

ABSTRACT

WEATHERBEE, SARAH ROSE. Beneficial Effects of Expressive Writing in the Elderly. (Under the direction of Jason C. Allaire, Ph.D.)

The current investigation examined whether expressive writing produced gains in elders' cognitive functioning. Given previous research, it was expected that expressive writing would reduce intrusive thoughts, which would lead to gains in cognitive performance. In the current study community dwelling elders ($n = 61$) with a mean age of 75 years ($range = 61 - 94$; $SD = 7.70$) were given a 2-hour pretest battery, which consisted of measures of basic cognitive ability, everyday cognition, and intrusive thinking. Following pretesting participants were randomly assigned to either the emotional expressive writing group or the non-emotional writing group where they were instructed to write for 20 minutes on five occasions over 10-days. Following the intervention all participants returned for post-testing, which occurred seven days after the writing period. Contrary to expectations, there was no evidence of a time by condition interaction for intrusive thinking. When cognitive change was examined a pretest to posttest gain was found for processing speed performance when collapsing across the two experimental groups. A similar pattern was also found for the measure of everyday cognitive functioning within the domain of memory. Discussion will focus on the fact that changes in cognitive performance may not necessarily be attributed entirely to the intervention; rather it could be mental exercise or mere practice effects.

Beneficial Effects of Expressive Writing in the Elderly

by

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Introduction

The current investigation intended to assess the effectiveness of an emotional expressive writing intervention, which intended to produce gains in older adults' cognitive functioning. Though previous cognitive intervention studies have successfully improved performance, they have been unable to improve functioning outside of the trained ability. The purpose of this study was to test whether an expressive writing intervention would improve performance more broadly across a number of cognitive abilities. The expressive writing intervention was designed to reduce intrusive thoughts and alleviate feelings and emotions associated with a stressful or traumatic event. Previous expressive writing interventions have found improvements in both psychological and physical health, but the current investigation represents one of the first studies to examine its efficacy to improve cognitive functioning in a community dwelling, healthy sample of elders.

Review of the Literature

Cognitive Functioning in Old Age

The study of cognitive functioning in older adults has been guided, in part, by the fluid, crystallized (Horn & Cattell, 1967; Horn & Hofer, 1992) and mechanic, pragmatic (Baltes, 1993) dichotomy of intellectual abilities. Both two-component theories postulate that most cognitive abilities can be separated into either domain (i.e., fluid-mechanic and crystallized-pragmatic) and the abilities within these domains differ with respect to their developmental trajectory. Crystallized-pragmatic abilities are considered culturally based and include verbal ability, knowledge, and fluency (Baltes, 1987; 1997). These abilities increase from childhood through mid-life then are marked by relative stability late in life (Baltes, Lindenberger, & Staudinger, 1998), and not until late on in life do the crystallized abilities decline (Singer, Verhaeghen, Ghisletta, Lindenberger, & Baltes, 2003). Cognitive

abilities from the fluid-mechanic domain are based on the neuropsychological functioning of the brain and include abilities such as inductive reasoning, memory, working memory, processing speed, and spatial orientation (Baltes, 1987; 1997). These abilities increase from childhood up to early adulthood and then tend to undergo a gradual decline throughout adulthood and into old age (Baltes, Lindenberger, & Staudinger, 1998; Singer et al., 2003). Even though these developmental trajectories have been found, age-related changes occur at different rates for different people leading to increased heterogeneity in the aging population (Baltes, 1987; Schaie, 1996; Singer et al., 2003).

Theoretical Orientation of Interventions

Given the age-related declines of the fluid-mechanic abilities, researchers have attempted to develop interventions focused on improving older adults' performance on tests of these abilities. Cognitive intervention research has been guided by the theoretical hypothesis that the aging mind retains a great deal of plasticity or modifiability, even in the face of age-related loss (Baltes, Dittmann-Kohli, & Kliegl, 1986; Baltes, Sowarka, & Kliegl, 1989; Singer et al., 2003). Consequently, intervention studies attempt to take advantage of the plasticity of the aging mind by providing various training approaches designed to improve elders' performance in that particular domain (Baltes & Lindenberger, 1988).

