with Mauchley's test, which indicated violations of sphericity for testing first-person singular pronouns, $\chi^2(2) = 8.25$, $p = .016$, and past-tense verbs, $\chi^2(2) = 10.11$, $p = .006$. The Huyng-Feldt correction was used for both tests that violated sphericity as their epsilon values were greater than .75. Family-Wise Error was taken into consideration by adjusting the p-value to .008 (.05/6) as six tests were conducted.

Assumptions of hypothesis 3. Three Repeated Measures Multivariate Analysis of Covariate Analyses (MANCOVA; this analysis mimics some aspects of linear growth

modeling) were conducted for each individual word category, but the assumptions are the same as those for a repeated measures ANOVA and are based on the original set of variables. The MANCOVA uses a specific syntax to analyze whether the slopes predict outcome based on correlations without transforming the relationship between variables. The assumptions that should be met are the same as in Hypothesis 2. Therefore, the assumption of normality was found to be met while the assumption of sphericity was not met for two of the three variables (i.e., first-person singular pronouns and past-tense verbs).

Assumptions of hypothesis 4. In addition to the same assumptions required for hypothesis 2, the assumption of homogeneity of variances also applies as there is a between-subjects factor. The assumptions of normality were not met by the Shapiro-Wilk's test for about half of the 36 values analyzed. When skewness and kurtosis were viewed, the data was nearly always within the recommended range. Sphericity was measured with Mauchley's test, which indicated violations of sphericity for testing first-person singular pronouns, $\chi^2(2) = 17.73$, $p < .001$, past-tense verbs, $\chi^2(2) = 12.96$, $p = .002$, and word count, $\chi^2(2) = 6.58$, $p = .037$. The Huyng-Feldt correction was used for these 3 categories that violated sphericity as their epsilon values were greater than .75. Family-Wise Error was taken into consideration by adjusting the *p*-value to .008 (.05/6) as six tests were conducted. Homogeneity of variances was tested with Box's test of equality of covariance matrices as well as Levene's test of equality of variances. Box's test indicated that the assumption of homogeneity of variances was met for all categories.

Testing Hypotheses

Hypothesis 1: Change in Use of Linguistic Categories Predicts Outcome of Expressive Writing. A hierarchical regression was used to determine which linguistic

categories predicted individual's post-test score on the IES-R. The purpose of this first regression was to determine which of the word categories were potential indicators of recovery from trauma or stress. The hierarchical regression used the pre-test scores of the IES-R in the first block. This was done to partial out the influence that pre-test scores had on the post-test scores. Individuals' scores for each word category were calculated by averaging how often each word category was used across all three days. Baseline score of the IES-R entered in the hierarchical regression in the first block was statistically significant, $F(1, 189) = 213.76$, $p < .001$ and explained 53% of the variance ($R^2 = .53$) in IES-R post-test scores. In the second block, 16 word categories were entered. The total model was statistically significant, $F(17, 173) = 17.53$, $p < .001$, and the 16 word categories explained an additional 10% of the variance (R^2 change = .10) in IES-R post-test scores. The results showed some expected findings as some of the word categories that were most frequently analysed in previous studies predicted outcome.

Table 4a provides a summary of the hierarchical regression with the 16 word categories entered simultaneously. Table 4b provides a summary of individual regressions for each of the 16 word categories. Because of the similarity in findings when word categories were examined individually vs. simultaneously, I chose to examine future analyses in the context of findings from the hierarchical regression, so as to provide a clearer picture of which variables had unique contributions to the process at hand. Namely, the key variables in table 4a were first-person singular pronouns and words relating to cognitive processing. First-person singular pronouns predicted outcome ($\beta = .10$) such that a greater use predicted higher post-test IES-R scores, which represents greater levels of distress. Thus, the more individuals apparently focussed on themselves in the narratives, the more they rated the stressful or traumatic event as having a negative

impact. This result was supportive of the hypothesis in that the use of first-person singular pronouns would predict negative outcome.

Three word categories relating to cognitive processing (inhibition, causation, certainty) also predicted outcome. An increase in the use of words representing inhibition ($\beta = .13$) predicted an increase in distress at outcome, while an increase in words representing causation ($\beta = -.13$) and words representing certainty ($\beta = -.10$) predicted a decrease in distress at outcome. These word categories show that more positive outcome occurred when individuals used fewer words that refer to restrictions and more words that reflect a searching for, and forming, conclusions. Neither of the emotion word categories (i.e., positive, negative) predicted outcome. The results on cognitive processing words are aligned with the hypothesized direction of change predicted by the word categories.

Two word categories that have received far less attention in studies on expressive writing were past-tense verbs and word count. However, in the current study, as use of past-tense verbs increased, the scores of the post-test IES-R decreased ($\beta = -.18$). This indicates that the more individuals talked about events as having taken place in the past, the better they seem to feel at the end of the intervention. Total word count also predicted outcome where an increase in the number of words written predicted an increase in post-test IES-R scores ($\beta = .11$), which may indicate that the more distressed an individual is by an event the more he or she writes about it.

Hypothesis 2: Linguistic patterns change over time. Mean frequencies for each of the 6 word categories over three writing sessions is presented in Table 5. Six 1 (words category) x 3 (writing sessions) repeated measures ANOVAs were conducted to determine whether word categories were used with more or less frequency during any of the three writing days. It was hypothesized that word categories that correlate with

negative improvement would be used with higher frequency during the first writing session compared to the third and final writing session. The opposite was hypothesized for the third day such that words relating to positive outcome would be used with higher frequency during the third writing session than the first writing session. Family-wise error was corrected for by reducing the significance level to $p = .0083$ (.05/6 = .0083).

