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Alexithymia and Expressive Writing: Emotional Awareness in Working Through Distress

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Alexithymia and Expressive Writing: Emotional Awareness in Working Through Distress

By

Michael A. Strating

A Thesis
Submitted to the Faculty of Graduate Studies
through the Department of Psychology
in Partial Fulfillment of the Requirements for
the Degree of Master of Arts
at the University of Windsor

Windsor, Ontario, Canada

2016

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Alexithymia and Expressive Writing: Emotional Awareness in Working Through Distress

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ABSTRACT

Expressive writing following difficult personal experiences is associated with mental health benefits, but questions remain with regard to how it works and who it works best for. The aim of the current study is to investigate the influence of alexithymia on mental health outcomes of expressive writing. The current study made use of archival data consisting of self-report questionnaires and expressive writing narratives completed by 241 undergraduate students who reported unresolved distress following an upsetting personal experience. Symptoms of trauma-related stress, depression, and anxiety were obtained at baseline and two weeks post-intervention. Text analyses of word use in participant narratives were coded using the Linguistic Inquiry and Word Count (LIWC) software. Results from this study suggest that alexithymia is associated with greater pre- to post-intervention reductions in symptoms of trauma-related stress, depression, and anxiety, irrespective of writing condition. However, alexithymia was not found to moderate the effectiveness of expressive writing, as has been reported elsewhere. Nonetheless, text analyses of trauma narratives revealed that, relative to those who are more emotionally aware, those who were high in alexithymia put more effort into seeking out causal explanations in order to minimize or reduce ambiguity and uncertainty. This intellectualized approach to working through distress was found to mediate the association between alexithymia and reductions in trauma-related stress.

Keywords: expressive writing, alexithymia, trauma, emotional processing

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CHAPTER I

INTRODUCTION

This pouring thoughts out on paper has relieved me. I feel better and full of confidence and resolution.

—Diet Eman, *Things We Couldn't Say*

Expressive writing, as a form of journal writing, is a successful intervention that is free, brief, and non-invasive. The original Pennebaker and Beall (1986) study demonstrated that actively writing about difficult experiences leads to modest but appreciable improvements in physical and psychological health. A wide range of benefits have since been documented, including decreases in health care visits and improved physiological functioning (Smyth, 1998), as well as reductions in symptoms of trauma-related stress, depression, and anxiety (e.g., Baikie, 2008; Graf, Guadiano, & Geller, 2008; Meston, Lorenz, & Stephenson, 2013).

The overall effectiveness of expressive writing has been replicated in hundreds of subsequent studies, but who it works most for and how it works remains less clear (Frattaroli, 2006). Hypothesized mechanisms include processes related to the release of previously inhibited negative emotions, facilitation of cognitive insight and meaning-making, and extinction of negative responses in recalling past experiences. What is clear, however, is that the facilitation of productive emotional processes is a central part of this intervention.

The current study examines the mental health benefits of expressive writing, concentrating on the function of emotional awareness, expression, and processing in this intervention. After surveying evidence demonstrating the effectiveness of expressive writing, this introduction will delve deeper into proposed moderators of expressive writing, focusing on alexithymia as an important influence on mental health outcomes. I will then investigate whether or not alexithymia influences how individuals write about and work through distress following

traumatic experiences, possibly providing clues as to why individuals high in alexithymia may or may not benefit from expressive writing.

Writing About Difficult Personal Experiences

Though popularized by Breuer and Freud, the idea that expression versus inhibition of emotion is a healthy response to stress has been around since the days of Aristotle (Nichols & Efran, 1985) and continues to be a core principle of modern psychotherapy. In order to examine the link between emotional expression and health, James Pennebaker and others have used expressive writing to study the mental and physical health effects of emotional expression following difficult or traumatic personal experiences.

In their seminal study, Pennebaker and Beall (1986) asked undergraduate students to write about either a trivial, non-emotional topic (e.g., descriptions of participant's living room, shoes, a tree, or bedroom) or about a traumatic personal experience for 15 minutes per day on four consecutive evenings. In the three trauma writing conditions, participants were instructed to either write 1) only about their feelings, 2) only a detailed description of the event, or 3) about both the details and emotions associated with the experience. They found that writing about trauma produced short-term increases in physiological arousal (i.e., blood pressure) and self-report negative mood from pre- to post-session. However, they also found that those who wrote about both the event and their associated emotions (Group 3) demonstrated fewer health problems four months later than those in the other conditions (Pennebaker & Beall, 1986).

Since this original study, many others have used variations of this procedure in attempts to replicate or extend the findings across diverse populations and health outcomes. For example, benefits have been documented among non-clinical student samples (64% of studies; Frattaroli, 2006) as well as clinical samples with psychiatric disorders or medical patients with asthma,

cancer, or HIV (to name a few) on outcomes ranging from improvements in immune functioning to student grade point average (Baikie & Wilhelm, 2005). Given the ease with which expressive writing can be implemented, it has also been used as a clinical intervention; alone, as an adjunct to other therapies, or as a form of self-help (e.g., Graf et al., 2008; Smyth & Helm, 2003).

Several meta-analyses have been conducted and the general consensus is that expressive writing has a small, but significant beneficial effect on health (e.g., Frattaroli, 2006; Frisina, Borod, & Lepore, 2004; Harris, 2006; Meads & Nouwen, 2005; Merz, Fox, & Malcarne, 2014; Smyth, 1998; Travagin, Margola, & Revenson, 2015). Estimates of the average (correlational) effect size of expressive writing across all outcomes range from .075 (Frattaroli, 2006) to .230 (Smyth, 1998), though effects are typically larger for physical health (.072) than mental health outcomes (.056; Frattaroli, 2006).

Proposed Mechanisms of Expressive Writing

Several theories have been proposed in attempts to pinpoint the precise mechanisms underlying the mental and physical health benefits of expressive writing, including theories of inhibition, cognitive processing, self-regulation, and exposure (for further discussion, see: Frattaroli, 2006; Sloan & Marx, 2004b).

Inhibition. The theory of inhibition and catharsis posits that withholding distressing thoughts, emotions, and behaviours leads to stress and ill health, whereas subsequent expression and release (i.e., catharsis) reduces stress (Nichols & Efran, 1985). The original Pennebaker and Beall (1986) study found that the combined fact and emotion writing group benefitted more than those who only wrote about emotion, suggesting that expression versus inhibition of emotion on its own is not enough to account for the health benefits of expressive writing. Subsequent research has largely supported this conclusion. In a noteworthy study by Greenberg, Wortman,

and Stone (1996), participants who wrote about an imaginary trauma (i.e., a trauma they had not experienced) benefited as much as those who wrote about a real trauma (i.e., a trauma they had experienced), suggesting that the release of unresolved distress from past lived experience does not necessarily account for the health benefits of expressive writing. Several predictions of inhibition theory were not supported in Frattaroli's (2006) meta-analysis; larger effects were not found for those who wrote about a previously undisclosed trauma or for those who tended to be more inhibited (e.g., men), and disclosure produces short-term increases, rather than decreases, in stress.

Cognitive Processing. Cognitive processing theories posit that traumatic experiences first disrupt, then must be integrated into, self-schemas (Sloan & Marx, 2004b). As such, expressive writing is thought to offer a framework for constructing coherent personal narratives, facilitating insight, meaning, and self-understanding (Pennebaker, 1993; Pennebaker, Mehl, & Niederhoffer, 2003; Waters, Shallcross, & Fivush, 2013), which in turn is associated with health improvements. This is supported by text analyses of written narratives demonstrating that health benefits are associated with increased use of cognitive insight and causation words (e.g., Klein & Boals, 2010; Pennebaker, Mayne, & Francis, 1997; Ullrich & Lutgendorf, 2002). However, larger effect sizes were not found in studies that used instructions to promote cognitive processing or in studies that allowed for more time (and, presumably, more processing) between writing sessions (Frattaroli, 2006). It also does not explain the findings from the study of writing about imagined traumas that was cited earlier (Greenberg et al., 1996). Therefore, cognitive processing theory appears to provide at least a partial, but not complete, account of the beneficial effects of expressive writing.

Self-Regulation. In order to explain the results from their imagined trauma writing study, Greenberg and colleagues (1996) proposed a self-regulation theory whereby expressive writing provides individuals with an opportunity to enhance their skills in expressing and regulating emotion, promoting a sense of perceived control and self-efficacy. Instead of dwelling on the negative, health benefits result from shifting one's focus to goals and positive self-appraisals (King, 2001). Indeed, North, Pai, Hixon, and Holahan (2011) were able to show that writing instructions that emphasized psychological acceptance and positive reappraisal produced improved emotional well-being relative to emotional expression alone. This theory also received mixed support in Frattaroli's (2006) review; in line with expectations, expressive writing was associated with declines in mood-related problems (e.g., depression) and writing about positive elements (e.g., goals) was just as effective as writing about negative emotions, however, there were no improvements in self-report measures of self-regulation.

Exposure. Exposure theories of expressive writing are rooted in behavioural models whereby repeatedly confronting negative stimuli (e.g., memories of trauma) in the absence of harm leads to habituation and extinction of aversive thoughts and feelings (e.g., Foa & Kozak, 1986; Sloan, Marx, & Epstein, 2005). Consistent with predictions, expressive writing is more beneficial for those who have experienced a trauma, leads to reductions in symptoms of trauma-related stress, and longer and more frequent sessions produce stronger benefits (Frattaroli, 2006).

In an attempt to examine each of these hypothesized mechanisms, Nazarian and Smyth (2013) compared variations in writing instructions designed to elicit each of the specific change processes listed above. Although they found differences between groups in word use and self-report ratings that were consistent with expectations (e.g., self-regulation instructions produced the highest ratings on positive affect and use of positive emotion words), there were also

instances of overlap between conditions (e.g., exposure instructions lead to greater cognitive processing). In another study that manipulated writing instructions, Guastella and Dadds (2008) found that those who moved sequentially from exposure, to cognitive processing, and finally to benefit-finding over three sessions showed greater reductions in anxiety and negative affect than participants who were given standard, unstructured expressive writing instructions. In light of the mixed evidence reported for each theory, findings from these studies suggest that a combination of theories, rather than any single theory on its own, likely accounts for the benefits of expressive writing.

It is clear, then, that the expression and processing of emotion plays a crucial, though complex, role in health benefits produced by expressive writing. While these theories have focused on both physical and mental health, which likely share common underlying mechanisms, the current study will focus on mental health outcomes in expressive writing.

Mental Health Benefits of Expressive Writing

Several studies have identified greater mental health benefits for those who write expressively, relative to controls, however, there are also many inconsistencies in the literature when examining specific domains of mental health. In the largest and most comprehensive meta-analysis conducted to date, Frattaroli (2006) identified 112 expressive writing studies that examined mental health outcomes (average correlational effect size of .056). Expressive writing was associated with significant benefits in terms of self-reported distress ($r = .102$), depression ($r = .073$), positive functioning ($r = .045$), anger ($r = .183$), and anxiety ($r = .051$). Conversely, she found that expressive writing was not associated with differences in self-reported grief/bereavement, stress, coping or coping strategies, cognitive schemas or core beliefs, posttraumatic growth, eating-disorder-related problems, or dissociative experiences. Two other

meta-analyses (Frisina et al., 2004; Meads & Nouwen, 2005) did not find significant overall effects for psychological health, though Frisina and colleagues (2004; 9 studies) did note that there were some improvements in depression, mood, anxiety, and sleep quality among clinical samples. Conversely, Meads & Nouwen (2005; 37 studies) found no differences in symptoms of anxiety or post-traumatic stress, but they did find that the expressive writing condition showed increases in positive and negative mood and – contrary to predictions – higher levels of depression, relative to controls.