Plasticity encompasses three levels, organized under what is known as *reserve capacity* (Baltes & Lindenberger, 1988; Kliegl & Baltes, 1987; Kliegl, Smith, & Baltes, 1989). Reserve capacity refers to an individual's potential range of ability, particularly towards prospective growth. The three levels of reserve capacity are referred to as: baseline performance, baseline reserve capacity, and baseline reserve developmental capacity. An individual's baseline capacity is the one-time measurement of a particular ability, or the

performance during a normal testing session. Baseline reserve capacity is the potential range of scores an individual might achieve under optimal conditions with no attempt to modify the individual's available cognitive range. In other words baseline reserve capacity is the measurement of the existing maximum plasticity. The developmental reserve capacity is the maximum level of performance someone can reach after an intervention has been applied. The developmental reserve capacity is the level of performance that a researcher is striving to push participants towards when employing an intervention. The goal of intervention research is to take advantage of the mind's plasticity and push performance from baseline capacity to developmental reserve capacity (Baltes & Lindenberger, 1988) (see Table 1). The remainder of this section will discuss the different methods used in intervention research as well as the utility of this approach in the aging population.

Table 1

The Three Levels of Plasticity

Level of Plasticity	Performance Assessment
Baseline	Assessment of performance under standardized conditions
Reserve Capacity	Assessment of current maximum performance in optimal conditions
Developmental Reserve Capacity	Assessment of performance after enhancing interventions

Approaches to Interventions

Previous cognitive intervention research has generally utilized one of two types of training approaches, experimenter-guided or self-guided instruction. Notably, the bulk of previous intervention studies have been initiated to improve cognition through experimenter-guided training within a group setting. One of the earliest intervention studies is a successful

training program known as the ADEPT (Adult Development and Enrichment Project) training approach, which required the experimenter to train the participants on particular strategies over numerous occasions (Willis, Blieszner, & Baltes, 1981). ADEPT has served as the foundation for more recent experimenter-guided training programs such as the Advanced Cognitive Training for Independent and Vital Elderly (ACTIVE) study by Ball and colleagues (2002). In both the ADEPT and ACTIVE interventions, emphasis is placed on training participants on explicit rules and strategies that are needed to effectively solve the problems on the given task. The trainers model specific techniques to use, then the participants are told to implement these methods on presented practice problems. Feedback is then given to the participants on accuracy and alternate strategies to use on future problems (Baltes, et al, 1989). A key component of experimenter-guided training is that the experimenter is specifically training the participant on the task at hand; the modeled strategies focus solely on the cognitive ability being studied.

Additional research has examined the effectiveness of self-guided training techniques, where there is minimal involvement on part of the experimenter (Baltes, Kliegl, & Dittmann-Kohli, 1988). In this approach, participants are generally given a practice booklet to work on without any outside assistance and are typically told that the basis for the study is to determine how well they can do on their own. No feedback is given on whether an answer is right or wrong, and no suggestions are provided on how to improve performance for future problems. The self-guided technique requires the participants to either practice previously learned rules and strategies to solve the presented problems, or they are told to practice the presented problems over numerous occasions (Hofland, Willis, & Baltes, 1981); both experimenter-guided and self-guided methods focus on improving performance on a specific

ability. Regardless of the type of training strategy used (experimenter-guided or self-guided), the goal of intervention studies is to improve performance on a particular skill rather than a host of abilities within a particular domain (Baltes, et al., 1989).