There was a significant difference between sessions for past-tense verbs, $F(1.94, 368.06) = 47.97$, $p < .001$, $\omega^2 = .197$. Specifically the first session had significantly higher ($p < .001$) frequency of past-tense verb use ($M = 6.87$, $SD = 2.80$) than either the second writing session ($M = 5.30$, $SD = 2.66$) or the third ($M = 4.95$, $SD = 2.70$). There was also a statistically significant difference between sessions in the use of words representing causation, $F(2, 380) = 7.86$, $p < .001$, $\omega^2 = .035$; with the first writing sessions having a lower frequency of word use ($M = 1.97$, $SD = .78$) than the second ($M = 2.19$, $SD = .91$) or third ($M = 2.24$, $SD = .90$) writing session. Difference between writing sessions for the frequency of first-person singular pronoun usage was statistically significant, $F(1.92, 364.75) = 5.80$, $p < .0083$, $\omega^2 = .025$, with the first day having a higher frequency ($M = 10.08$, $SD = 3.24$) than the second ($M = 9.66$, $SD = 3.13$) and third sessions ($M = 9.42$, $SD = 3.28$). No significant differences were found between writing days for the categories of word count [$F(2, 380) = .75$, $p > .05$, $\omega^2 = -.001$], words relating to certainty [$F(2, 380) = .85$, $p > .05$, $\omega^2 = -.001$], and words relating to inhibition [$F(2, 380) = .20$, $p > .05$, $\omega^2 = -.004$].

In summary, these observations are partially supportive of the hypotheses and show a pattern where (irrespective of outcome) individuals in this expressive writing task use language that reflect more focus on past-tense and personal events, and less focus on discovering reasons. Later in the process, their language was characterized by a greater

focus on understanding causes with less of a focus on the individual's personal perspective and less on past events.

Hypothesis 3: The pattern of change (slope) for linguistic categories over time will predict changes in outcome. A MANCOVA was used to determine whether the slope of word usage over the three writing sessions of the study predicted post-IES-R scores for the three variables that had significant differences between word usage across days (i.e., first-person singular pronouns, past-tense verbs, and words relating to causation). As before, family-wise error was corrected for by reducing the significance level to $p = .0083$. Analyses found that for first-person singular pronouns, neither the intercept, (B = .24) t=1.01, $p > .05$, 95% CI [-.23, .72], linear relationship, (B = -.35) t= -.64, $p > .05$, 95% CI [-1.40, .71], nor quadratic relationship, (B = .26) t= .38, $p > .05$, 95% CI [-1.08, 1.60] predicted changes in outcome. Similarly, analyses for words relating to causation also resulted in non-significant findings for the intercept, [B = -.74] t= -.78, $p > .05$, 95% CI [-2.62, 1.14]; linear relationship, [B = -1.58] t= -.95, $p > .05$, 95% CI [-4.84, 1.68]; quadratic relationship, [B = -1.33] t= 1.73, $p > .05$, 95% CI [-4.73, 2.08]). The use of past-tense verbs also had no significant change: intercept: [B = -.45] t= -1.66, $p > .05$, 95% CI [-.98, .08]; linear relationship: [B = .03] t= .054, $p > .05$, 95% CI [-1.03, 1.09]; quadratic relationship, [B = .63] t= .98, $p > .05$, 95% CI [-.64, 1.89]. These results do not support the hypothesis that the slope of change for predictor variables would relate to outcome.

Hypothesis 4: The pattern of change of linguistic categories for the expressive writing condition will be different from that of the control condition. The mean frequency of occurrence for each of the six word categories for each condition, over three writing sessions is presented in Table 6. Each predictor retained from hypothesis 2 (i.e.,

past tense verbs, words relating to causation, and first-person singular words) was analyzed with a 2 (expressive writing condition and control condition) x 3 (time) Repeated Measures ANOVA to determine whether the expressive writing condition used word categories at a different rate than the control condition across the three days. Once again, family-wise error was corrected for by reducing the significance level to $p = .0083$.

The first repeated measures ANOVA was for past-tense verbs (See Figure 2) and revealed a significant main effects of time [$F(1.92, 457.39) = 15.63$, $p < .001$, $\omega^2 = .056$], in addition to a main effect of condition [$F(1, 24 = 100.00$, $p < .001$, $\omega^2 = .292$], and interaction [$F(1.92, 457.39) = 6.83$, $p < .001$, $\omega^2 = .022$]. Post hoc analyses indicated that the expressive writing condition had a significantly ($p < .001$) lower frequency of past-tense verb use ($M = 5.71$) than the control writing condition ($M = 9.01$). This result was somewhat supportive of the hypothesis, which stated that participants in the expressive writing condition would use fewer past-tense verbs compared to the control condition and increase in that word usage over time. Participants in the expressive writing condition used fewer past-tense verbs during the first writing session as found in hypothesis 2 but, instead of increasing, their usage decreased over time. One reason why a between-group difference was observed may be that the control condition was explicitly asked to discuss a *past* event without referring to thoughts and emotions whereas the expressive writing condition was asked to include thoughts and feelings, which includes *current* thoughts and feelings about the past. This difference in instruction may have led the expressive writing condition to continually use fewer past-tense verbs compared to the control condition as they spent a proportion of the writing time thinking about other aspects of their past situation, namely, its relevance to the present. In regards to the expressive writing condition's decrease in the use of past-tense verbs, one possible explanation is

that as participants attempted to make meaning of the experience, they focussed less on the past and more on hypotheticals or general observations in an attempt to "make sense" out of what happened. If this was the case, it would seem to reflect a therapeutic process.

Next, three separate repeated measures ANOVAs were conducted for word categories related to cognitive processes (i.e., words related to causation, inhibition, or certainty) and they each produced similar results. The analysis for words relating to *causation* revealed a statistically significant main effect of condition [$F(1, 238) = 77.30$, $p < .001$, $\omega^2 = .241$], but there was no statistically significant main effect of time [$F(1.99, 473.85) = 2.91$, $p > .017$, $\omega^2 = .008$] or interaction [$F(1.99, 473.85) = 1.01$, $p > .017$, $\omega^2 = .000$]. Post hoc analysis indicated that the expressive writing condition had a significantly ($p < .001$) higher frequency of use for words relating to causation ($M = 2.14$, $SD = .62$) than the control condition ($M = 1.26$, $SD = .62$). The analysis for words relating to *inhibition* also revealed a statistically significant main effect of condition [$F(1, 238) = 13.28$, $p < .0083$, $\omega^2 = .049$] where the expressive writing condition used words relating to inhibition ($M = .49$, $SD = .25$) with statistically higher frequency ($p < .001$) than the control condition ($M = .34$, $SD = .25$). There was no significant main effect of time [$F(2, 476.00) = .75$, $p > .05$, $\omega^2 = -.001$], or interaction [$F(2, 476.00) = .42$, $p > .05$, $\omega^2 = -.002$]. Regarding words relating to *certainty*, the analysis revealed a statistically significant main effect of condition [$F(1, 238) = 217.65$, $p < .0083$, $\omega^2 = .474$], but there was no significant main effect of time [$F(2, 476.00) = .25$, $p > .05$, $\omega^2 = -.003$], or interaction [$F(2, 476.00) = 1.00$, $p > .05$, $\omega^2 = .000$]. Post hoc analyses revealed that the expressive writing condition used a statistically significant ($p < .001$) greater number of words relating to certainty ($M = 1.82$, $SD = .53$) than the control condition ($M = .57$, $SD = .53$). These findings are illustrated in Figure 1.