To summarize, consensus is generally lacking regarding the effects of expressive writing within specific domains of mental health, even among the meta-analyses that have been conducted to date. However, several studies have been carried out since these meta-analyses were published approximately ten years ago. As such, it is also important to review more recent studies, focusing here on those which include the most relevant and commonly studied mental health outcomes, namely, symptoms of trauma-related stress, depression, and anxiety.

Trauma-Related Stress. An estimated 76% of Canadians experience at least one traumatic event in their lifetime, though only 9% of those also go on to develop Post-Traumatic Stress Disorder (PTSD; van Ameringen, Mancini, Patterson, & Boyle, 2008). While the DSM-5 defines *trauma* as exposure to or witnessing a life-threatening event or serious injury (American Psychiatric Association, 2013), in expressive writing, the term is often used broadly to include any personally distressing experience (e.g., interpersonal conflict, breakup of a romantic relationship, job loss, college exams, etc.). Symptoms of trauma-related stress include intrusive thoughts and feelings, avoidance of feelings or reminders of the trauma, and elevated arousal (e.g., startle response; Weiss & Marmar, 1997).

More recent evidence is mixed regarding the effectiveness of expressive writing in terms of trauma-related stress. Some studies have found significant reductions in trauma symptoms following expressive writing (Bragdon & Lombardo, 2012; Hirai, Skidmore, Clum, & Dolma, 2012; Meston et al., 2013; Sloan, Marx, Bovin, Feinstein, & Gallagher, 2012), however, others have found no significant differences relative to control groups (Kearns, Edwards, Calhoun, & Gidycz, 2010; Slavin-Spenny, Cohen, Oberleitner, & Lumley, 2011; Sloan, Marx, & Greenberg, 2011; Smyth, Hockemeyer, & Tulloch, 2008).

Depression. Likewise, recent findings regarding the effects of expressive writing on depression were also mixed. Expressive writing was associated with greater reductions in symptoms of depression, relative to controls, in studies of college students (Epstein, Sloan, & Marx, 2005; Sloan, Feinstein, & Marx, 2009), parents of children with leukemia (Martino, Freda, & Camera, 2013), and clinically depressed (Krupan et al., 2013) or general psychotherapy client (Graf et al., 2008) samples. However, other studies found non-significant effects on depression (Baikie, Geerligs, & Wilhelm, 2012; Giannotta, Settanni, Kliever, & Ciairano, 2009; Sloan et al., 2011).

Anxiety. Findings from studies examining anxiety symptoms have also shown similar inconsistencies. Relative to controls, significant reductions in symptoms of anxiety following expressive writing have been identified among psychotherapy clients (Graf et al., 2008) and various non-clinical samples (Epstein et al., 2005; Hirai et al., 2012; Guastella & Dadds, 2009; Martino et al., 2013). However, as in the other symptom domains, non-significant findings have also been reported in other studies (Baikie et al., 2012; Giannotta et al., 2009; Sloan et al., 2009).

A notable study was conducted by Meshberg-Cohen, Svikis, and McMahon (2014) who found significant effects in all three symptom domains. In this study, 149 women who were in

residential treatment for diagnosed substance use disorders completed four writing sessions. Most participants had experienced at least one trauma and more than half of the sample met diagnostic criteria for PTSD. At the two-week follow-up, participants in the expressive writing condition showed greater reductions in self-report symptoms of trauma-related stress, depression, and anxiety, relative to those in the control writing condition. However, these differences disappeared by the one-month follow-up as those in the control condition also reported reductions in symptoms by this time.

While this is only a selection of the available literature, the studies reviewed here suggest that although expressive writing is associated with mental health benefits generally, there are also many inconsistencies with regard to specific symptom domains. One explanation for these inconsistencies is that perhaps expressive writing is not effective for every person, in the same way. As such, researchers have been interested in investigating moderators of expressive writing effects, seeking to identify the conditions that enhance or reduce its effectiveness.

Moderators of Expressive Writing Benefits

Many moderating variables have been proposed in previous research. In her meta-analysis, Frattaroli (2006) classified proposed moderators into five categories, namely; report information (i.e., whether or not the study was published), setting, participant, methodological, and treatment variables. Among participant variables, Frattaroli (2006) found that only those who were less optimistic tended to report greater mental health benefits. In contrast, age, gender, ethnicity, mood, alexithymia, and emotional inhibition were not significant moderators of mental health effects. However, Frattaroli (2006) cautions that these null findings may be a result of 1) having too few studies that explicitly examine each moderator and 2) that studies with null interactions were potentially underpowered and lacking information that would allow for

computation of effect sizes. Furthermore, moderating effects were assessed across all mental health outcomes simultaneously. This means that these moderation analyses included several non-significant outcomes of the intervention. As such, although pessimism was the only significant moderator to emerge in this meta-analysis, it is too early to exclude other potential moderators from consideration, particularly with regard to specific mental health outcomes such as trauma-related stress, depression, and anxiety.

Since then, other participant variables that have been investigated as treatment moderators include personality traits, perceived social support, and coping strategies. Those who benefitted more from expressive writing tended to be more mindful (Poon & Danoff-Burg, 2011), were higher in extraversion and agreeableness and lower in conscientiousness (Beyer et al., 2013), had better social support (Sheese, Brown, & Graziano, 2004) and emotional coping skills (Kraft, Lumley, D'Souza, & Dooley, 2008), and reported more maladaptive brooding (Sloan, Marx, Epstein, & Dobbs, 2008) and less positive cognitive reappraisal strategies (Wisco, Sloan, & Marx, 2013).

Emotional expressiveness is an important moderator to consider in the context of expressive writing. Among studies that directly examined emotional inhibition, some have identified significant moderation effects, with higher levels of social constraint or ambivalence over expression being associated with greater improvements (Lu & Stanton, 2010; Zakowski, Ramati, Morton, Johnson, & Flanigan, 2004). However, other studies have not found evidence of such moderating effects (Lepore et al., 2015) or that symptom reductions are associated with greater dispositional expressiveness (Niles, Haltom, Mulvenna, Lieberman, & Stanton, 2014).

Similarly, interest in gender and culture as treatment moderators stems from prescribed norms regarding expressivity, with men and members of Asian culture being socialized to inhibit

their emotions to a greater extent than females and Caucasians (Lu & Stanton, 2010; Range & Jenkins, 2010). Smyth (1998) identified greater benefits for men than women in his meta-analysis of expressive writing studies (also: Manier & Olivares, 2005), however, some studies have found no such effects (Epstein et al., 2005; Lepore, Revenson, Roberts, Pranikoff, & Davey, 2015) or even that women benefitted more than men (Ironson et al., 2013). Furthermore, Lu and Stanton (2010) found that Asians and highly ambivalent participants benefited most from expressive writing, suggesting that it may be due to a process whereby, “the perceived safety of expressing oneself in writing... reduce[s] the conflict between the desire to disclose and the failure to do so.”

Therefore, despite some inconsistencies in findings, there is some evidence to tentatively suggest that those who tend to inhibit or suppress their emotions may benefit more from expressive writing than those who are more naturally expressive.

Alexithymia and Emotional Expressiveness

A construct closely related to emotional awareness and expressiveness is *alexithymia* (literally, “lacking words for feelings”); a dispositional trait characterized by difficulties a) identifying and b) describing internal feeling states, as well as c) an externally-oriented thinking style (Lumley, Neely, & Burger, 2007). In contrast to those who actively inhibit emotions that one is aware of but must withhold, individuals with alexithymia struggle to communicate and regulate emotions due to limited emotional awareness and capacity for emotional processing. For example, alexithymia is associated with an inability to recall emotion words (Luminet, Vermeulen, Demaret, Taylor, & Bagby, 2006) and delays in identifying emotion words following emotional primes (Suslow & Junghanns, 2002). As a result, when asked about their emotions, people with alexithymia are often vague or unsure (e.g., “I don’t know”) or describe

feelings in terms of bodily sensations (e.g., “my stomach hurts”) or external events and behaviours (e.g., “I want to punch the wall”; Lumley et al., 2007).

The construct of alexithymia originated from clinical observations and research on psychosomatic disorders, beginning with Ruesch (1948) and MacLean (1949), and was formally conceptualized in the late 1960’s by Sifneos (1967) and Nemiah (Nemiah & Sifneos, 1970). These clinical researchers noted that psychosomatic patients often had difficulties communicating affect and had diminished symbolic or fantasy lives (Taylor, Bagby, & Parker, 1997). More recent research has shown that alexithymia is not specific to psychosomatic disorders, but is also associated with deficits in affect regulation (Taylor et al., 1997) and addictive or compulsive disorders including eating disorders, problematic gambling, and substance use disorders (Lumley et al., 2007).

Given the centrality of emotional processing deficits in alexithymia, it is not surprising that it is also associated with disordered affect, with higher levels of alexithymia correlated with greater symptom severity with regard to PTSD (Di Giacinto et al., 2015; Frewen, Dozois, Neufeld, & Lanius, 2008), depression (Arancibia & Behar, 2015; Li, Zhang, Guo, & Zhang, 2015), and anxiety (Karukivi et al., 2010; Marchesi, Brusamonti, & Maggini, 2000; Motan & Gençöz, 2007). Greater use of emotional avoidance, a maladaptive coping mechanism providing short-term relief of distress, has been implicated as an important link between alexithymia and poor mental health in studies of PTSD (Eichhorn, Brähler, Franz, Friedrich, & Glaesmer, 2014) and depression (Panayiotou et al., 2015). Emotional disclosure through writing may be one way of counteracting these maladaptive avoidance strategies. Therefore, in light of associations between alexithymia and mental health, it is important to consider the influence of alexithymia when investigating the mental health benefits of expressive writing.

Alexithymia Moderates Expressive Writing Benefits. Alexithymia has been identified as a significant moderator of expressive writing effects, however, the directionality of this relationship remains unclear since alexithymia has been linked with either positive or negative outcomes, depending on the study (e.g., Baikie, 2008; Lumley, 2004; Páez, Velasco, & González, 1999).

Different explanations have been given in attempts to understand the various relationships. On one hand, some argue that expressive writing may be best suited to those who are already naturally expressive, with several studies reporting greater benefits for those lower in alexithymia (Ashley, O'Connor, & Jones, 2011; Horneffer & Chan, 2009; Lumley, 2004; O'Connor & Ashley, 2008). In a series of studies on expressive writing in clinical samples with physical health concerns (Lumley, 2004), higher ratings of alexithymia were generally associated with poorer health outcomes in terms of illness-related disability, pain, health care utilization, depression, and anxiety. Similarly, in a study of undergraduate students, Horneffer and Chan (2009) found that alexithymia was associated with increases in psychological symptoms following relaxation and expressive writing exercises. Findings from these studies are consistent with others who have found that coping through identifying and expressing emotions is best suited to those who are already naturally expressive (Stanton & Low, 2012). However, this also has implications for those who are not expressive, with some researchers suggesting that expressive writing may be contraindicated for those high in alexithymia since it may actually lead to an exacerbation of symptoms (Horneffer & Chan, 2009; Lumley, 2004).

On the other hand, some studies have reported the opposite, namely, that individuals high in alexithymia show greater benefits following expressive writing (Páez et al., 1999; Solano, Donati, Pecci, Persichetti, & Colaci, 2003). Solano and colleagues (2003) studied the effects of

expressive writing in patients who underwent surgery for bladder cancer. They found that patients with higher ratings of alexithymia spent fewer days in the hospital and reported greater decreases in general psychiatric symptoms, but only for those who wrote expressively. In a sample of undergraduate students, Páez and colleagues (1999) found that high-alexithymic participants reported lower levels of negative mood following intensive writing (three 20-minute sessions) than those who wrote briefly (one 3-minute session). This pattern (i.e., that alexithymia is associated with better outcomes) suggests that expressive writing may facilitate the identification and expression of emotion among those who are typically less inclined to do so. For example, perhaps writing provides individuals with a safe opportunity for exploring and expressing their emotions if they otherwise avoid doing so (e.g., Eichhorn et al., 2014; Panayiotou et al., 2015).