Cognitive Intervention Findings

As mentioned previously, the majority of the intervention research has focused on age-vulnerable cognitive abilities from the fluid-mechanic domain such as memory, reasoning skills, spatial orientation, and processing speed (Baltes, et al., 1989; Baltes & Kliegl, 1992; Willis & Schaie, 1986). The previously mentioned ACTIVE study (Ball, et al., 2002) aimed at improving performance in cognitive abilities through the use of three different cognitive interventions. A four-group design was applied, including three intervention groups (e.g. memory, processing speed, and inductive reasoning) that received training and a control group where no training was received. The results from the study indicated that in all three cognitive interventions participants performed better only on the measures of the ability they that were trained in (e.g. inductive reasoning group improved performance *only* on inductive reasoning tasks). Results from a two-year post-test demonstrated that participants were performing at higher levels on their particular trained ability compared to the other groups, including the controls. Unfortunately the training effects were restricted to the trained cognitive ability and improved performance did *not* carry over into other cognitive or everyday cognitive ability measures at both the immediate posttest and the two-year follow-up assessment. The following sections discuss intervention studies that have examined training effects on memory, inductive reasoning, and speed.

Memory

A meta-analysis conducted by Verhaeghen, Marcoen, and Goossens (1992) on 67 mnemonic training studies, a specific strategy to improve memory performance, concluded a significant pre- to post-test gain with an effect size of 0.66, confirming the effectiveness of memory intervention studies. Kliegl and colleagues (Baltes & Kliegl, 1992; Kliegl, Smith, & Baltes, 1989; 1990) implemented the method of loci (MoL) approach to facilitate memory for a serial list of words. The main idea behind the method of loci is to form mental images of the presented words in order of appearance from a series of landmarks. During recall the participant turns back to the mental landmarks in the specific order and retrieves the related mental representations to be decoded, which able them to identify the words to be remembered. The results pertaining to these studies were mixed. Although both younger and older adults were able to improve memory through this mnemonic strategy, the older adults were not able to overcome the age-related differences in memory performance.

An old (*mean age* = 84 years) and a young adult sample (*mean age* = 24.7 years) were recruited from the BASE study (a longitudinal study that examined aging on multiple dimensions; Baltes & Mayer, 1999) to examine memory-training gains (Neely & Backman, 1995; Singer, Lindenberger, & Baltes, 2003). This particular sample was used to examine plasticity of memory performance in very old age; the young adult was used as a comparison to obtain a measure of age-related changes (decline) from young to old age. The participants were randomly assigned to either the control or the training group. In the lab, participants were trained on encoding operations, attentional functions, and relaxation. In the study participants were trained for a total of eight sessions on the method of loci (MoL) strategy using pictures of famous Berlin landmarks, after receiving training the participants completed a recall task for the to-be-remembered words given while trained on the MoL.

After training, both the young and old participants were able to improve memory performance, but performance gains were moderate compared to previous studies using the MoL training, particularly for the older adults (Baltes & Kliegl, 1992; Kliegl et al, 1990). The minimal training gains in the older sample can be explained by the restricted plasticity resulting from age-related decline in the memory domain (e.g. fluid intelligence). Improved performance on the memory task, even after training, will be smaller in a very old sample compared to a younger sample of older adults that have not encountered as severe age-related declines.

Inductive Reasoning

A study by Saczynski and colleagues (Saczynski, Wills, & Shaie, 2002) examined gains in inductive reasoning through the use of cognitive training on spatial orientation and reasoning abilities. Results showed that the group trained on reasoning abilities implemented significantly more strategy usage from pre- to post-test compared to the participants trained in spatial orienting. The increased strategy usage led to greater gains in performance on the inductive reasoning tasks. Regardless of age, young-old and old-old, participants increased strategy use after being trained. The overall findings provide support that the strategy use was an effective mechanism for intervention training gains on inductive reasoning tasks.

More recently, a separate study included both group-guided and self-guided cognitive training interventions to examine gains in inductive reasoning tests within a sample of older adults (Saczynski, Margrett, & Willis, 2004). Two experimental groups (individual-training and collaborative-training) and a control group were used in the study. The collaborative groups consisted of married couples that worked together to complete the cognitive training task. Three inductive reasoning tests (Letter series, Word series, and Letter sets) were used to

assess level of performance for pre- and post-test assessments. Strategy use increased across both methods of training. In addition, participants in both types of training interventions showed greater improvements from pre- to post-test on all three inductive reasoning tests compared to the control group. The results of this study indicate that both individual and collaborative training strategies are effective cognitive interventions when improving reasoning skills in elderly adults.