In short, when compared to the control, the expressive writing condition used significantly more words related to causation, inhibition, and certainty. Nonetheless, these findings relating to the three categories of cognitive processing words (i.e., words relating to causation, inhibition, and certainty) were generally not supportive of the hypothesis. The between-group difference for usage of word categories between expressive writing and control conditions on the first day was as expected in only one word category: words relating to inhibition. The hypothesized changes over time (that might make initial between-group differences negligible) was not seen for any of the three word categories relating to cognitive processing as each word category maintained their discrepancy across all three writing sessions.

The repeated measures ANOVA on first-person singular pronouns revealed no statistically significant main effects of condition [$F(1, 238) = 1.43$, $p > .017$, $\omega^2 = .002$] or time [$F(1.89, 449.25) = 1.38$, $p > .017$, $\omega^2 = .002$], as well as no significant interaction, [$F(1.89, 449.25) = 96$, $p > .017$, $\omega^2 = .000$]. These results were contrary to the hypothesis and therefore not expected. The final repeated measures ANOVA on word count revealed a statistically significant main effect of time [$F(1.97, 469.05) = 6.88$, $p < .0083$, $\omega^2 = .023$] as well as a significant interaction [$F(1.97, 469.05) = 5.59$, $p < .0083$, $\omega^2 = .018$]. There was no significant main effect of condition [$F(1, 238) = 4.64$, $p = .032$, $\omega^2 = .015$], although it did approach significance. The trend was for participants in the expressive writing condition to write more words ($M = 578.53$, $SD = 179.54$) compared to the control condition ($M = 516.59$, $SD = 179.54$).

CHAPTER 4

Discussion

Overview of Findings

The main goal of this study was to determine whether individuals who are on the road to recovery after suffering from a traumatic or stressful event have a similar style of writing to one another and whether that style of writing incorporates a range of linguistic categories and changes in usage of those words over time. Examining a wider range of linguistic categories compared to other studies as well as how each linguistic category's use changes over time offers a richer understanding of how individuals write about their trauma or stressful event. This richer understanding could shed light on the mechanisms of change at work in helping someone work through unresolved distress.

This study investigated the small subset of linguistic categories that most studies in the literature also investigate, namely: first-person singular pronouns, words relating to causation, and emotion words (Pennebaker et al., 2007). Prior studies have often shown these word categories to be correlated with or predictive of outcome. This study further incorporated additional linguistic categories, such as temporal verbs and subcategories of words relating to cognitive processing, with the aim that these word categories would provide additional insight into the writing style that might be related to psychological wellbeing. Studies have shown that these word categories might offer additional information besides what the more commonly examined word categories provide (Arntz et al., 2012; Boals & Klein, 2005; Pennebaker, Mehl, & Niederhoffer, 2003). This study also investigated how predictive word categories change in usage over a series of the three writing sessions as the importance of the temporal sequence of word use has

provided additional information regarding the manner in which individuals write (Margola et al., 2010).

The results from this study found partial support for the stated goals. The study found support for only a few categories that have otherwise receive little investigation, confirming the centrality of word categories that are already the targets of more frequent exploration in the existing literature. This study also found that observing word use over time for some, but not all, word categories provided more insight into how individuals write about their distressing experience.

Word Categories Predict Outcome

The examination of narratives about a traumatic or stressful event was expected to reveal several word categories as markers of participants recovering from a distressing experience. Six word categories were found to predict change in individuals rating of their upsetting experience, four of which are commonly studied in the research literature (i.e., words relating to inhibition, causation, and certainty as well as first-person singular pronouns) and two of which are studied less often (i.e., past-tense verbs and total word count). Individuals reported the event having less of a distressing impact when they used *more* words relating to causation, certainty, or past-tense, and used *fewer* words relating to inhibition, first-person singular pronouns, or when they wrote fewer words overall. In short, use of the first three word categories is predictive of positive outcome, while use of the latter three is predictive of negative outcome. With some exception, this is largely consistent with the literature.

The findings that words related to cognitive processing were significant predictors was as expected. In the study by Margola and colleagues (2010), those participants who were still distressed used a greater number of words referring to inhibition while those

who recovered used a greater number of words relating to causation. In contrast, a study by Hamilton-West and Quine (2007) found words related to certainty were markers of *fewer* psychological improvements whereas improvement was made when participants began instead to use more words related to tentativeness. The current study found words related to certainty predicted positive outcome, possibly because individuals were referring to setting boundaries. This concept is related to assertive anger found in Pascual-Leone and Greenberg's (2007) model that emphasizes setting limits and is a healthy emotion related to better outcomes. Less use of first-person singular pronouns predicted lower distress, which has also been found in several other studies (Boals & Klein, 2005; Pennebaker & Lay, 2002). Rude, Gortner, and Pennebaker (2004) found that individuals who were depressed used a greater number of first-person singular pronouns when writing about the challenges of starting college than those who had never been depressed.

Thus, the findings that words relating to cognitive processing and first-person singular pronouns predicted change in outcome was comparable with the literature (Hoyt & Pasupathi, 2008; McCullough, Root, & Cohen, 2006; Rude, Gortner, & Pennebaker, 2004; Pennebaker, Mayne, & Francis, 1997), but the non-significance found for emotions words was unexpected. As in this study, Boals and Klein (2005) examined narratives describing a distressing event (i.e., a romantic break-up) from a non-clinical population. The authors found similar results, in that more words relating to cognitive processing and lesser use of first-person singular pronouns predicted positive changes in outcome. However, in contrast to the current study, Boals and Klein found a greater use of negative emotion words was also a significant predictor of more avoidance with respect to the distressing event. As a note, the current study did not examine the relation between word use and avoidance, although that was a subscale of the outcome measure used. It may be

that the current study's analysis of emotion words did not correlate outcome, as similarly observed by Hamilton-West and Quine (2007). Those researchers found that use of positive and negative emotion word use was not related to improved psychological health and hypothesized that an individual's inability to express emotions may have been a factor in why the non-significance was found. Other studies have shown that alexithymia may be a moderating variable in the use of word categories analyzed by the LIWC (Pluth, 2012) or changes in outcome (van Middendorp & Geened, 2008). The possibility of such a moderating variable on the overall usage of emotion words may also be an effect in the current study.