However, it should also be noted that inconsistencies regarding the direction of the moderating effects of alexithymia have been found within individual studies (e.g., Baikie, 2008; Jensen-Johansen et al., 2013). For example, in an undergraduate student sample, Baikie (2008) found significant moderation effects that varied, depending on outcome. Higher alexithymia was related to greater benefits in terms of fewer physician health visits, lower depressive symptoms, and less sleep disturbance. However, those who were higher in externally-oriented thinking (a facet of alexithymia) showed increases in symptoms of trauma-related stress. Therefore, it seems that whether individuals with alexithymia benefit more or less from expressive writing also depends on the specific outcomes being assessed.

Word Use as Indicators of Psychological Processes and Outcomes in Expressive Writing

In addition to investigations into individual difference variables as treatment moderators, researchers have also analyzed the content of written narratives in attempts to understand the

underlying mechanisms of expressive writing. Text analyses of word use correspond with demographic variables (e.g., age and gender), personality, mental and physical health status, and social status (for a review, see Tausczik & Pennebaker, 2010). Text analyses of word use has also been shown to correspond with various implicit psychological processes in expressive writing, particularly with regard to affective, cognitive, and attentional (e.g., on self or others) processes (Kahn, Tobin, Massey, & Anderson, 2007; Nazarian & Smyth, 2013; Tausczik & Pennebaker, 2010). As expected, individuals who write about distressing personal experiences use more emotion (Lepore et al., 2015) and cognitive words (Merz et al., 2014) than neutral controls. The induction of sad versus amusing mood (i.e., through videos and recall of autobiographical memories) prior to writing corresponded with the subsequent use of positive and negative emotion words in participant narratives (Kahn et al., 2007). Finally, Nazarian & Smyth (2013) found that changes in word use were generally consistent with predictions based on comparisons between standard expressive writing and variations in writing instructions designed to elicit specific hypothesized mechanisms. For instance, those who were instructed to engage in cognitive-processing (i.e., understanding and insight related to stressful event) used more cognitive insight words than those in the standard expressive writing condition (i.e., deepest thoughts and feelings regarding a stressful event).

Linking word use to mental health outcomes. The words people use are also associated with health outcomes in expressive writing, with greater benefits generally associated with a higher frequency of positive emotion words and cognitive words, as well as a moderate use of negative emotion words (Pennebaker, Chung, Ireland, Gonzales, & Booth, 2007). A greater use of positive emotion words (e.g., *love, nice, sweet*) has been consistently associated with mental health benefits, particularly on measures of depression, in both clinical (Baikie et al., 2006; van

Middendorp & Geenen, 2008) and nonclinical samples (Pulverman, Lorenz, & Meston, 2014; Rude, Gortner, & Pennebaker, 2004). Research examining the use of negative emotion words (e.g., *hurt*, *ugly*, *nasty*) in relation to mental health has been somewhat mixed. Most studies have linked negative word use with poorer outcomes with regard to trauma-related stress (Boals & Klein, 2005; Margola, Facchin, Molgora, & Revenson, 2010), depression (Rude et al., 2004), anxiety (Niles, Haltom, Lieberman, Hur, & Stanton, 2016), and post-traumatic growth (Ullrich & Lutgendorf, 2002). However, some have found non-significant results (Baikie et al., 2006; van Middendorp & Geenen, 2008; Reddy, Seligowski, Rabenhorst, & Orcutt, 2015) or better outcomes (D'Andrea, Chiu, Casas, & Deldin, 2012) associated with the use of negative emotion words.

In short, while the benefits associated with positive emotion words seem clear, there are discrepancies with regard to the function of negative emotion words in adaptive emotional processing. Many of these studies (e.g., Boals & Klein, 2005; Margola et al., 2010) did not control for initial negative affectivity and, as such, the use of negative emotion words in previous studies may be confounded with distress (Kennedy-Moore & Watson, 2001). In contrast, controlling for negative affect might otherwise reveal positive outcomes associated with the use of negative emotion words (e.g., D'Andrea et al., 2012). This is consistent with clinical models suggesting that arousal and expression (rather than inhibition) of negative emotion also plays a part in healthy coping processes (Greenberg & Pascual-Leone, 2006). In other words, it is still unclear whether more or fewer negative emotion words indicate adaptive emotional processing in expressive writing, though taking initial distress levels into account may provide clarity.

The use of cognitive words are often interpreted as evidence of cognitive processing whereby individuals actively reflect on and integrate distressing experiences into a coherent and

meaningful personal narrative (Klein & Boals, 2010; Pennebaker et al., 2003). Higher frequencies of cognitive words such as *cause*, *know*, and *ought* are generally associated with better psychological health (Boals & Klein, 2005; Jelinek et al., 2010; Margola et al., 2010; Ullrich & Lutgendorf, 2002; van Middendorp & Geenen, 2008), though some have reported negative relations with psychological health (Baikie et al., 2006; D'Andrea et al., 2012). While the cause of these unexpected negative findings is unclear, D'Andrea and colleagues (2012) speculated that a greater use of cognitive words may represent maladaptive coping strategies of over-intellectualization or rumination in the absence of sufficient affective processing.

While most studies have looked at the overall use of cognitive words, some have also examined the use of specific sub-types of cognitive words. In a study by Margola and colleagues (2010), high school students who wrote about the sudden death of a classmate on three consecutive days generally showed increases in their use of affective and cognitive words over time. More importantly, those who reported reductions in symptoms of trauma-related stress at a 4-month follow-up tended to use more insight and tentative words, and fewer inhibition words, than those who reported consistently high or worsening symptoms. Similarly, a study of individuals who had a form of spinal arthritis (Hamilton-West & Quine, 2007) found that the use of more tentative and fewer certainty words was associated with reductions in depressive symptoms. Boals and Klein (2005) also found significant positive correlations between causation words and symptoms of avoidance (a component of trauma-related stress) and grief following the breakup of a romantic relationship.

Findings for the effects of first person pronoun use (e.g. *I*, *me*, *mine*) on mental health are also mixed. More frequent self-references are typically associated with poorer psychological health (Boals & Klein, 2005; D'Andrea et al., 2011; Rude et al., 2004; Margola et al., 2010;

Pulverman et al., 2014). Changes or flexibility in use of self-references over time have also been investigated. In a study of 53 drug dependent patients, Baikie and colleagues (2006) reported that greater variability in the use of first-person pronouns over writing sessions were related to improvements in anxiety. Similarly, Dunnack and Park (2009) found that, while greater use of the pronoun “I” in the first session was related to elevated symptoms of trauma-related stress and depression, increases in the use of the word “I” by the fourth and final writing session were related to reductions in trauma-related stress and depression in college students. In contrast, Pulverman and colleagues (2014) found that a reduction in the use of “I” over time (5 writing sessions) was associated with higher levels of depression in female survivors of childhood abuse. Therefore, it seems that it is important to consider changes in the use of first-person pronouns over time (rather than average use across sessions), though it is unclear whether increases or decreases are beneficial.

It should also be noted that a previous linguistic analysis (Morrison, 2015) of narratives used in the current study revealed that symptoms of trauma-related stress were associated with more frequent use of inhibition words and self-references and less frequent use of causation and certainty words, but were unrelated to use of positive or negative emotion words.

Associations between alexithymia and word use in trauma narratives. Given that alexithymia involves impairments in one’s ability to identify emotions and put them into words, it is important to consider the role of language and verbal ability in alexithymia. In a study of undergraduate students, Montebanocci et al. (2011) reported that participants higher in alexithymia were less accurate in identifying facial expressions of emotion than those who were lower in alexithymia, however, these differences disappeared when verbal intelligence was taken into account. At first glance, this suggests that alexithymia may reflect more global deficits in

language or vocabulary. However, in addition to lower verbal intelligence, a study of psychosomatic outpatients found that alexithymia was also associated with lower scores on nonverbal and general intelligence (Valdes et al., 2001). Similarly, Lane et al. (1996) found that alexithymia was associated with poorer accuracy in matching emotional stimuli with emotional responses, regardless of whether stimuli and responses were in verbal, nonverbal, or mixed formats. Finally, Luminet et al. (2006) reported that, after being presented with a list of words, students who were higher in alexithymia recalled fewer positive and negative emotion words than those who were lower in alexithymia, however, there were no differences in recall of neutral words. In short, although alexithymia may be associated with more global cognitive impairments, it is not reducible to a verbal deficiency. Instead, alexithymia is characterized by deficits that appear to be specific to the processing of emotional information.

One way of understanding these emotional processing deficits is to investigate associations between alexithymia and differences in the way that people write about difficult personal experiences in expressive writing; differences that are reflected in the words that they use. In a correlational analysis of word use, Pluth (2012) found that alexithymia was positively correlated with tentative words, negatively correlated with positive emotion words, and unrelated to negative emotion words or insight and causation words. In this study, alexithymia was also unrelated to changes in word use over time (i.e., across sessions). Páez and colleagues (1999) found that individuals high in alexithymia were less introspective and that those who had greater difficulty describing feelings (a facet of alexithymia) wrote shorter essays and used fewer self-references and positive emotion words. Similarly, Tull, Medaglia, and Roemer (2005) reported that those with difficulties identifying feelings used fewer positive and more negative emotion words. Likewise, Kahn and colleagues (Experiment 3; 2007) found that dispositional

expressivity (i.e., low alexithymia) was associated with more frequent positive emotion words, but dispositional restrictiveness (i.e., high alexithymia) was unrelated to negative emotion word counts. However, some have failed to find significant correlations between alexithymia and use of emotion words (Jelinek et al., 2010; van Middendorp & Geenen, 2008) or personal pronouns (Kettendörfer, 2014).

Few studies have reported findings with regard to alexithymia and the use of cognitive processing words. In a clinical sample of mental health outpatients (Vanheule, Meganck, & Desmet, 2011), externally-oriented thinking predicted fewer positive emotion words and cognitive words. Conversely, difficulties identifying feelings were related to more frequent use of cognitive words. This suggests that facets of alexithymia may influence word use differently, with externally-oriented thinking representing a general lack of cognitive and affective coping with distress, whereas when attempts are made to deal with distress, difficulties identifying feelings may indicate a bias in favor of cognitive over emotional processing in response to physiological arousal.

Another limitation of previous research is that very few studies have explicitly connected differences in linguistic patterns to mental health outcomes in an attempt to understand the moderating influences of alexithymia on expressive writing. One exception to this was a study conducted by O'Connor and Ashley (2008) using a sample of healthy college students. In this study, alexithymia was found to be a significant moderator of expressive writing effects such that lower levels of alexithymia were associated with reductions in emotional distress among those who wrote about an upsetting event. They also found that differences in physiological responses to lab-induced stress tasks two weeks after writing depended on both alexithymia and the proportion of positive relative to negative emotions that participants wrote about. Reduced stress

responses were associated with disclosing more positive than negative emotions for those lower in alexithymia, whereas the opposite was true for those higher in alexithymia who benefited from disclosing more negative than positive emotions. This suggests that the moderating effects of alexithymia on expressive writing may be due, in part, to differences in the processing of positive and negative emotions.