Speed

Few studies have used cognitive training that focused on processing speed. Recent studies conducted by Edwards and colleagues (Edwards et al., 2002; in press) examined training effects on older adults' speed of processing. All participants completed a pretest, which consisted of a battery of cognitive assessments. Immediately following the initial assessment, the participants were randomly assigned either to the control (no intervention) or experimental condition. In the experimental condition, participants underwent a series of 1-hour speed of processing training sessions over ten occasions. The experimental group was trained using the UFOV[®] (Useful Field of View; Ball, et al., 1990), which measures the speed at which a person can rapidly process multiple stimuli in the visual field. There are three subtests within the UFOV[®] that increase in complexity and examine basic speed of processing, divided attention, and selective attention abilities. During each of the exercises, the participant practiced at a continuous level of difficulty until the task was mastered. Following the training procedure (approximately six weeks after the pretest), both the experimental and control conditions were administered a posttest similar to the initial assessment battery.

The results from the studies indicated that the older adults in the intervention groups performed significantly better on the speed of processing measures compared to the control groups. In addition, participants in the trained condition improved performance on the timed instrumental activities of daily living (IADL), which is a measure of everyday cognition. Examples of the Timed IADL are finding a telephone number in a telephone directory, finding and counting the correct change from a group of coins, and finding and reading ingredients on a food can label. These results indicate that enhanced performance on processing speed carried over into enhanced performance on everyday cognition speed measures. Improvement in performance on abilities other than the ones that the participant was trained on is known as a “transfer of abilities”. The notion behind the transfer hypothesis is discussed in the subsequent section.

Transfer of Training Effects

In addition to improving performance on measures of a trained ability, cognitive intervention research has also strived to produce transfer of training gains, in which training on a specific cognitive ability improves performance on related cognitive abilities. As can be seen in Table 2 the most basic form of transfer is known as “near transfer” where enhanced performance on one cognitive task can transfer to performance on a similar cognitive task within that particular domain. For example, improved performance through training on the Letter Series test will carry over to improved performance on the Letter Sets tests, both of which are measures of inductive reasoning. The second form of transfer is referred to as “near-far transfer”, where training on one particular cognitive domain (i.e. inductive reasoning) can improve performance on a different cognitive domain (i.e. memory). The most complex form of transfer is known as “far-far transfer,” where improved performance

on one cognitive domain (i.e. reasoning) can improve the level of functioning in a distal domain (i.e. health).

The important idea behind near and far transfer is the belief that training gains have the capability to extend to other abilities beyond the particular trained cognitive ability. Given the consistent finding of positive manifold (for more information, see Gorsuch, 1974) among most cognitive abilities, it is expected that gains in one ability will also be realized in other strongly correlated abilities. For example, if an individual is trained to increase performance on memory tasks, the trained ability will transfer to additional cognitive abilities such as inductive reasoning.

Table 2

Transfer Hierarchy

Level of Transfer	Outcome	Target Ability	Transfer Ability
Near Transfer	Improved performance in similar cognitive task of same ability	Inductive Reasoning (Letter Series)	Inductive Reasoning (Letter Sets)
Near – Far Transfer	Improved performance on a different cognitive domain	Inductive Reasoning (Letter Series)	Memory (HVLТ)
Far – Far Transfer	Improve the level of functioning in a distal domain	Inductive Reasoning (Letter Series)	Everyday Cognitive Abilities (Medication Use)

Past studies have continually focused on training to improve performance within a particular ability; consequently training is solely focused on improving the skills needed to

master that specific ability (Baltes & Kliegl, 1992; Blieszner, Willis, & Baltes, 1981).