The two word categories that are less frequently examined in the literature but still predicted changes in the current study were the use of past-tense verbs and total word count. The finding that a greater use of past-tense verbs was associated with lower symptoms related to PTSD is consistent with results from a study conducted by Manne (2002). That study found that parents who used a greater number of past-tense verbs when writing about their child surviving cancer also reported less avoidance of the event as well as fewer symptoms of traumatic stress. Manne suggested that the use of past-tense verbs is consistent with cognitive processing theory. The parent who refers to the past more often is confronted more with the child's experience facing cancer and thereby integrates that experience into their own life more successfully. As mentioned by Manne, individuals who refer more often to the past may be engaged in their historical account in potentially healthy ways such as trying to understand it better, instead of unhealthy alternatives such as ruminating. This engagement with distressing experience may have influenced the outcome measure (i.e., IES-R) as one of its subscales focusses on

avoidance symptoms. If individuals are more engaged, it is likely that this would entail fewer avoidance symptoms.

Change in Word Use Occurred during the First and Second Writing Sessions

Three of the six word categories that predicted outcome varied in their usage over the three writing sessions. The first writing session included a greater number of first-person singular pronouns and use of past-tense verbs as well as lower number of words relating to causation. The second and third writing session used a greater number of words relating to causation and a fewer number of first-person singular pronouns and past-tense verbs. It is interesting to note that the major change in word use of these three variables occurred between the first and second writing sessions with a plateau (i.e., no significant change) occurring between the subsequent (second and third) writing sessions.

Past literature indicates that an individual's transition from a fact-focused state to a state focussed on applying coping strategies is indicative of recovery. For example, in the study by Margola and colleagues (2010), the researchers found that the words used during the first of three writing sessions were comprised mostly of words regarding the facts of the distressful event the group had experienced (e.g., words referring to death). By the third writing session, the narratives used fewer words relating to factual events and far more emotion words as well as future-tense verbs. The researchers hypothesized that individuals engaged in more coping strategies and meaning-making as time progressed. The current study shows a similar pattern where individuals began by referring to more personal experiences in the past during the first session before transitioning to a greater focus on finding explanations for the events. The increase in words relating to causation reflects an increase in cognitive processing. The use of causation words has been linked to less cognitive suppression and more superficial processing (Beevers & Scott, 2001).

Although the word count for words relating to inhibition and certainty did not change over time, these findings still provide useful insight into the manner in which individuals wrote about their distressing experience. It may be that as individuals engage in coping strategies the use of some linguistic categories change over time while others linguistic categories do not.

Change in Word Use over Time does not Predict Outcome

No pattern in the use of linguistic categories over time, whether quadratic or linear, predicted outcome. It is important to note that this was an exploratory inquiry as no other study has tested whether such patterns exist as no study has investigated whether the rate of change between the three writing sessions (i.e., slope) predicted outcome. Some studies have investigated whether an increase or decrease in word usage predicted outcome (e.g., Hamilton-West & Quine, 2007), but the results are not comparable as only a rate of change occurred, one which did not impact outcome.

Expressive Writing Condition Wrote differently than the Control Condition

Individuals in the expressive writing condition used a greater number of words related to cognitive processing (i.e., words related to causation, inhibition, and certainty; see Figure 1) and fewer past-tense verbs (see Figure 2) compared to those who wrote about non-emotional events that took place the day before each writing session as per the control conditions instructions. Regarding outcome, individuals in the expressive, compared to the control condition, showed patterns of writing indicative of both positive and negative outcome. The pattern in the expressive writing condition that was indicative of positive outcome was greater usage of words relating to causation and certainty compared to the control condition, as from H1, the greater use of both word categories predicted improved outcome. The pattern in the expressive writing condition that was

indicative of negative outcome was, compared to the control condition, a fewer use of past-tense verbs, as fewer use was related to poorer outcome, and a greater use of words related to inhibition, as a greater use was related to poorer outcome. This combined pattern may be reflective of individuals working through their difficulties. Pascual-Leone (2009) highlighted that individuals do not change in a linear direction but rather show improvements and regressions within the same therapy session. Thus, the mixed findings of both patterns of positive and negative outcome may be indicative of that non-linear emotional processing.

Few studies have made comparisons of word usage between an expressive writing condition and a control condition. One such study was conducted by Arntz and colleagues (2012) who found that the difference in usage of words relating to causation and past-tense verbs between the expressive writing and control subsided over the course of the two years of the study. Given that the participants in the study were asked to write about general aspects of their lives instead of a distressing event and about receiving therapy, as well as the fact that the study lasted over the course of two years, makes comparison difficult.

One important but limited comparison can be made to a mega-analysis study (Pennebaker et al., 2007) that investigated writing styles of several conditions, including an expressive writing condition and control condition. Data for the expressive writing and control conditions were compiled from over a thousand files for both groups that the researchers received from twenty-nine different studies. This amalgamation of data provided base rates of each word category analyzed by the LIWC for either condition. The base rates the researchers established indicated that overall the expressive writing condition used a greater number of words compared to the control condition in every

category of interest to this study, namely, past-tense verbs, first-person singular pronouns, word count, and words relating causation, certainty, or inhibition. The current study found comparable results as the categories relating to cognitive processing and word count were used more frequently by participants in the expressive writing condition than in the control condition, and the frequency of use for these categories for each condition in the current study are comparable to the base rates set in the larger study. One difference between studies was the frequency with which individuals in the control condition used past-tense verbs, as those in the current study used a greater number than the base rates that were established. As already suggested, this may be due to the writing instruction for the control condition in the current study as the participants were asked to write about the sequence of events in the 24 hours prior to writing. Individuals in the control condition in the larger study mainly wrote about their plans for the day or descriptions of objects or events. This difference in instructions could explain the elevated frequency of use for past-tense verbs.