To summarize, there are relatively few studies examining differences in word use associated with alexithymia. In those that have, alexithymia appears to be associated with the use of fewer positive and more negative emotion words, though support is somewhat mixed with regard to the use of negative emotion words. The use of cognitive words and personal pronouns are largely understudied in the context of alexithymia. Even fewer studies have explicitly connected linguistic patterns associated with alexithymia to mental health outcomes of expressive writing. In one study that has (O'Connor & Ashely, 2008), this pattern of expressing fewer positive and more negative emotions seems to be more adaptive for those higher in alexithymia than for those lower in alexithymia.

Furthermore, these studies examined word categories as individual predictors of outcomes. However, such approaches fail to account for possible cumulative effects of word use across multiple categories. For example, if frequent use of words in categories A and B are associated with mental health outcomes, someone who scores high in both categories may differ appreciably from someone else who scores high in only one category and not the other. In other words, category A and category B may be necessary, but not sufficient, conditions to bring about reductions in psychological symptoms, but perhaps both categories together are sufficient to produce such beneficial effects. A composite measure may capture these additive effects that

might not otherwise be accounted for in previous research, obscuring our understanding of processes underlying the moderating influence of alexithymia on expressive writing.

Study Rationale

In addition to exploring *how* it works, researchers have also started asking questions about *who* expressive writing works best for. Alexithymia has been identified as a significant moderator of expressive writing effects, however, the nature of this relationship remains unclear (e.g., Baikie, 2008). Some studies show that expressive writing is best suited to those who are lower in alexithymia while other studies report greater benefits for those who are higher in alexithymia. Text analyses of word use in expressive writing narratives may provide insights into a) inconsistencies in the literature regarding the moderating effects of alexithymia and, more broadly, b) the mechanisms underlying associations between alexithymia and mental health outcomes. Previous research has identified associations between word usage, alexithymia, and mental health outcomes. However, only one study to date has examined all three together (O'Connor & Ashley, 2008) and none have used a composite measure of multiple word use categories to explain the moderating effects of alexithymia in expressive writing. The literature suggests that greater use of cognitive processing words reflecting insight, causation, and tentativeness, as well as lesser use of inhibition words, are generally associated with desirable mental health outcomes (e.g., Boals & Klein, 2005; Margola et al., 2010). Increases in the use of positive and decreases in negative emotion words are often interpreted as evidence of adaptive emotional processing, whereas self-references are predictors of poorer outcomes (e.g., Rude et al., 2004). This is particularly relevant for understanding the suitability of expressive writing for individuals who are high in alexithymia and demonstrate deficits in emotional awareness and

processing; deficits which may be reflected in the way they write about their difficult personal experiences.

Current Study & Hypotheses

The aim of the current study was to investigate whether or not alexithymia was associated with differences in how individuals wrote about and worked through distress following difficult personal experiences, possibly providing clues as to the role of alexithymia in expressive writing. The first goal was to determine whether alexithymia facilitated or impeded mental health benefits following expressive writing. The second goal was to determine if patterns in word use provide insights into the psychological processes underlying the moderating effects of alexithymia on mental health outcomes. In order to address these questions, the following specific hypotheses were tested.

Hypothesis 1: Expressive Writing Produces Mental Health Benefits. Participants in the expressive writing condition were hypothesized to demonstrate greater reductions in mental health symptoms from pre- to post-intervention, relative to control participants. Mental health outcomes consist of change scores on self-report symptoms of trauma-related stress, depression, and anxiety, assessed independently.

Hypothesis 2: Alexithymia Influences the Effectiveness of Expressive Writing. The relation between writing condition (control versus expressive writing) and symptom reduction was hypothesized to be moderated by alexithymia. In light of discrepancies in previous literature, no specific hypotheses were made in advance with regard to the direction of this moderation effect, namely, whether individuals higher or lower in alexithymia demonstrated greater reductions in symptoms from pre- to post-intervention when writing expressively (compared with controls).

Hypothesis 3: Distinct Patterns of Word Use Are Associated with Alexithymia. This exploratory hypothesis was used to determine whether alexithymia was associated with specific combinations of words used in expressive writing narratives. Previous literature suggests that alexithymia may be associated with more tentative and negative emotion words, in addition to fewer self-references and positive emotion words. Other cognitive word categories associated with mental health outcomes (i.e., insight, causation, inhibition, and certainty words) were also included for exploratory purposes. As such, associations between alexithymia and the eight word categories listed above were investigated. A composite word use score (for use in Hypothesis 4) was computed based on the combined frequencies of word categories which significantly predicted self-reported alexithymia.

Hypothesis 4: The Alexithymia Composite Word Use Score Mediates the Relation Between Alexithymia and Mental Health Outcomes of Expressive Writing. Among those who wrote expressively, individuals high in alexithymia were expected to score higher on the alexithymia word use composite, which in turn would have been positively associated with changes in trauma-related stress, depression, and anxiety. In other words, writing patterns consistent with alexithymia were hypothesized to be associated with weaker reductions or greater increases (i.e., change scores that are near zero or positive, respectively) in symptom severity from pre- to post-intervention.

CHAPTER II

METHOD

Participants

This study made use of archival data collected by Pascual-Leone and colleagues (2011) between October 2010 and December 2012. In that parent study, undergraduate students enrolled in psychology courses at the University of Windsor were recruited through a Research Participant Pool. Students were selected who indicated that they had experienced a distressing event that was reportedly unresolved or was still upsetting to them at the time of the study. A total of 255 students took part in the study, however 13 participants (5.1%) were excluded due to missing data, primarily at follow-up, and one participant was excluded who did not complete the post-intervention depression questionnaire. Two participants had missing data for one of the three writing days, however, they were included in the sample since average scores were used to assess word use in trauma narratives.

The final sample for the current study consists of a total of 241 participants. Of these, 212 (88%) were female, 28 (12%) were male, and one (.4%) was transgendered. The majority of participants were Caucasian (59%), followed by African American (12%), South Asian (10%), and Middle Eastern (5%). While many participants were psychology majors, students from a wide range of undergraduate programs and at various stages of completion (i.e., from first- to fourth-year and above) were represented in the sample. Despite experiencing a significant personal upheaval, the majority of participants (65%) had not previously sought out counselling or psychiatric medication to help deal with issues related to their difficult experience.

Procedure

Research Ethics Board approval was obtained for the original data collection before the parent study commenced and participants gave informed consent upon arrival. Participants were assigned unique identification numbers which were linked with their data in order to maintain confidentiality. They were then brought to a quiet computer lab where they completed a battery of questionnaires related to general physical health and psychological wellbeing which included measures of depression, life satisfaction, and emotional coping (a complete list of measures can be found in Appendix A). Participants then completed a writing task for fifteen minutes per day for three consecutive days. Finally, participants completed self-report measures on two more occasions; two-weeks and one-month after completion of the writing task. At the end of the study participants were debriefed and received a three percent course credit along with \$35 in remuneration.

Participants were randomly assigned to one of five writing conditions, which were differentiated on the basis of writing instructions that were modifications of those used in the original Pennebaker & Beall (1986) study. The study was double-blinded, that is, both the researcher and participant were blind to condition assignment for the duration of the study. In the control condition, participants were instructed to write a detailed, non-emotional description of what they did in the previous 24-hour period. Those in the remaining four conditions were instructed to write about their deepest thoughts and feelings related to their difficult personal experience. In one of these groups participants were free to write about any emotion, whereas instructions given to the other three groups were designed with the intention of eliciting specific expressions of emotion, from less adaptive (e.g., global distress) to more adaptive (e.g., assertive

anger), based on the sequential emotion processing model developed by Pascual-Leone and Greenberg (2007).

Earlier investigations of this dataset ($n = 109$, Harrington, 2012; $n = 255$, Sawashima, 2015) suggested that differences in emotional processing were primarily due to being told to write about emotional versus non-emotional content, rather than whether or not participants were instructed to write about specific emotions. Furthermore, the emphasis of the current study is on differences between expressive writing and a writing control group, rather than on variations of writing instructions for eliciting specific emotions per se. As such, these four groups are regarded as functionally equivalent for the purposes of this study and together comprise a single “expressive writing condition.” As a result, 49 participants were in the control condition and 192 participants were in the expressive writing condition.

Measures

In addition to outcome, individual difference, and process measures, participants were asked to rate overall life stress (9-point scale) and physical health concerns (5-point scale) that they had experienced during the span between the start of the intervention and the two-week follow-up. Higher ratings indicated greater stress or health concerns. This was done in order to assess (very broadly) potential confounding influences on general well-being from factors outside the study.

Outcome measures. A subset of measures were selected from the archival data set representing mental health outcomes assessed pre- and post-intervention (i.e., prior to the beginning of the first writing session and two-weeks following the last writing session). The selected measures assess self-report symptoms of trauma-related stress, depression, and anxiety. In order to account for less-than-perfect reliability in measures assessed at two time points,

internal consistencies for change scores used in the current study were determined by subtracting pre- from post-intervention ratings for each item in the scale, then computing Cronbach's α for each scale based on these item-level difference scores.

Trauma-Related Stress. The Impact of Event Scale-Revised (IES-R; Appendix B; Weiss & Marmar, 1997) is a 22-item questionnaire assessing features of intrusiveness, avoidance, and hyperarousal associated with post-traumatic stress. For each symptom, participants rated the degree of distress they experienced in relation to their difficult life event on a 5-point scale from 0 (*Not at All*) to 4 (*Extremely*). Sample items on the intrusiveness subscale include "Any reminders brought back feelings about it" and "I thought about it when I didn't mean to." Avoidance items include "I tried to remove it from my memory" and "I stayed away from reminders about it." Finally, items on the hyperarousal subscale include "I felt irritable and angry" and "I felt watchful and on guard."

The IES-R is a widely-used measure in stress and trauma research and has demonstrated acceptable psychometric properties. Test-retest reliabilities range from $r = .89$ to 0.94 (Weiss & Marmar, 1997) and internal consistencies (Cronbach's α) for the subscales range from 0.79 to 0.97 (Creamer, Bell, & Failla, 2003). Internal consistency (Cronbach's α) in the current study was $.85$ for pre- to post-intervention difference scores on the IES-R. High correlations have been found with the original IES and with other measures of trauma-related stress. The IES-R has also been found to differentiate between individuals with and without post-traumatic stress disorder, thereby demonstrating concurrent and discriminative validity as well (Beck et al., 2008; Creamer et al., 2003). The IES-R is recommended as a measure of subjective distress associated with a specific event, rather than for diagnosis of post-traumatic stress disorder per se.

Depression. The Center for Epidemiologic Studies Depression Scale (CES-D; Appendix C; Radloff, 1977) is a widely used measure in the assessment of depressive symptoms in the general population. A shortened, 10-item version of the scale was used which required participants to rate the frequency with which they had experienced each symptom over the past week, using a 4-point scale ranging from *Rarely or None of the Time* to *Most or All of the Time*. Representative sample items include “I felt depressed”, “I felt hopeful about the future” (reverse scored), and “I felt that everything I did was an effort.”

The shortened 10-item version has demonstrated strong internal consistency (Cronbach’s $\alpha = .88$) and is highly correlated ($r = .97$) with the full 20-item version of the CES-D (Zhang et al., 2012). Internal consistency (Cronbach’s α) in the current study was .78 for pre- to post-intervention difference scores on the CES-D. Two-week test-retest reliability for the 10-item version is good ($r = .85$; Miller, Anton, & Townson, 2007). It is also sensitive to treatment effects and has good convergent, discriminant, and divergent validity (Weiss, Aderka, Lee, Beard, & Björgvinsson, 2015). The CES-D is correlated, in the expected directions, with other brief measures of depression ($r_{avg} = .86$) as well as measures of anxiety, stress, worry, psychological wellbeing, and emotion regulation skills (Weiss et al., 2015).