Studies have had great training effects; unfortunately the training effects have not transferred to any other domain besides the one of interest (Ball, et al., 2002). The bulk of intervention research has only established transfer effects within the fluid intelligence domain (Baltes & Lindenberger, 1988). One particular study (Baltes, Dittmann-Kohli, & Kliegl, 1986) focused on training within multiple fluid abilities, which demonstrated that on the far transfer domains the training group failed to significantly improve and performed similar to the control group. Within the near transfer domains (i.e. inductive reasoning and figural relations) the training group did perform significantly better compared to the control group. Additionally, a study conducted by Blieszner, Willis, and Baltes (1981) examined inductive reasoning training effects. The researchers measured transfer effects on near (fluid) and far (non-fluid) domains. Although there were significant training improvements on the trained induction tasks, there appeared to be no significant transfer to the other cognitive abilities. The training effects for the near-transfer measures were not significant at the individual level, neither were the far-transfer measures.

As mentioned earlier, Ball and colleagues (2002) implemented a four-group design to examine whether training gains from a trained ability would transfer to other abilities beyond the particular domain. There was no transfer of training gains to far domains for any of the three training conditions. That is, the inductive reasoning group only improved performance on inductive reasoning tasks, the memory group only improved performance on tests of memory, and the processing speed group only improved performance on speed of processing tasks. Even though each training group had improved performance within the

trained domain their training did not carry over into other abilities such as health and everyday cognitive functioning.

Lack of Transfer within Cognitive Research

Very little evidence has been found to support the far-far transfer argument discussed in the above section (Ball, et al., 2002; Plemons, Willis, & Baltes, 1978; Willis, Cornelius, Blow, & Baltes, 1983). One possible reason for the lack of transfer in the previous intervention studies may be due to the fact that the particular training approaches were too narrow given that they focused on the strategies and skills needed for a specific ability. In other words, the studies train the individual on effective strategies that only apply to the ability of interest. Consequently, it has been suggested that such an intervention approach is not actually improving the underlying ability but rather “teaching to the test” (Anderson, 1982). A possible remedy to this situation would be implementing an intervention that does not focus on improving a specific ability like inductive reasoning, but rather focus on improving a more macro or “higher-order” process that will impact multiple cognitive domains.

In sum, intervention studies, particularly within the elderly population, have not been able to improve performance across multiple domains of cognitive functioning. Therefore the current investigation implemented an alternate approach that utilizes a more extensive intervention technique. This technique is known as expressive writing, which was proposed to improve performance across multiple domains of cognitive functioning. The expressive writing intervention is described in the following sections.

Expressive Writing

Expressive Writing Technique

Pennebaker (1989) established a therapeutic intervention through the use of expressive writing, which is defined as the act of writing down thoughts and emotions related to a stressful or traumatic event. Typically the intervention procedure involves an experimental group that is instructed to write about an emotionally charged event and a control group who are told to write about a non-emotional event (i.e. time management). The participants are usually instructed to write for 20 minutes everyday over the course of three to five days (Pennebaker, 1997). The writing occurs most often in a laboratory setting where the experimenter describes the writing assignment and then the participants are told to write for a designated length of time.

Findings from Previous Expressive Writing Studies

Expressive writing interventions were originally developed in a clinical setting to help patients deal with stressful events and the feelings and thoughts that accompany those events. Previous studies focusing on the therapeutic benefits of expressive writing have found decreases in depression, anxiety, and PTSD symptoms (L'Abate & Baggett, 1997; L'Abate, Boyce, Fraizer, & Russ, 1992; Schoutrop, Lange, Hanewald, Davidovich, & Salomon, 2002). A study by Green, Lindy, and Grace (1988) found that Vietnam veteran's who had been diagnosed with Post Traumatic Stress Disorder showed improvements in their symptoms related to the PTSD when using an emotional expression intervention approach. Additional studies found that symptoms of anxiety and depression were alleviated through the use of emotional expression writing compared to controls who wrote about a non-emotional event (L'Abate & Baggett, 1997; L'Abate, Boyce, Fraizer, & Russ, 1992).