Previous hypotheses have established that first-person singular pronouns are a predictor of outcome, but the expressive writing condition's usage of first-person singular pronouns may be an artifact of the writing condition itself. This may be implied as there was no difference in usage of first-person singular pronouns between conditions in the current study. Chung and Pennebaker (2008) compared three methods of expressive writing to a control condition and found no difference between the expressive writing groups and the control condition in their use of first-person singular pronouns. That study, like the current one, asked individuals in the control condition to write about a sequence of event in their past. This may have been the reason for why no differences were seen in first-person singular pronouns as both individuals were still focussed on past events of

their lives. Other studies have asked control participants to describe ordinary objects or events (see Pennebaker et al., 2007), which would inherently lead participants away from writing using first-person point of view and reduce the use of first-person singular pronouns.

Strength, Limitations, and Future Research Directions

This study confirmed that studies seeking to understand processes related to change in outcome should focus on categories related to cognitive processing and first-person word use, although the importance of emotion word use was not observed. One addition that the current study recommends to this core set of word categories is the inclusion of time orientation, namely the use of past-tense verbs, as has been highlighted in other studies (Boals & Klein, 2005; Manne, 2002; Pennebaker & Lay, 2002). The current study further highlighted the unique aspect of how participants' use of linguistic categories changed over time. This is important for studies seeking to better understand the underlying mechanisms of change that may be active when individuals engage in expressive writing. Many studies have simply viewed the overall use of a linguistic category but do not observe changes in word use over time (e.g., Follette, Hall, & Palm, 2002; van Middendorp & Geenen, 2008; Schwartz & Drotar, 2004), which may have lent more credence to their findings. The current study highlighted individuals' unique pattern of writing, wherein they used some words categories consistently over time (i.e., words relating to cognitive processing) while using others at varying rates (i.e., first-person singular pronouns and past-tense verbs) during each writing session. The current study made use of a control condition to determine whether the expressive writing condition's use of linguistic categories was an effect of writing condition or an artifact of writing itself. The inclusion of a control condition changed the interpretation of the expressive

writing condition's use of first-person singular pronouns. It was noted that the control condition's instructions may have negatively impact comparisons with past-tense verbs between conditions, but other comparisons of word categories should not be affected and are still considered as valid. As such, other studies may need to make use of a control condition that uses established instruction to differentiate between effects of condition from artifacts of writing.

A limitation of the current study was comparing predictive categories to the expressive writing condition as a whole. It may be possible that some individuals within the expressive writing condition did not improve over time, and that their pattern of word usage may be different for those who did recover. Margola and colleagues (2010) divided participants into several groups depending on whether they were distressed or not distressed before or after completing the expressive writing task. The majority of the participants in their study (75%) were identified as a stable-distressed group, wherein individuals reported elevated levels of distress before and after writing. Only a small number of individuals (15%) were identified in the recovery group where they progressed from elevated distress before writing to "normal" levels after writing. The researchers found varying patterns of word usage for either group.

It may be that similar subgroups exist within the expressive writing condition of the current study, and that their differing usage of word categories was a reason why mixed results were found when comparisons were made to the control condition. This suggests that expressive writing did not have a strong enough of an impact to change certain individual's coping mechanism. Not all expressive writing studies have reported positive changes (see Frattaroli, 2006). Determining which individuals alleviated their unresolved feelings or not within the expressive writing condition was beyond the scope

of the current project. Moreover, subgroups would have had limited use as the range of scores on the outcome measure was too narrow, and with too many participants below the cut-off scores recommended in the literature and used by Margola and colleagues (2010). In short, there would be too small a sample of individuals who improved to permit the statistical analyses used in the current study. Future studies should differentiate between individuals who benefited from expressive writing and those who did not. For example, participants in the expressive writing condition could be divided into groups based on those who improved from pre- to post-writing and those who did not. To ensure that that there is a greater range of scores, researchers should also use outcome measures that are sensitive to the sub-clinical levels of distress when working with a non-clinical student population. Future studies could examine how word categories relate separately to symptoms of avoidance, intrusive thoughts, and hyperarousal. It may be that different processes are employed to deal with a different cluster of symptoms, and analyzing word counts may shed some light on whether such different processes are at work.

One reason why emotion words were not significant in predicting outcome may be due to a moderating variable, as previously mentioned. Alexithymia has been found to moderate the benefits expressive writing across four separate studies (Lumley, 2004). Some research has shown an increase in levels of alexithymia may relate to decreases in psychological wellbeing (van Middendorp & Geened, 2008), such as increased level of post-traumatic symptoms (Baikie, 2008). In the current study, if a substantial number of participants exhibited high levels of Alexithymia, their difficulty with identifying emotions may have moderated the effects by influencing outcome score, thereby masking positive emotion words as a predictor of outcome, or by influencing the use of some linguistic categories. Alexithymia has been found to relate to the use of several word

categories within the LIWC dictionary (Pluth, 2012). As levels of alexithymia increased, individuals increased in usage of categories relating to cognitive processing but decreased in the use of family words and positive emotion words, and such an effect was seen in the current study.

The LIWC is an objective rating tool, but it too has inherent limitations. The program can detect on average more than 86 percent of writing words, but there are still words that are potentially not accounted for in its various word categories. As a case in point, since the completion of the analyses in the current study, a third update of the LIWC dictionaries was released in 2015, which can identify a greater number of words relating to affect as well as cognitive processes compared to the version used for the current study, indicating that some words were absent from the dictionaries for the current study. The program cannot detect sarcasm or understand the context of words and would inaccurately label the word “happy” in the sarcastic sentence “Yeah, because that reeeeally made me happy,” as a positive emotion word. Sometimes such inconsistencies between program evaluation and context can provide additional information (Pennebaker, Mayne, & Francis, 1997), but the analyses of any inconsistencies were outside of the scope of this project. Pennebaker and Francis (1996) noted that the rate of misidentifying words due to context is relatively minimal, but this nonetheless means that word analyses overall all are not wholly accurate.

Conclusions

This study has shown the usefulness of examining additional linguistic categories as well as taking into consideration when word categories are used. As researchers begin to include a greater range of linguistic categories in their analyses as well as monitor

changes in word usage over time, we may begin to identify more distinct patterns of writing that are indicative of change in psychological wellbeing.

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Table 1.