Anxiety. The State-Trait Anxiety Inventory (STAI, Form Y; Appendix D; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) is a brief self-report questionnaire designed to assess dynamic (state) and enduring (trait) dimensions of anxiety in adults. Whereas state anxiety fluctuates over time with changes in perceived stress, trait anxiety is a relatively stable disposition characterized by a general proneness to worry and unease.

The Pascual-Leone and colleagues (2011) parent study used only the twenty trait anxiety items, asking participants to rate the frequency with which they felt each anxiety-related

experience in the previous two weeks. Using a four-point Likert scale ranging from *Almost Never* to *Almost Always*, individuals responded to statements such as “I feel nervous and restless” and “I worry too much over something that really does not matter”. Higher scores indicate greater levels of dispositional anxiety and some items are reverse coded; for example, “I am calm, cool, and collected.”

A review of STAI reliability estimates published in 46 studies reported mean internal consistencies of .89 (Cronbach’s α ; $SD = .05$) and mean test-retest reliabilities of .88 (Pearson r ; $SD = .05$) for trait anxiety (Barnes, Harp, & Jung, 2002). Internal consistency (Cronbach’s α) in the current study was .76 for pre- to post-intervention difference scores on the STAI. The STAI has been found to differentiate between anxious and normal subjects and has also demonstrated high correlations with other measures of anxiety, thereby supporting construct validity (Spielberger & Reheiser, 2009). As such, the STAI is a popular measure of anxiety used in many studies across several different countries (Spielberger & Reheiser, 2009).

Individual difference measure. The Toronto Alexithymia Scale (TAS; Appendix E; Parker, Taylor, & Bagby, 2003) is the most widely used measure of alexithymia. It is a 20-item self-report measure assessing difficulties identifying and describing feelings, as well as externally-oriented thinking. Using a five-point Likert scale ranging from *Strongly Disagree* to *Strongly Agree*, individuals rated the degree to which each of the statements was true for them. Sample items include “When I am upset I don’t know if I am sad, frightened, or angry”, “People tell me to describe my feelings more”, and “I prefer talking to people about their daily activities rather than their feelings.”

The TAS has been shown to be a valid and reliable measure of alexithymia. Cronbach’s alpha values are reported around .80 to .83, indicating acceptable internal consistency, and three-

week test-retest reliability ratings of .77 have also been found (Bagby, Parker, & Taylor, 1994). The TAS has demonstrated convergent and discriminant validity with other theoretically-relevant constructs, including psychological mindedness and openness to experience (Bagby, Taylor, & Parker, 1994). It also shows high levels of agreement with observer ratings of alexithymia (Parker et al., 2003).

Conventional TAS cut-off values are used for classifying individuals as alexithymic (scoring 61 or above), borderline alexithymic (scoring from 52 to 60), and non-alexithymic (scoring 51 or below; Parker, Keefer, Taylor, & Bagby, 2008). While these conventions are not reflective of discrete diagnostic categories per se, they are nevertheless clinically-meaningful indicators of elevated levels of alexithymia. Based on these cut-off scores, 17.4% of participants in the parent study were classified as alexithymic, 25.7% as borderline alexithymic, and 56.8% as non-alexithymic ($M = 49.65$, $SD = 11.92$, range: 20 to 82). As such, it should be noted that the prevalence of alexithymia in the current sample is slightly higher than what generally might be expected for samples of university students (cf. the 11% alexithymic anticipated by Parker et al., 2008).

Process measure. A linguistic analysis was used in order to quantify psychological processes evident in participant narratives. The current study made use of computerized text analyses of word use that had previously been coded in an earlier study (Morrison, 2015) using the 2007 version of the Linguistic Inquiry and Word Count (LIWC; Pennebaker et al., 2007) software program. In addition to the original LIWC word categories, a unique composite word use score was computed by combining word categories that are significant predictors of alexithymia. This composite score was used to assess potential cumulative effects of implicit processes linking alexithymia with mental health outcomes of expressive writing.

The LIWC uses a dictionary of approximately 4,500 words and word stems to quantify word use in 80 linguistic categories, reported as percentages of total word use (in order to control for essay length). However, the sum of all word categories exceeds 100% since some words can be classified into multiple categories. For example, the word *cried* represents five linguistic categories: sadness, negative emotion, overall affect, verb, and past tense verb. The development of LIWC dictionaries involved gathering words from a range of sources (e.g., English dictionaries and psychological rating scales), classification of words into psychological process categories by a group of expert judges, and a series of revisions based on the application of the LIWC to several hundred thousand text files (for more details, see Pennebaker et al., 2007).

Given associations found between word use and mental health in previous studies, the current study examined the use of emotion words, cognitive words, and first person singular pronouns (e.g., I, me, mine). Emotion words were separated into two subcategories; positive emotion words (e.g., love, nice, sweet) and negative emotion words (e.g., hurt, ugly, nasty). Five subcategories of cognitive words were used, namely: words related to insight (e.g., think, know, consider), causation (e.g., because, effect, hence), tentativeness (e.g., maybe, perhaps, guess), certainty (e.g., always, never), and inhibition (e.g., block, constrain, stop).

There are two indicators of internal validity that provide estimates of inter-correlations between occurrences of a single word with all other words in the same category, across a number of essays. The binary method codes for the presence (1) or absence (0) of a word in a text, but may overestimate reliability as the length of texts increases. The uncorrected method computes the percentage of words used in a single category relative to the total number of words used, but may underestimate reliability due to high variability in base rates of words used in a category. Reliability estimates vary, but generally exceed correlations of .60 (Pennebaker et al., 2007).

Although there are several studies demonstrating that the LIWC is a valid measure of natural word use (see Tausczik & Pennebaker, 2010), only two will be mentioned here. In an expressive writing study, Pennebaker and Francis (1996) found high correlations, ranging from .35 to .75, between LIWC scales and ratings of four expert judges. More recently, Kahn and colleagues (2007) found that LIWC emotion word counts correspond with variations in writing instructions designed to elicit expression of either sadness or amusement in essays about autobiographical memories or reactions to film clips. Estimates suggest that, on average, the LIWC captures 86% of the words people use (Pennebaker et al., 2007).

Data Analyses

Multiple regression analyses were used to test the ability of writing condition and alexithymia (independent variables) to account for changes in mental health symptomology from pre- to post-intervention. Change scores (post minus pre) were computed for each mental health outcome. Symptoms of post-traumatic stress, depression, and anxiety (dependent variables) were assessed independently as outcomes in separate regression models.

Testing H1: Effects of Writing Condition. Condition (expressive writing vs. control), alexithymia, and an Alexithymia by Condition interaction term were entered as predictors of outcomes into multiple regression models. Support for the first hypothesis was determined by whether or not writing condition (expressive writing vs. control) emerged as a significant predictor of pre-to-post symptom change in regression models for each outcome.

Testing H2: Alexithymia Moderation. A Condition by Alexithymia interaction term was used to test for significant moderation effects. All predictors were centered in order to eliminate nonessential multicollinearity and for ease of interpretation (see Cohen, Cohen, West, & Aiken, 2003, Chapter 7). No predictions were made with regard to directionality due to lack of

clarity in previous research regarding whether participants higher or lower in alexithymia benefit more from expressive writing (e.g., Lumley, 2004; Páez et al., 1999).

Testing H3: Patterns of Word Use Associated with Alexithymia. For those in the expressive writing condition, a linguistic composite was computed based on the combined frequencies of word usage in categories that significantly predicted self-reported alexithymia. In the first block, pre-intervention scores on trauma-related symptoms were entered into a multiple regression model in order to control for initial levels of distress. In the second block, eight categories of words related to emotion (i.e., positive, negative), cognition (i.e., insight, causation, tentative, certainty, and inhibition), and personal pronouns were entered into the model as predictors of alexithymia. For each participant, word frequencies in significant word categories were multiplied by their respective beta weights from the regression model and summed to create a composite word use score associated with alexithymia. This was done in order to create a unique variable that indexes alexithymia by proxy through observed word use.

Testing H4: Word Use Mediation. As an indicator of implicit psychological processes associated with alexithymia, the linguistic composite (from Hypothesis 3) was tested as a mediator linking self-reported alexithymia (as a dispositional trait) with changes in psychological symptoms following expressive writing (Figure 1). Mediation models were assessed for each outcome using Preacher & Hayes (2004) bootstrapping techniques (5000 iterations). Analyses were based on multiple regression models using alexithymia and the linguistic composite as predictors of symptom change, with each outcome being assessed in independent models. In order to ensure that the correct model is specified, a second set of mediation analyses were conducted with writing condition and the linguistic composite reversed (i.e., with condition as the mediator).

CHAPTER III

RESULTS

Sixty-two participants (26%) had one or more missing data points across measures of alexithymia and the three outcomes (IES-R, CES-D, and STAI). The number of missing data points per participant ranged from 1 to 5 missing values, with no participant having more than 2 missing values on any single measure. Out of a total of 29,884 observations, only 94 (.3%) values were missing across the data matrix. SPSS missing value analysis procedures were used to impute missing values, based on regression equations using items from non-missing data points to estimate missing values.

At the post-intervention follow-up, participants were asked to rate their overall life stress and physical health concerns over the two weeks since the writing intervention. The majority of participants (56%) reported ratings of 6 or higher on a 9-point scale for overall stress ($M = 5.73$, $SD = 1.704$), indicating that most participants regarded their lives as being stressful. Overall, most participants reported being in “good” (39%) health, with 42% indicating “very good” or “excellent” health and 19% indicating “fair” or “poor” health. Outcomes were significantly correlated with life stress ($r = .121$ to $.166$, $p = .010$ to $.061$) and physical health ($r = .106$ to $.175$, $p = .006$ to $.100$), so life stress and physical health were subsequently included as covariates in analyses reported below.

Independent samples t-tests revealed no significant differences between the control and expressive writing conditions on pre-intervention ratings of alexithymia [$t(239) = -.981$, $p = .327$], trauma-related stress [$t(239) = -.076$, $p = .940$], depression [$t(239) = -.562$, $p = .575$], or anxiety [$t(239) = .422$, $p = .674$]. Descriptive statistics for alexithymia and pre- and post-intervention outcomes are reported in Table 1. On average, participants reported a 6.38 point

decrease ($SD = 13.43$, range: -43 to 42) in trauma-related stress, a .96 point decrease ($SD = 5.44$, range: -20 to 23) in depression, and a 1.86 point decrease ($SD = 6.85$, range: -29 to 20) in anxiety from pre- to post-intervention. Paired samples t-tests showed that, irrespective of condition, reductions in symptoms of trauma-related stress [$t(240) = -7.372$, $p < .001$], depression [$t(240) = -2.752$, $p = .006$], and anxiety [$t(240) = -4.215$, $p < .001$] from pre- to post-intervention were statistically significant, with 95% CIs of [-8.082, -4.674], [-1.655, -.274], and [-2.730, -.991], respectively.

Regression Assumptions

The sample size was adequate for each of the regression analyses that was conducted, based on Stevens' (2012, p. 117) recommendation of 15 participants per predictor. Interaction analyses (H1 and H2) contained 5 predictor variables ($N = 241$), analyses involved in the computation of the linguistic composite variable (H3) included 12 predictor variables ($N = 192$), and the linguistic composite mediation analyses (H4) contained 4 predictors ($N = 192$). The independence of errors assumption was also met since participants completed the study individually and privately. They were also asked not to discuss the study with others. Visual inspection of bivariate scatterplots did not reveal any obviously non-linear associations between predictors and outcomes. There were no concerns with regard to multicollinearity among predictors following examination of tolerance ($> .10$) and VIF (< 10) values as well as bivariate correlation tables for any of the regression models that were tested. Plots of standardized predicted scores by standardized residual scores and normal probability plots of residuals revealed no violations in assumptions of homoscedasticity or normality for any of the regression analyses that were conducted.