The efficacy of expressive writing interventions has also been realized in domains such as health (Smyth, Stone, Hurewitz, & Kaell, 1999), academic performance (Lumley & Provenzano, 2003), and working memory (Klein & Boals, 2001). For instance, patients diagnosed with either asthma or rheumatoid arthritis participated in an expressive writing study where half of the participants diagnosed wrote about stressful life events (experimental group) and the other half about an emotionally neutral event (control group) (Smyth, et al., 1999). Four months after the intervention, the experimental group reported an overall decrease of symptoms related to the diagnosed illness, whereas the control group did not. Crow, Pennebaker, and King (2001) examined changes in blood pressure when implementing an expressive writing intervention. Participants were randomly assigned to the experimental (writing condition) and control (no-writing condition) conditions and were given baseline blood pressure readings. The participants in the experimental group were then asked to write about a stressful life event for three days during a period of 20 minutes. Six weeks after the final day of writing the participants had their blood pressure measurements taken again. Compared to the control group, the experimental group displayed a significant drop in blood pressure.

The effects of expressive writing on working memory have been examined within a group of college freshman in two different experiments by Klein and Boals (2001). In the first experiment half of the participants wrote about stressful experiences related to their first year of college (emotional topic), while the other half wrote about time management (non-emotional topic). The students who wrote on the emotional topic displayed larger gains in working memory compared to the students who wrote about time management. Working memory was assessed by the Operation Span task. Seven weeks after the final writing period

the emotional expressive writing group was performing over one standard deviation better than the time management group. For the second experiment all participants were asked to write about one positive and one negative event that had an important impact on their lives. Each participant was then randomly assigned to one of three conditions (e.g. negative event, positive event, and time management). The students in the negative condition wrote about the negative event they described from the first session, while students in the positive condition wrote about the positive event that was written down. The third group of students wrote about their time management. The participants in the negative condition had higher scores in working memory ($mean = 47.6$) compared to the positive ($mean = 44.0$) and time management ($mean = 44.2$) groups. The negative condition also displayed fewer numbers of intrusive thoughts compared to the other two conditions.

The results indicated that improvements in working memory from those in the expressive writing conditions were mediated by a decline in intrusive thoughts particularly pertaining to writing about negative experiences. As proposed by Klein and Boals (2001), the elimination of the intrusive thoughts allowed for a more efficient use of the limited processing resources encompassed within the working memory capacity. Unwanted thoughts particularly those pertaining to a negative experience are difficult to inhibit, consequently the working memory system will not perform at an optimal level when additional resources are consumed by intrusive thinking. The following section discusses the effectiveness of expressive writing and how the aging population can benefit from such an intervention.

Basis for How Expressive Writing Works

The fundamental idea behind the expressive writing intervention is the act of purging the unwanted or intrusive thoughts of the stressful or traumatic experience. Pennebaker

(1993) posits that when a person is faced with a traumatic or stressful event they may be inhibiting any thoughts, feelings, or behaviors pertaining to the event. The act of inhibiting the expression of an emotional experience reduces the amount of time spent on processing, organizing, and assigning verbal meaning to the experience (Pennebaker, 1993). Therefore, the inhibition mechanism becomes an impending danger to cognition when the cognitive processes that ordinarily occur when faced with an emotional event are impaired. As the person actively avoids talking about or expressing their feelings on an emotional event, they are allowing the event to ruminate in their minds a lot longer than intended. This creates the inability to resolve their internal “conflict” of the trauma and hinder the inherent coping process. Without resolution, resources will be directed towards concern and avoidance of the event, which will overcrowd the working memory and consume the stored capacity. This will use up the necessary cognitive resources that are needed to focus on current, relevant goals (Bowles & Salthouse, 2003; Wrosch & Heckhausen, 2002).

The Impact of Expressive Writing on Older Adults

As previously explained, expressive writing at the basic level involves writing down feelings and emotions pertaining to a traumatic or stressful event. As the thoughts are written down on paper, the person is “pushing out” the intrusive thoughts that have the potential to be psychologically taxing (Pennebaker, 1989). As age increases there is a potential to experience more life stressors (e.g. death of a spouse or decline in health), which may bring about more intrusive thoughts. In fact, recent research has found that the number of intrusive thoughts generally increase with age (Wrosch & Heckhausen, 2002). Wrosch and Heckhausen (2002) found that older adults reported having high numbers of intrusive thoughts for major life situations (i.e. loss of a spouse or recent diagnosis of a terminal

illness). Consequently, the number of intrusive thoughts would increase and pose a threat to cognitive functioning (Bowles & Salthouse, 2003; Wrosch & Heckhausen, 2002).