List of Word Categories Organized by Theme

Emotion Words	Positive emotion (+), Negative emotion (-)
Words Relating to	Causality (+), Tentativeness (+), Insight (+), Inhibition (-),
Cognitive processing	Discrepancy (+), Certainty (+), Exclusivity (+)
Pronouns	1st Person singular (-), 1st Person plural
	3rd Person
Words Relating to Time	Past, Future
Other Potential Variables	Social, Word count

Note: Based on a survey of the literature, (+) indicates word categories that predict positive outcome while (-) indicates word categories that predict negative outcome. Where no sign is indicated, the literature has been mixed depending on context.

Table 2.

Summary of Hypotheses

Hypothesis 1.	Many of the stated linguistic categories will predict outcome	
	Words that relate to <u>improved</u> outcome:	Words that relate to <u>poorer</u> outcome:
Hypothesis 2.	Will be of a higher proportion of total words in the *third* writing session.	Will be of higher proportion of total words in the *first* writing session.
Hypothesis 3.	Will predict improved outcome with an *increasing* trajectory.	Will predict improved outcome with a *decreasing* trajectory.
Hypothesis 4.	Will be of a *lower* proportion of total words in session one and two compared to the control condition	Will be of a *higher* proportion of total words in session one and two compared to the control condition

Table 3.

Correlations of Average Frequency of Word Categories across the Three Writing Sessions

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. IES Pre	--																	
2. IES Post	.73	--																
3. WC	.09	.15	--															
4. 1st P Sing	-.05	.03	.10	--														
5. 1st P Plur	-.02	-.14	-.05	-.30	--													
6. 3rd P	.06	.01	-.04	-.11	-.03	--												
7. Pos Emo	-.01	-.07	-.10	.04	-.14	.08	--											
8. Neg Emo	-.01	.02	.06	.17	-.40	.27	.24	--										
9. Insight	-.03	-.02	.12	.32	-.38	-.38	.43	.63	--									
10. Cause	.05	-.04	.11	.16	-.36	.24	.18	.48	.47	--								
11. Discrep.	.04	-.05	.19	.18	-.18	.18	.27	.53	.58	.35	--							
12. Tentative	.04	.09	.05	-.02	-.34	.15	.36	.44	.58	.29	.53	--						
13. Certainty	.09	-.04	.19	.05	-.23	.24	.39	.44	.54	.35	.48	.41	--					
14. Inhibition	.06	.18	.09	.08	-.01	.02	.03	.25	.17	.13	.19	.16	.15	--				
15. Exclusive	.16	.17	.09	.10	-.32	.27	.39	.59	.65	.41	.68	.68	.49	.14	--			

Table 3. Cont'd

Correlations of Average Frequency of Word Categories across the Three Writing Sessions

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	1
16. Social	.07	-.06	.15	-.17	.25	.20	.14	.15	.15	.12	.36	.01	.35	-.00	.18	--		
17. Past	-.06	-.20	.01	.05	.39	-.37	-.38	-.44	-.47	-.41	-.34	-.53	-.38	-.13	-.58	.05	--	
18. Future	-.06	-.10	.16	.13	-.15	.21	.31	.41	.49	.32	.78	.46	.46	.17	.56	.34	-.37	-

Note: IES = Impact of Events Scale; Pre = Pre-Test Score; Post = Post-Test Score; WC = Word Count; 1st P Singular = First-Person Singular Pronouns, 1st P Plur = First-person Plural, 3rd P = Third-Person Plural; Pos Emo = Positive Emotion;

Table 4a.

Summary of Hierarchical Regression Analysis for Word Categories Predicting IES-R Post-Test Scores

Variable	β	*t*	*R*	R^2	ΔR^2
Step 1			.729	.531	.531
Pre-test IES-R Score	.73	14.62***			
Step 2			.797	.634	.104
Pre-test IES-R Score	.71	14.70***			
Positive Emotion	-.08	-1.53			
Negative Emotion	-.03	-.48			
Causality	-.13	**-2.67****			
Tentativeness	.02	.37			
Insight	-.03	-.44			
Inhibition	.13	**2.66****			
Discrepancy	-.10	-1.46			
Certainty	-.10	**-2.00***			
Exclusivity	.06	1.02			
1st Person Singular	.10	**1.72**			
1st Person Plural	-.07	-1.12			
3rd Person	-.04	-.68			
Past Tense	-.18	**-3.10****			
Future Tense	-.03	-.57			

Table 4a. cont'd

Summary of Hierarchical Regression Analysis for Word Categories Predicting IES-R Post-Test Scores

Variable	β	*t*	*R*	R^2	ΔR^2
Word Count	.11	**2.20***			
Social Words	.045	.75			

Note: $N = 193$, **Bold:** $p < .10$, *$p < .05$, **$p < .01$, ***$p < .001$

Table 4b.

Summary of Individual Hierarchical Regressions Predicting Change in IES-R Post-Test Scores for 16 Word Categories

Variable	β	*t*	*R*	R^2	ΔR^2
Positive Emotion	-.07	-1.01	.07	.01	.01
Negative Emotion	.02	.20	.02	.00	.00
Causality	-.04	-.50	.04	.00	.00
Tentativeness	.09	1.24	.09	.01	.01
Insight	-.02	-.21	.02	.00	.00
Inhibition	.18	2.53	.18	.03	.03*
Discrepancy	-.05	-.65	.05	.00	.00
Certainty	-.04	-.49	.04	.00	.00
Exclusivity	.17	2.42	.17	.03	.03*
1st Person Singular	.03	.41	.03	.00	.00
1st Person Plural	-.14	-1.89	.14	.02	.02
3rd Person	.01	.07	.01	.00	.00
Past Tense	-.20	-2.83	.20	.04	.04**
Future Tense	-.10	-1.40	.10	.01	.01
Word Count	.15	2.15	.15	.02	.02*
Social Words	-.06	-.79	.06	.00	.00

Note: $N = 193$, *$p < .05$, **$p < .01$

Table 5.