For all analyses, deleted studentized residuals and leverage values were used to identify potential outliers on outcome and predictor variables, respectively. In addition, both Cook's distances and standardized DFFITS values were used to identify potential influential observations. No influential observations were identified in any of the analyses that were conducted.

All regression models were analyzed with and without gender as a predictor variable. However, gender was not a significant predictor in any model and resulted in the loss of one participant who self-reported as transgendered. Therefore, the gender variable has been excluded from all regression analyses that are reported below.

Effects of Writing Condition (H1) and Alexithymia Moderation (H2)

Three hierarchical regression models were tested; one for each outcome, namely, change scores on trauma-related stress, depression, and anxiety. Life stress and physical health concerns were included in order to control for potential covariates which could confound the data. In addition to covariates, condition (expressive writing vs control) and alexithymia were also entered into Block 1 of each regression. A condition*alexithymia interaction term was then entered in Block 2 in order to assess the potential moderating effects of alexithymia on expressive writing.

Seven outliers were identified on independent variables, all of whom were participants in the control condition. However, since only a minority of participants (20.3%) were in the control condition, it was suspected that leverage values may have been artificially inflated for these participants. When regressions were re-analyzed, excluding the condition and condition*alexithymia interaction terms, there were no longer any outliers identified on independent variables, so no independent variable outliers were removed from the complete,

five-predictor models. With regard to outliers on dependent variables, two outliers were identified on trauma-related stress, four on depression, and four on anxiety. Removal of eight outlying cases (two cases were outliers on two outcomes) produced negligible changes in statistical assumptions and regression results and were included in all results reported below.

Regression models predicting pre- to post-intervention changes in trauma-related stress [$F(5,235) = 3.055, p = .011$], depression [$F(5,235) = 4.714, p < .001$], and anxiety [$F(5,235) = 4.536, p = .001$] were all statistically significant, accounting for 6.1 to 9.1 percent of variance in outcomes (see Table 2 for a summary). Condition (control vs. expressive writing) was not a statistically significant predictor of changes in trauma-related stress ($p = .728$), depression ($p = .866$), or anxiety ($p = .338$). Similarly, no significant condition by alexithymia moderation effects were found for trauma-related stress ($p = .622$), depression ($p = .245$), or anxiety ($p = .347$). However, alexithymia did emerge as a significant predictor of changes in trauma-related stress ($\beta = -.157, p = .016$), depression ($\beta = -.232, p < .001$), and anxiety ($\beta = -.235, p < .001$) such that higher levels of alexithymia were associated with greater reductions in psychological symptoms. Likewise, life stress predicted increases in depression ($\beta = .123, p = .062$) and anxiety ($\beta = .145, p = .028$), whereas health concerns predicted increases in trauma-related stress ($\beta = .182, p = .008$) and depression ($\beta = .144, p = .032$) from pre- to post-intervention.

Word Use Associated with Alexithymia (H3)

Identification of word use patterns associated with alexithymia and subsequent computation of the linguistic composite was completed through a three-step process. For both regression equations reported here, total word count and pre-intervention ratings of trauma-related stress, as well as post-intervention ratings of life stress and health concerns, were entered as covariates in Block 1, followed by the addition of LIWC word categories in Block 2. First, a

preliminary regression model was tested which included all 8 LIWC word categories as simultaneous predictors of alexithymia. Second, a revised regression model predicting alexithymia was created using only those word categories which approached statistical significance (that is, categories which returned a p -value of .10 or less) in the first regression equation. Third, the linguistic composite variable was then computed for each participant by a) weighting scores from each significant ($p \leq .05$) word category by multiplying the score by the category's respective beta-weight, and b) summing the weighted scores for each of the significant word categories. Only participants in the expressive writing condition were included since differences in writing styles that correspond with varying degrees of dispositional emotional awareness were assumed to be less evident in non-emotional essays than in trauma narratives. More importantly, this also serves to control for writing content since the inclusion of both trauma and mundane (control) narratives introduces ambiguity into the interpretation of study results.

No dependent variable (alexithymia) and only one independent variable outlier was identified. The removal of this outlier produced negligible changes in statistical assumptions and regression results and is therefore included in all results reported below.

Causation ($\beta = .119, p = .071$) and certainty ($\beta = .155, p = .018$) words were the only two LIWC word categories to approach statistical significance as predictors of alexithymia. In the revised regression which only included causation ($\beta = .126, p = .045$) and certainty ($\beta = .157, p = .014$) word categories, both categories emerged as significant predictors of alexithymia while controlling for word count ($\beta = -.187, p = .003$), trauma-related stress ($\beta = .417, p < .001$), life stress ($\beta = -.073, p = .269$), and physical health concerns ($\beta = .215, p = .001$). The final revised regression model predicting alexithymia [$F(6,185) = 12.714, p < .001$] was statistically

significant, accounting for 29.2 percent of variance. Based on this revised regression, the linguistic composite variable was computed as follows: $(.126 * \text{causation}) + (.157 * \text{certainty})$.

Word Use Mediation (H4)

Three linear regression models and Preacher and Hayes (2004) mediation analyses were used to test the hypothesis that the linguistic composite would mediate the association between alexithymia and mental health outcomes among participants who wrote expressively. For regression models, life stress, health concerns, and alexithymia were entered in the first block. The linguistic composite was entered into a second block in order to assess any differences in the alexithymia predictor before and after the inclusion of the linguistic composite.

A total of 6 dependent variable outliers were identified; one on trauma-related stress, three on depression, and three on anxiety (one participant was an outlier on both depression and anxiety). A single independent variable outlier was also identified. Regression and mediation analyses were conducted both with and without these 7 outliers. However, removal of outliers produced negligible changes in statistical assumptions and results. Therefore, all expressive writing participants ($n = 192$) were included in the results reported below.

Regression models predicting pre- to post-intervention changes in trauma-related stress [$F(4,187) = 5.541, p < .001$], depression [$F(4,187) = 3.612, p = .007$], and anxiety [$F(4,187) = 3.943, p = .004$] were all statistically significant, accounting for 7.2 to 10.6 percent of variance in outcomes. As illustrated in Figure 1, Preacher and Hayes (2004) bootstrapping analyses revealed that the linguistic composite (i.e., weighted causality and certainty words) mediated the effect of alexithymia on pre- to post-intervention changes in trauma-related stress. Results indicated that alexithymia was a significant predictor of the linguistic composite ($B = .002, SE = .001, 95\% \text{ CI } [.001, .004] p = .003$) while the linguistic composite was a significant predictor of trauma-related

stress ($B = -20.213$, $SE = 7.570$, 95% CI [-35.146, -5.280], $p = .008$). Furthermore, results were consistent with full mediation as alexithymia was a significant predictor of trauma-related stress before ($B = -.169$, $SE = .077$, 95% CI [-.320, -.018], $p = .029$), but not after ($B = -.124$, $SE = .077$, 95% CI [-.277, .028], $p = .109$), the addition of the linguistic composite variable into the regression model. Finally, 5000 bootstrapped samples produced a mean unstandardized indirect effect of $-.045$ ($SE = .023$), with a 95% confidence interval of [-.103, -.011]. Therefore, the indirect effect was statistically significant; that is, alexithymia was associated with pre- to post-intervention reductions in trauma-related stress, through the linguistic composite. Exploratory analyses revealed no such indirect effects for those who were in the control condition. The alternative hypothesis – that alexithymia mediates the association between the linguistic composite and trauma-related stress – was not supported in a follow-up bootstrap analysis, which produced an indirect effect of -2.643 ($SE = 1.873$, 95% CI [-7.227, .286]).

In addition to trauma-related stress, alexithymia was also associated with reductions in symptoms of both depression ($B = -.088$, $SE = .033$, 95% CI [-.153, -.023], $p = .008$) and anxiety ($B = -.116$, $SE = .041$, 95% CI [-.197, -.034], $p = .006$). However, the linguistic composite was not a significant predictor of either depression ($B = -.183$, $SE = 3.229$, 95% CI [-6.554, 6.188], $p = .955$) or anxiety ($B = -2.183$, $SE = 4.042$, 95% CI [-10.156, 5.791], $p = .590$). Preacher and Hayes (2004) bootstrapping estimates of potential indirect effects of the linguistic composite on associations between alexithymia and outcomes were also non-significant for both depression and anxiety, with 95% CIs of [-.013, .012] and [-.025, .011], respectively.

CHAPTER IV

DISCUSSION

The overall aim of this study was to investigate one of the processes underlying the influence of emotional awareness and expressivity (i.e., alexithymia) on the effectiveness of expressive writing with regard to mental health outcomes. In general, the results of this study provided limited support for study hypotheses. Contrary to expectations, the expressive writing intervention did not produce mental health benefits, and it followed that alexithymia did not moderate the effectiveness of expressive writing. However, alexithymia was associated with reductions in mental health symptoms, irrespective of writing condition. Furthermore, word use mediated the relation between alexithymia and changes in trauma-related stress among those in the expressive writing condition. More specifically, alexithymia was associated with the use of more causation and certainty words in trauma narratives, which in turn predicted greater reductions in symptoms of trauma-related stress.

Alexithymia Moderation (H2) could not be Tested due to a Failure to Replicate Expressive Writing Effects (H1) on Mental Health Outcomes in the Current Study

The fact that expressive writing did not produce mental health benefits relative to non-emotional controls is surprising since the general consensus is that expressive writing has a small, but beneficial effect on mental health (Frattaroli, 2006). However, previous research has also revealed a great deal of inconsistency with regard to specific mental health outcomes. As reviewed in the introduction above, studies can be found demonstrating both significant and non-significant differences between expressive writing and neutral control groups with regard to symptoms of trauma-related stress (e.g., Hirai et al., 2012; Kearns et al., 2010), depression (e.g., Baikie et al., 2012; Krpan et al., 2013), and anxiety (e.g., Baikie et al., 2012; Hemenover, 2003).

Furthermore, not all studies have reported significant effects of expressive writing on mental health. For example, in a meta-analysis of 37 expressive writing studies, Meads and Nouwen (2005) concluded that expressive writing did not lead to improvements in symptoms of post-traumatic stress, depression, or anxiety. Non-significant results were also found for each of these symptom domains in a study of Italian adolescents who wrote about problems with peers (Giannotta et al., 2009). Nevertheless, it remains unclear as to why the expressive writing task was not effective for any mental health outcome in the current study.

It is unlikely that these null results were due to failures on the part of the experimental manipulation itself. Randomization appears to have been successful, with no differences evident prior to the start of the intervention between control and expressive writing participants on study measures. With regard to the task itself, the control condition and one of the expressive writing conditions employed standard instructions, based on Pennebaker and Beall's (1986) original study, which have yielded significant intervention effects in previous research. Furthermore, instructions given to the remaining three expressive writing conditions were designed to elicit specific expressions of emotion that are hypothesized to be associated with adaptive sequential processing of emotion (Pascual-Leone & Greenberg, 2007). These conditions were expected to produce stronger effects than the standard Pennebaker and Beall (1986) expressive writing procedure (e.g., van Middendorp et al., 2008). For example, in a comparable study, Guastella and Dadds (2009) developed instructions intended to isolate and evoke key shifts in emotion processing and found that participants who moved sequentially from exposure, to exploration of dysfunctional cognitions, to benefit-finding demonstrated greater reductions in anxiety and negative affect than those in a standard expressive writing condition. In a previous analysis of data used in the current study, Harrington (2012) found that those in the control group displayed

less global distress, fear/shame, rejecting anger, self-soothing, and emotional experiencing than those in the expressive writing condition, but that, within the expressive writing condition in the parent study, there was significant variation in terms of the actual emotions that were expressed. Therefore, there is evidence of successful experimental manipulation even though there was no evidence of corresponding differences in mental health outcomes in the current study.