The majority of the prior research on expressive writing has been conducted using young and middle-aged adult samples. However, the few studies that have used an older adult sample have found beneficial results attributed to the interventions. A study by Segal, Bogaards, Becker, and Chatman (1999) examined a sample of adults, between the ages of 51 and 85, who had recently experienced the death of a loved one. The researchers implemented a verbal expression intervention, where the participants were told to express their feelings about the recent loss for 20 minutes over four occasions. Immediately following and one year after the intervention, the researchers found that the emotional expression group was exhibiting less depression and hopelessness compared to the control group who did not participate in the verbal expression intervention.

It is important to note that the participants in this study were a specific sample of older adults. They were all in a period of stress and/or crisis from the recent loss of a loved one. The participants in this intervention are not typical of community dwelling volunteers in aging intervention studies. In general intervention studies that obtain an older adult sample contain participants who are not experiencing a crisis situation, which would potentially impact their psychological or physical functioning and impede on the effects of the study.

The purpose of the current investigation was to develop an expressive writing intervention aimed at improving cognitive functioning in older adults. The implementation of an expressive writing intervention would aim at reducing the overabundance of intrusive thoughts thereby freeing up cognitive resources which would in turn produce both

psychological and physical benefits (e.g. successful transfer effects). It is hypothesized that older adults have an excess of intrusive thoughts that result from an inefficient inhibitory mechanism. In the following section there is a description of how decline in inhibitory control and cognition are related through the mechanism of executive functioning. Additionally, a detailed explanation of inhibitory decline in older adults and previous studies on such decline is included.

Potential Mechanisms for Change

Executive Functioning

The function of the executive system is to “guide, monitor, and optimize goal-directed behavior...” (Frias, Dixon, & Strauss, 2006, p. 206), which encompasses all general cognitive abilities such as working memory and inhibitory control. Miyake and colleagues (2000) identified through confirmatory factor analyses three components to executive functioning: mental shifting, information updating and monitoring, and inhibition of inactive responses. Although these three components work together under one construct they were found to play separate roles in the performance on complex tasks (Miyake, Friedman, Emerson, Witzki, Howerter, & Wager, 2000).

The overall age-related decline in executive functioning has been found to be related to the deterioration of the frontal lobe. This is where the age-related changes appear to be most apparent (Crawford, Bryan, Luszcz, Obonsawin, & Stewart, 2000). The three components described above (e.g. shifting, monitoring, and inhibition) are hypothesized to be declining at different rates (Rabbitt & Lowe, 2000). For example, while the working memory component stays somewhat intact the inhibitory control component could show considerable decline. As a result poor inhibition may be causing lapses in working memory

or other executive functions. Age-related decline in executive functioning is thought to be related to individual differences in frontal lobe decay, therefore these individual differences account for the reasons that some older adults attain better levels of cognitive functioning compared to others.

In sum, cognitive functioning and inhibition are separate components that lie under the same construct of executive functioning; therefore decline in one component may affect decline in performance on another. The current study aimed to decrease intrusive thoughts that potentially overload inhibitory functioning, which should in turn free up resources within the executive functioning mechanism and therefore improve performance in other cognitive components (i.e. working memory). The following section will describe the inhibition hypothesis and recent studies related to its decline in older adults.

Inhibition Hypothesis

As described above, inhibitory control is one component within executive functioning that can explain cognitive decline in older adults. The theory of inhibition has been proposed to be a key component of the expressive writing hypothesis (Pennebaker, 1993). Specifically, the inhibitory mechanism has been hypothesized to account for both beneficial and detrimental effects when a person is faced with a stressful, emotional experience (Pennebaker, 1993). When the emotion experience is inhibited, a person is able to “forget” about the event, which allows for the benefit of not dealing with the stressful incident. When the event is ignored, it also becomes unresolved. This irresolution of the event becomes the detrimental aspect of inhibiting a stressful, emotional experience. By not confronting and/or expressing the event a person is unable to work through the feeling and emotions related to it.