Frequencies and Standard Deviations of the Six Word Categories across the Three Writing Sessions

Condition	MEAN (*SD*)	Visit 1	Visit 2	Visit 3
Expressive Writing Condition				
	Causality	1.97 (*.78*)[a**]	2.19 (*.91*)[b**]	2.24 (*.91*)[b**]
	Inhibition	.48 (*.37*)	.51 (*.40*)	.48 (*.38*)
	Certainty	1.81 (*.77*)	1.78 (*.83*)	1.87 (*.78*)
	1st Pers. Sing.	10.08 (*3.24*)[a**]	9.66 (*3.13*)[b**]	9.42 (*3.28*)[b**]
	Past Tense	6.87 (*2.80*)[a**]	5.30 (*2.66*)[b**]	4.95 (*2.70*)[b**]
	Word Count	577.17 (*177.61*)	574.39 (*197.19*)	584.04 (*200.05*)
Control Condition				
	Causality	1.22 (*.72*)	1.24 (*.69*)	1.33 (*.76*)
	Inhibition	.30 (*.28*)	.38 (*.33*)	.36 (*.37*)
	Certainty	.52 (*.45*)	.65 (*.50*)	.54 (*.45*)
	1st Pers. Sing.	9.24 (*3.15*)	9.14 (*2.73*)	9.19 (*3.23*)
	Past Tense	9.29 (*2.47*)	8.73 (*1.91*)	9.03 (*2.14*)
	Word Count	480.06 (*174.97*)	531.45 (*203.72*)	538.24 (*185.74*)

Note: $N = 242$, *$p < .0083$, **$p < .001$. Differing superscripts denote significant difference between writing session for the same word. Only differences between writing sessions for each category was examined within the expressive writing condition.

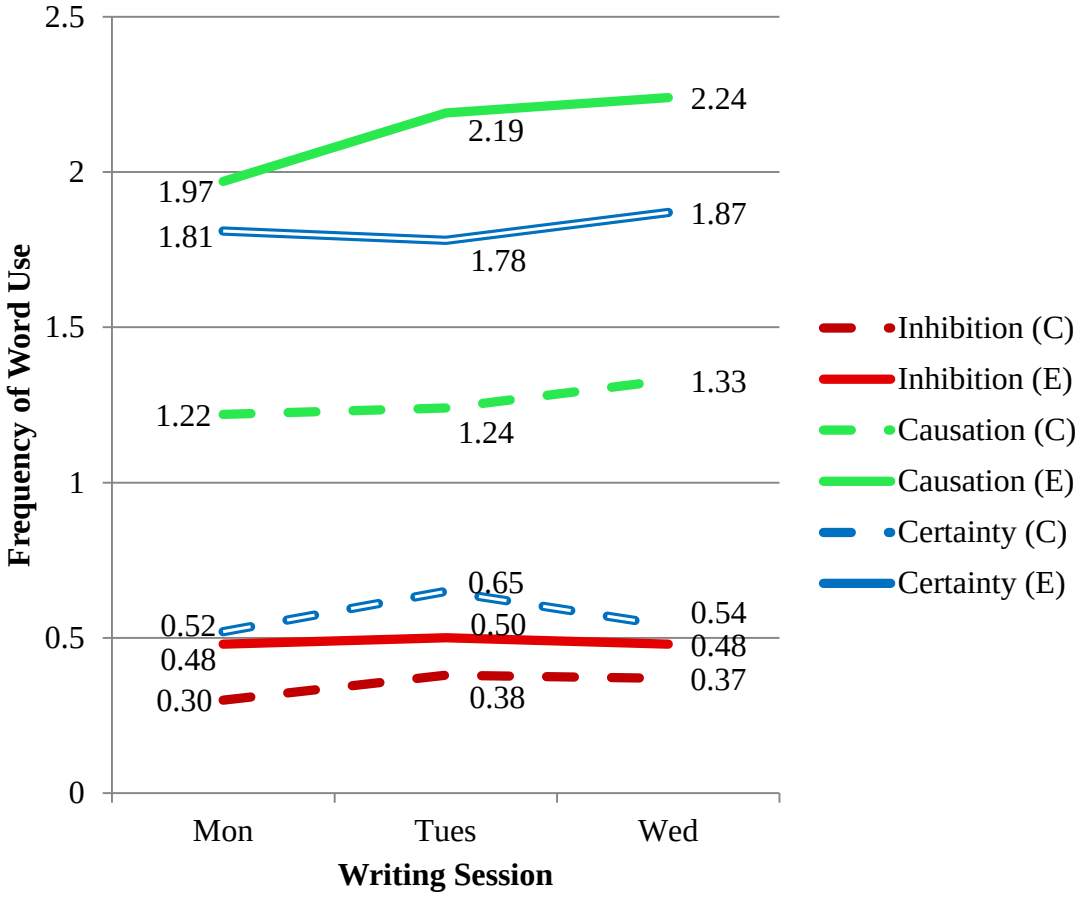
Table 6.

Mean Frequencies and Standard Deviations of Six Word Categories

MEAN (*SD*)	Expressive writing Condition	Control Condition
Causality	2.14 (*.64*)**	1.26 (*.54*)
Inhibition	.49 (*.26*)**	.34 (*.22*)
Certainty	1.82 (*.57*)**	.57 (*.31*)
1st Pers. Sing.	9.72 (*2.81*)	9.19 (*2.53*)
Past Tense	5.71 (*2.15*)**	9.01 (*1.69*)
Word Count	578.53 (*180.66*)	516.59 (*175.08*)