A more plausible explanation is that the null effects obtained in the current study may be due, in part, to the small effect size for mental health changes that are associated with expressive writing ($r = .056$; Frattaroli, 2006). Cumming (2013) has demonstrated that p -values in null hypothesis significance testing are notoriously unreliable, particularly for small effects, and he recommends the use of confidence intervals and meta-analyses in estimating the replicability of findings. Therefore, confidence intervals reported in the current study (Table 2) must be understood within the context of those in other studies and, in light of significant (though small) intervention effects reported in previous meta-analyses (e.g., Frattaroli, 2006), it seems that the non-significant intervention effects found in the current study are likely a reflection of the unreliability of p -values, rather than the absence of a true effect.

Given the non-significant findings, the current study was not in a position to replicate previous research suggesting that the effectiveness of expressive writing depends, in part, on alexithymia. Some studies have found that those who are more emotionally aware and expressive tend to receive greater benefits from expressive writing and that having alexithymia interferes with successful emotional processing, rendering expressive writing less useful for those high in alexithymia (Lumley 2004; Niles et al., 2014). In contrast, other studies have found that those high in alexithymia show greater benefits, suggesting that expressive writing may provide a safe context for practicing and developing skills involved in identifying and working through painful

emotions that are otherwise outside of awareness (Solano et al., 2003; Páez et al., 1999). The current results do not support or clarify either moderation effect, as was hypothesized. Although it is possible that no such moderation effect exists in reality, the moderation effects would be consistent with current knowledge and theory with regard to overlap between emotional processing deficits associated with alexithymia and core hypothesized change mechanisms of expressive writing (e.g., meaning-making and emotion regulation). Therefore, it is plausible that an alexithymia moderation effect actually exists, but that this effect may have been hidden due to the failure to replicate a significant intervention effect in the current study.

Alexithymia Predicts Word Use, which Predicts Mental Health Outcomes

Contrary to expectations, higher levels of alexithymia were associated with greater reductions in symptoms of trauma-related stress, depression, and anxiety, irrespective of condition. Previous literature is unequivocal with regard to the poor physical and mental health outcomes associated with alexithymia (Lumley, 2004; Taylor & Bagby, 2013), including resistance to psychotherapeutic intervention (Ogrodniczuk, Piper, & Joyce, 2011). More specifically, alexithymia has been positively correlated with symptoms of trauma-related stress (Declercq et al., 2010; Frewen et al., 2008), depression (Li et al., 2015), and anxiety (Marchesi et al., 2000) in clinical and non-clinical populations.

An initial attempt to explain the positive association between alexithymia and outcome found in the current study begins with a consideration of commonalities between the control and expressive writing conditions. Since differences in outcomes did not emerge between control and expressive writing conditions, this effect cannot be due to processes related to deepened processing or working through difficult emotions or personal experiences during the intervention per se. However, consideration of the selection and recruitment process may have some bearing

on this finding. For example, the use of avoidance of painful emotions as a coping strategy has been shown to mediate associations between alexithymia and poor mental health outcomes (Panayiotou et al., 2015). Participants who signed up for the study may have differed from those who did not because the very act of seeking out participation in the study presumably involves 1) an acknowledgement of personal distress causing significant impairment in functioning, as well as 2) actively seeking out a means of confronting, reflecting on, and working through distress towards resolution. Therefore, among those with higher levels of alexithymia, participants may have been more motivated and ready for change than certain non-participants, taking steps to cope with and confront their painful emotions rather than avoiding them. Furthermore, participants were conceivably more likely than non-participants to have also taken additional steps outside of the study to address their personal distress. Finally, participants also received a degree of validation and acceptance from the researchers, which in itself may bring relief, particularly for a non-clinical population, regardless of whether they were in the control or expressive writing condition.

While these initial interpretations are speculative, the word use mediation effect found in the current study may provide further clarification as to *how* participants with alexithymia worked through their distress in the expressive writing task. A previous linguistic analysis of the same dataset used in the current study (Morrison, 2015) found that reductions in symptoms of trauma-related stress were associated with the use of *more* causation, certainty, and past-tense words, and *fewer* inhibition words and first-person singular pronouns. The current study extends these earlier findings by suggesting that those higher in alexithymia tend to use more causation (e.g., words like: because, effect, hence) and certainty (e.g., words like: always, never) words and that this writing style predicts reductions in symptoms of trauma-related stress. This finding

is somewhat consistent with previous literature suggesting that difficulties identifying feelings (a facet of alexithymia) may be associated with the use of more cognitive processing, although externally-oriented thinking may be associated with the use of fewer cognitive processing words (Vanheule, Meganck, & Desmet, 2011). This could be because those with alexithymia avoid introspection and hence use fewer cognitive processing words overall, but when they do work through distress, they do so via an emphasis on cognitive processing over affective processing due to their deficits in emotional awareness. The current study was unable to replicate findings in previous studies reporting associations between alexithymia and the use of tentative words (see Pluth, 2012) or personal pronouns (see Páez et al., 1999).

The associations between the use of cognitive processing words and improvements in mental health outcomes in the current study are also consistent with previous research. The use of more cognitive words has been associated with self-reported psychological well-being in rheumatoid arthritis patients (van Middendorp & Geenen, 2008) and fewer avoidance symptoms of trauma in a sample of college students who wrote about the breakup of a romantic relationship (Boals & Klein, 2005). Although cognitive word use during expressive writing is generally related to physical and mental health improvements, it should be noted that some have reported negative associations with mental health outcomes (e.g., Baikie et al., 2006; D'Andrea et al., 2012).

Cognitive processing words regarding causation and certainty emerged as important predictors of trauma symptoms for those high in alexithymia in the current study. The experience of trauma leads to disruptions in beliefs about the self and reality (Janoff-Bulman, 1992). As such, the use of cognitive words is thought to represent attempts to make sense of a distressing personal experience, with the goal of re-constructing a coherent self-narrative (Pennebaker,

1993). Causal reasoning plays an important role in constructing coherent personal narratives since it involves arranging actions into logical, temporal sequences in order to identify links or relations between actions that make up a single event or a series of events (Reese et al., 2011). Narrative coherence, in turn, is associated with problem resolution and mental health outcomes. For example, incoherence in expressive writing narratives was positively correlated with trauma symptoms in a sample of adult survivors of childhood abuse (Mundorf & Paivio, 2011). The fact that alexithymia was associated with the use of more causation and certainty words in the current study suggests that, relative to their more emotionally aware counterparts, those who are high in alexithymia may be putting greater effort into rationalizing and making sense of external features of life events in order to reduce the perceived ambiguity of their distressing internal responses to these events, with the goal of constructing a more coherent self-narrative. This could account for the association in the current study between alexithymia and reductions in symptoms of trauma-related stress from pre- to post-intervention.

Although experiential theories of emotional processing emphasize the importance of simultaneous cognitive and affective engagement in working through painful experiences (Whelton, 2004), this was not the case for those with alexithymia in the current study. By comparison, a previous study on expressive writing with high school students who wrote about the sudden and unexpected death of a classmate (Margola et al., 2010) found that those who moved from factual accounts, to greater affective processing, to integrated cognitive and affective processing across writing sessions reported lower levels of trauma-related stress. In contrast, the current study suggests that for those who are higher in alexithymia, attempts to cope with distress are characterized by greater cognitive than affective engagement with experience. Sundararajan (2001) has described this as a strategy of coping with distress that privileges

reasoning or instrumental means (e.g., “what’s to be done?”) over self-exploration and attending to experience (e.g., “what is it?”).

Poor integration of cognitive and affective functioning has also been implicated in research into the neuro-biological underpinnings of alexithymia. In an fMRI study of individuals who viewed emotionally aversive versus neutral pictures, van der Velde and colleagues (2015) found that alexithymia was associated with reduced activity in brain regions associated with cognitive awareness and recognition of emotion, including those involved in the retrieval of conceptual knowledge about emotion. However, no differences were found in areas involved in emotional arousal or emotion regulation (van der Velde et al., 2015). These findings are not restricted to visual stimuli, but extend to other modalities as well, including the processing of nonverbal cues of emotion in speech (Goerlich-Dobre et al., 2014). As such, there appears to be a disconnect between emotional arousal and cognitive awareness of emotion. Within the context of the current study, individuals with alexithymia may be attempting to bypass these cognitive “emotional awareness” pathways by using alternative cognitive strategies (e.g., searching for causal relationships) in attempts to make sense of their feelings.

With regard to brain structure, Goerlich-Dobre, Votinov, Habel, Pripfl, and Lamm (2015) found that alexithymia was associated with increased white matter volumes in the corpus callosum, representing a greater number of communication pathways between the right and left hemispheres of the brain. A very basic and simplistic conceptualization of hemispheric function suggests that the right hemisphere is generally responsible for processing lower-order, nonverbal information about emotion, whereas the left hemisphere is responsible for higher-order cognitive processes involved in becoming aware of (e.g., verbal labelling), making sense of, and utilizing emotional information (Bermond, Vorst, & Moormann, 2006). Rather than representing better

communication between hemispheres, Goerlich-Dobre and colleagues (2015) interpreted that this large number of pathways may actually represent inefficient and less integrated communication between hemispheres. The effect of poorly integrated inter-hemispheric communication may be analogous to difficulties one might have in comprehending the meaning of specific messages when many speakers are conversing simultaneously in a crowded room.

Putting everything together, Lane, Weihs, Herring, Hishaw, and Smith (2015) coined the term *affective agnosia*, drawing parallel comparisons between alexithymia and visual (see Grill-Spector & Malach, 2004 for a review) and other agnosias, which are defined as the “intact perception of a stimulus while not knowing or recognizing its meaning.” This suggests that those with alexithymia have intact sensory perception of emotional arousal, but are unable to bring it into meaningful symbolization in awareness. In computer language, they have the input, but lack the means to use that information to produce meaningful output. This is in line with what Carl Rogers referred to as incongruence between the self (which is akin to awareness) and experience (Rogers, 1959; as cited in Sundararajan, 2001). Therefore, the preference of people higher in alexithymia for cognitive over affective processing may be due, at least in part, to affective deficits related to poor cognitive and affective integration.

Strengths, Limitations, & Future Directions

Based on Kazdin’s (2007) seven essential criteria for demonstrating causality, the current study has many features which provide preliminary support for a causal interpretation of associations between alexithymia, the use of more causation and certainty words in trauma narratives, and subsequent reductions in trauma-related stress. First, a statistically significant mediation effect was found with *associations* between alexithymia and word use as well as symptomology, and between word use and symptomology. Furthermore, the alternative

hypothesis – that alexithymia mediated the association between word use and symptomology – was not supported. Second, the *timeline* supports such causal orderings since alexithymia, word use, and symptomology were assessed before, during, and after the intervention, respectively. Third, the proposed mediation model appears to be *plausible* in light of existing theory and the empirical research reviewed above.

However, in order to strengthen the causal interpretation tentatively offered in the current study, further research will be needed in order to rule out other plausible mediators (i.e., *specificity*), to replicate this mediation effect in other samples (i.e., *consistency*), and to establish an incremental dose-response relation (i.e., *gradient*; where “dose” represents the severity of alexithymia). With regard to the latter criterion, one could possibly expect to find a stronger effect in a clinical sample with higher levels of alexithymia, relative to the non-clinical sample in the current study. Finally, the *experimental manipulation* criterion suggests another potential avenue of future research, namely, through the experimental manipulation of emotional awareness in a manner that mimics the alexithymia condition. Although causality cannot be demonstrated by a single study, the current study offers a preliminary starting point for further investigations into connections between alexithymia and mental health benefits of expressive writing.