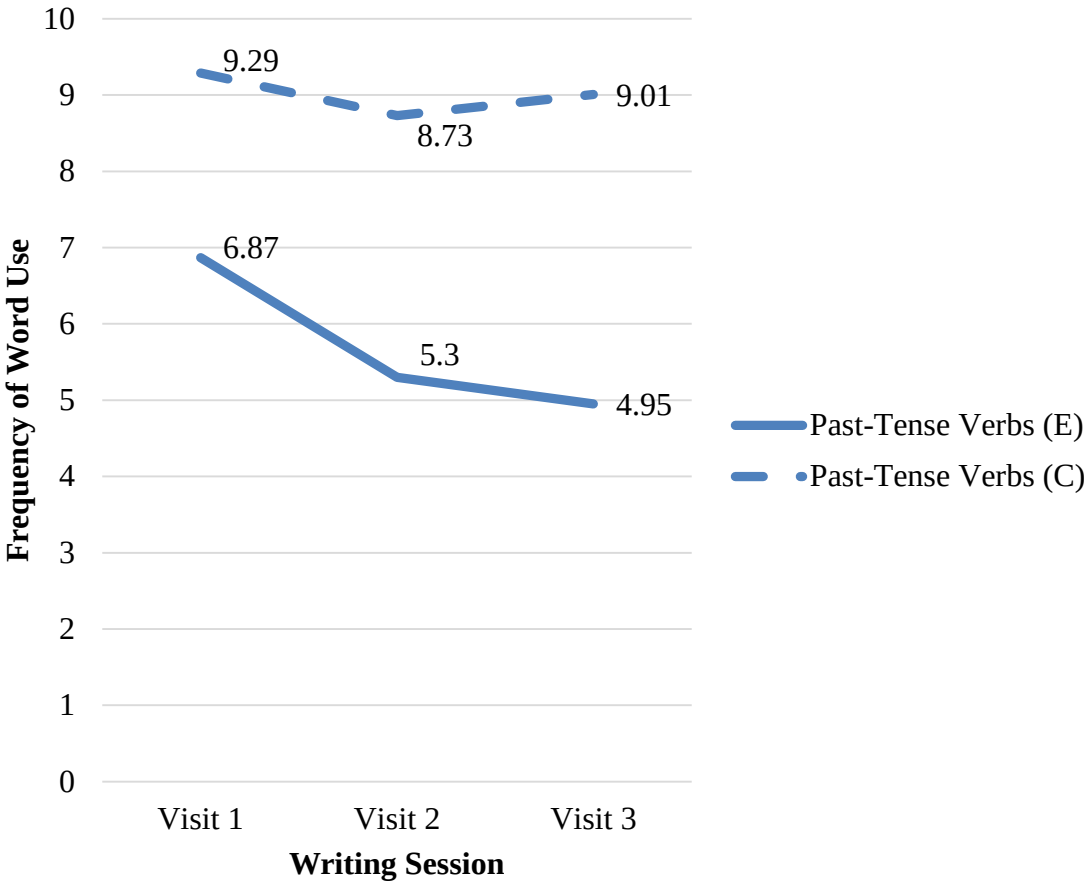
Note: $N = 242$, In comparison between conditions for each word category: *$p < .0083$, **$p < .001$

Figure 1. Significant Differences between Conditions (i.e., expressive writing condition and control condition) and Writing Session (i.e., Monday, Tuesday, and Wednesday).



Note: There was a significant difference between the expressive writing condition and the control condition for each of the three word categories (i.e., words related to inhibition, causation, and certainty are represented by different colors). The expressive writing condition (E) is indicated by solid lines. The control condition (C) is indicated by dotted lines. All three main effects (between expressive and control conditions) were significant at $p < .001$.

Figure 2. Significant Interaction between Conditions (i.e., expressive writing condition and control condition) and Writing Session (i.e., Monday, Tuesday, and Wednesday).



Note: There was a significant main effect of time across the three writing sessions ($p <$ .001), main effect of condition ($p <$ .001; i.e., between the expressive writing and control condition), as well as a significant interaction ($p <$ .001). The expressive writing condition (E) is indicated by a solid line. The control condition (C) is indicated by a dotted line.+

Appendix A

Impact of Events Scale – Revised

INSTRUCTIONS: Below is a list of difficulties people sometimes have after stressful life events. Please read each item, and then indicate how distressing each difficulty has been for you **DURING THE PAST SEVEN DAYS** with respect to _____, which occurred on _____. How much were you distressed or bothered by these difficulties?

Item Response Anchors are

0 = Not at all; 1 = A little bit; 2 = Moderately; 3 = Quite a bit; 4 = Extremely.

1. Any reminder brought back feelings about it.
2. I had trouble staying asleep.
3. Other things kept making me think about it.
4. I felt irritable and angry.
5. I avoided letting myself get upset when I thought about it or was reminded of it.
6. I thought about it when I didn't mean to.
7. I felt as if it hadn't happened or wasn't real.
8. I stayed away from reminders of it.
9. Pictures about it popped into my mind.
10. I was jumpy and easily startled.
11. I tried not to think about it.
12. I was aware that I still had a lot of feelings about it, but I didn't deal with them.

13. My feelings about it were kind of numb.
14. I found myself acting or feeling like I was back at that time.
15. I had trouble falling asleep.
16. I had waves of strong feelings about it.
17. I tried to remove it from my memory.
18. I had trouble concentrating.
19. Reminders of it caused me to have physical reactions, such as sweating, trouble breathing, nausea, or a pounding heart.
20. I had dreams about it.
21. I felt watchful and on-guard.
22. I tried not to talk about it.

Appendix B

Guidelines for Cleaning Data

Check for correct spelling

1) All misspellings need to be fixed, but be careful with other forms of misspelling or grammar issues.
    a. Fix words that are misspelled to an appropriate word (e.g., change there to their when it is appropriate
    b. Do not delete multiple words (aka no “no no no”) as this may be used for emphasis
2) Do not correct verbs for plurals or verb tense/conjugation. Sometimes the word program says that the verb is incorrect when it is actually right.
3) When trying to figure out what a word is when the spelling is incomplete, look at the context of the sentence, but also look at the keyboard for what letter might have been hit.

Fix Punctuation and other issues

1) Use Ctrl & “f” to open the find menu and click on the replace tab
2) In the search menu, enter one of the follow and its corresponding correction in the replace menu.
    a. It’s = It is *or* it has
    b. There’s = there is
    c. That’s = that is
    d. He’s = he is

e. Who's = who is – be careful as this may be "whose" and person wrote "who's"

f. What's = what is3ws

g. When's = when is

h. Let's = let us

3) As a double check, search for: 's

a. Any other words that end in 's where the apostrophe-s are abbreviations for "is" are to be change to remove the apostrophe and include the verb "is"

4) Again, use the replace function for the following:

a. – (hyphen) = replace with [space]-[space]

b. Do the same for /

Fix unknown words

1) Search for the following and replace with its pair.

a. w/ with

b. b/ between

c. & and

d. 'cause because

e. gotta got to

f. lotta lot of

g. and/or and - or

h. 'an or 'n and

i. mos months (when searching, go to more and click "whole words")

j. sec second (when searching, go to more and click “whole words”)

k. cause because (when searching, go to more and click “whole words”)

l. @ at

m. Also search for “soo” any written form that extends “so” to longer should be replace to be only written as “so”

Check Other Rules as required by the LIWC Program

1) Change filler words so that they are not added to any other category

   a. You know youknow

   b. I mean imean

   c. I don’t know idontknow

   d. Like rrlike

2) Remove punctuation from time markers (e.g., change a.m. to am)

3) Abbreviation: U.S. changed to USA.

4) Search for number 0-9 and remove if in an inappropriate spot.

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