One of the implications of the current study is that alexithymia is associated with greater cognitive than affective engagement in coping with distress. However, the extent to which those with alexithymia are actively engaged in processing the affective or internal elements of their experience is unclear in the current study. On the one hand, alexithymia was not associated with the use of fewer positive or negative emotion words, which are thought to reflect affective processing (in contrast to cognitive processing). This finding has also been reported in other

studies as well (Jelinek et al., 2010; van Middendorp & Geenen, 2008), although it should be noted that others have found associations between alexithymia and the use of fewer positive emotion words (Kahn et al., 2007; Páez et al., 1999; Tull et al., 2005). On the other hand, Sundararajan (2001) – drawing primarily upon the work of Rogers, Gendlin, and Zelazo – suggests that those higher in alexithymia differ from those lower, not in terms of how many emotion words they use, but rather, in terms of the way in which they use emotion words. Put another way, it's not the quantity of emotion words that is important, but how well they use them. By way of elaboration, alexithymia is associated with poor introspection and mental symbolization, and a superficial use of words as symbols (Gendlin, 1997). In effect, for those with alexithymia, emotion words are not differentiated from neutral words (e.g., “chair”) in terms of impact on self. The LIWC is unable to provide such a highly-nuanced analysis of word use and may be unable to capture critical information regarding affective engagement in working through distress. Therefore, the current study (and others like it that make use of the LIWC) may be limited by a lack of more fine-grained analyses of emotional processing that are necessary for understanding the role of alexithymia – and perhaps other potential mediating or moderating factors – in expressive writing.

A major limitation of the current study is that the linguistic word use composite and alexithymia variables were not independent from one another in the mediation model. The linguistic composite was constructed so that it would be correlated with self-reported alexithymia prior to being entered into the mediation regression. As such, these results could be an artifact of the current sample and/or methodology and would need to be replicated in other samples. This is especially important in light of the absence of a significant intervention effect, since there may have been other unidentified confounding influences on the data collected, making our sample

unique from those who have reported significant mental health benefits of expressive writing. Ideally, a model predicting alexithymia from word use would be derived from a reference sample, then subsequently replicated and applied to mental health outcomes in an independent comparison sample in order to reduce the possibility of spurious findings from only a single study.

The use of a broad definition of trauma in the current study (i.e., “the experience of a personally upsetting event”) has important implications for the generalizability of current findings. This definition is more inclusive than the DSM-5 definition of trauma (i.e., exposure to or witnessing a life-threatening event; American Psychiatric Association, 2013) and, as such, allows these findings to be applied to a larger and more diverse segment of the population. However, this was a non-clinical sample with presumably less severe trauma histories and/or symptomology. Without formal diagnostic interviewing, it is difficult to determine the extent to which the present findings apply to more clinical populations. Therefore, future research should look to replicate the current findings with more clinically severe and/or clearly defined samples of individuals with PTSD or related presentations.

In conclusion, this study has found that those who are higher in alexithymia seem to use a more cognitive or intellectual approach to working through distress that is characterized by a search for certainty and causal explanations for experiences. In the context of current literature, one may speculate that current findings suggest that by constructing a more coherent self-narrative, an intellectualized approach to meaning-making may actually lead to reductions in trauma-related stress for those who are less emotionally aware, perhaps as a means of compensating for poor cognitive-affective integration at the neurophysiological level. However, this formulation of the current findings is speculative and will need to be tested empirically.

Although alexithymia is not a clinical disorder per se, it is certainly an important and clinically-relevant factor in how we understand and help people who are working through personally distressing experiences.

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Table 1

Descriptive Statistics for Alexithymia and Pre- and Post-Intervention Outcome Measures

Measure	<i>M</i>	<i>SD</i>	Min.	Max.
Alexithymia	50.03	12.08	20	82
preIESR	32.62	17.00	0	75
postIESR	26.24	17.66	0	88
preCESD	11.67	6.47	0	30
postCESD	10.70	6.45	0	29
preSTAI	48.45	11.17	22	72
postSTAI	46.59	11.12	21	72

Note. IESR = trauma-related stress; CESD = depression; STAI = anxiety.

Table 2

Linear Regression Results for Condition (H1) and Alexithymia Moderation (H2) Effects

Predictors	Dependent Variables					
	IESR (R ² = .061)		CESD (R ² = .091)		STAI (R ² = .088)	
	<i>B (SE)</i>	<i>p</i>	<i>B (SE)</i>	<i>p</i>	<i>B (SE)</i>	<i>p</i>
Life Stress	.562 (.524) [-.470, 3.446]	.284	.392 (.209) [-.020, .804]	.062	.584 (.264) [.065, 1.103]	.028
Health Concerns	2.576 (.964) [.676, 4.476]	.008	.828 (.384) [.071, 1.586]	.032	.699 (.485) [-.256, 1.654]	.151
Condition	-.739 (2.124) [-4.924, 3.446]	.728	.143 (.847) [-1.525, 1.812]	.866	1.025 (1.068) [-1.079, 3.129]	.338
Alexithymia	-.177 (.073) [-.320, -.034]	.016	-.106 (.029) [-.163, -.049]	< .001	-.135 (.037) [-.207, -.063]	< .001
Cond*Alex	.092 (.187) [-.276, .460]	.622	.087 (.074) [-.060, .233]	.245	.089 (.094) [-.096, .274]	.347

Note. Significant predictors are bolded for clarity. 95% CIs reported in brackets. IESR = trauma-related stress; CESD = depression; STAI = anxiety.

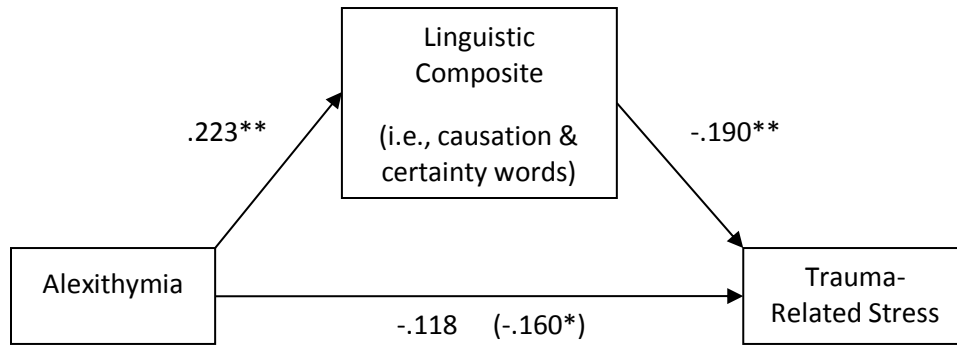


Figure 1. Standardized regression coefficients of the association between alexithymia and pre- to post-intervention changes in symptoms of trauma-related stress, as mediated by the linguistic composite variable. Recall that the linguistic composite is an indicator of implicit psychological processes associated with alexithymia, based on word use (causation and certainty words) in trauma narratives. The association between alexithymia and trauma-related stress prior to the inclusion of the linguistic composite is indicated in parentheses.

* $p \leq .05$ ** $p \leq .01$

APPENDIX A

Full List of Measures Administered in the Pascual-Leone et al. (2011) Parent Study

Session Effects (measured at the beginning and end of every writing session)

- The Self-Assessment Manikin (Bradley & Lang, 1994)
- Positive and Negative Affect Scale (PANAS; Watson et al., 1988)
- Saliva cortisol testing

Treatment Outcome (measured at the beginning of the first writing day and again at 2-week and 4-week follow-up)

- Satisfaction with Life Scale (Pavot & Diener, 2009)
- Post-Traumatic Growth Inventory-SF (Tedeschi & Calhoun, 1996)
- Self-reported health (Sirois & Gick, 2002)
- Resolution Scale – Modified (Singh, 1994)
- Impact of Events Scale – Revised (Weiss & Marmar, 1997)
- Anger Rumination Scale (Sukhodolsky et al., 2001)
- State-Trait Anxiety Inventory (Spielberger et al., 1970)
- Center for Epidemiologic Studies' Depression Scale (Radloff, 1977)

Individual Differences (measure at the beginning of the first writing day)

- Emotional Approach Coping Scale (Stanton et al., 2000)
- Toronto Alexithymia Scale (Parker et al., 2003)
- Self-Compassion Scale (Neff, 2003)
- Almost Perfect Scale – Revised (Slaney et al., 2001)

APPENDIX B

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 C

Center for Epidemiological Studies Depression Scale

For each of the following statements, tell us how often you felt or behaved this way during the **past 2 weeks**:

	Rarely or none of the time	Some or a little of the time	Occasionally or a moderate amount of the time	Most of or all of the time
1. I was bothered by things that don't usually bother me.				
2. I did not feel like eating – my appetite was poor.				
3. I felt that I could not shake off the blues even with help from my family and friends.				
4. I had trouble keeping my mind on what I was doing.				
5. I felt depressed.				
6. I felt that everything I did was an effort.				
7. I had crying spells.				
8. I enjoyed life.				
9. I felt hopeful about the future				
10. I could not “get going.”				

APPENDIX D

State-Trait Anxiety Inventory

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then **circle the number next to the answer that describes how you have been feeling in the past two weeks**. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

	Almost Never	Sometimes	Often	Almost Always
1. I feel pleasant	1	2	3	4
2. I feel nervous and restless	1	2	3	4
3. I feel satisfied with myself	1	2	3	4
4. I wish I could be as happy as others seem to be....	1	2	3	4
5. I feel like a failure	1	2	3	4
6. I feel rested	1	2	3	4
7. I am calm, cool, and collected.....	1	2	3	4
8. I feel that difficulties are piling up so that I cannot overcome them.	1	2	3	4
9. I worry too much over something that really does not matter.	1	2	3	4
10. I am happy	1	2	3	4
11. I have disturbing thoughts	1	2	3	4
12. I lack self-confidence	1	2	3	4
13. I feel secure	1	2	3	4
14. I make decisions easily	1	2	3	4
15. I feel inadequate	1	2	3	4
16. I am content	1	2	3	4
17. Some unimportant thought runs through my mind and bothers me.	1	2	3	4
18. I take disappointments so keenly that I can put them out of my mind	1	2	3	4
19. I am a steady person	1	2	3	4
20. I get in a state of tension or turmoil as I think over my recent concerns.	1	2	3	4

APPENDIX E

Toronto Alexithymia Scale – 20

Instruction: Please circle the number that indicates how much you agree or disagree with each of the following statements using the scale below each statement.

1. I am confused about what emotion I am feeling.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
2. It is difficult for me to find the right words for my feelings.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
3. I have physical sensations that even doctors don't understand
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
4. I am able to describe my feelings easily.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
5. I prefer to analyze problems rather than just describe them.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
6. When I am upset, I don't know if I am sad, frightened, or angry.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
7. I am often puzzled by sensations in my body.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
8. I prefer to just let things happen rather than to understand why they turned out that way.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
9. I have feelings that I can't quite identify.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
10. Being in touch with emotions is essential.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
11. I find it hard to describe how I feel about people.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree

12. People tell me to describe my feelings more.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
13. I don't know what's going on inside me
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
14. I don't know why I am angry.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
15. I prefer talking to people about their daily activities rather than their feelings.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
16. I prefer to watch "light" entertainment shows rather than psychological dramas.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
17. It is difficult for me to reveal my innermost feelings, even to close friends.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
18. I can feel close to someone, even in moments of silence.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
19. I find examination of my feelings useful for solving personal problems.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree
20. Looking for hidden meanings in movies or plays distracts from their enjoyment.
1 2 3 4 5
strongly disagree moderate disagree neither disagree nor agree moderately agree strongly agree

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