The following section describes the inhibitory mechanism and how its decline relates to older adults.

Studies Pertaining to Inhibitory Decline in Older Adults

According to Hasher, Zacks, and colleagues (Hasher, Quig, & May, 1997; Hasher & Zacks, 1988; Hasher, Zacks, & May, 1999; Zacks & Hasher, 1994) the role of inhibition is to keep information processing focused on relevant information while simultaneously filtering out irrelevant information (Hasher, et al., 1997). Essentially, the task of inhibition is to maintain concentration on goal-specific information, or the task at hand, rather than unrelated information.

Several studies have found evidence of age-related decline in inhibitory processes (Charlot & Feyereisen, 2004; Hamm & Hasher, 1992; Hartman & Hasher, 1991; McCrae & Abrams, 2001; McDowd & Filion, 1992). Tests such as the Stroop task, the Garden Path Sentence task (see Hartman & Hasher, 1991), and the Wisconsin Card Sorting Task (WCST) have been used to establish age differences in inhibitory functioning (von Hippel & Dunlop, 2005).

Findings from a study that used the Garden Path Sentence task indicated that young adults successfully inhibited the disconfirmed word, whereas the older adults maintained “access” to both the target and the disconfirmed words (Hasher et al., 1997). In sum, the older adults’ maintained attention on both the relevant and no-longer relevant information, which was believed to be a result of poor inhibition by failing to suppress the irrelevant information. Hartman and Dusek (1994) used a similar design by presenting sentences with a target (to-be-remembered word) and non-target word. The younger adults yielded greater priming effects for the to-be-remembered word compared to the non-target word, whereas

the older adults showed equivalent priming effects for both word types. In sum, the older adults were unable to ignore the non-target word and were susceptible to priming effects even when told to pay no attention to non-target word. Once more, the results demonstrate that older adults exhibit poorer inhibitory control compared to the younger adults'.

The above studies provide evidence to support age differences in inhibitory control between young and old samples. In addition, studies have examined age-related declines in inhibition within a sample of older adults to determine whether or not the inhibitory function continually declines throughout late life (Gold & Arbuckle, 1995; Persad, Abeles, Zacks, & Denburg, 2002). Age differences on inhibitory functioning within a sample of older adults between the ages of 60 to 85 were examined by dividing the sample between young-old and old-old age-groups (Persad et al., 2002). Results from this study indicated that the young-old adults performed better on the inhibitory task compared to the old-old adult group, suggesting that the inhibitory function progressively deteriorates with age. In addition, the findings illustrated that performance on the inhibition measure, the Trail Making Task, accounted for age-related variance on tests of verbal learning and attention. These results provide support for the idea that inhibition plays a role in other domains of cognitive performance, supporting the idea that declines in inhibitory functioning mediate age changes in cognition through the mechanism of executive functioning.

Many studies that have used the Stroop task (see Stroop, 1935) found age differences, such that poor inhibitory performance was larger for older adults compared to young and middle aged samples on various forms of the task (e.g. visual and auditory; Cohn, Dustman, & Bradford, 1984; Houx, Jolles, & Vreeling, 1993; Sommers & Huff, 2003). Wurm and colleagues extended previous research by using an Emotional Stroop task to compare

differences between young and old adults (Wurm, Labouvie-Vief, Aycock, Rebucal, & Koch, 2004). The authors reported age-related differences in inhibitory performance from two separate experiments using two different versions of the Emotional Stroop task.

In the first experiment, the participants listened to a word list presented from a voice recording played by the experimenter. The voice recording spoke each word in the form of a particular tone of emotional expression (e.g. happy tone, petrified tone, depressed tone, or neutral tone). The presented lists contained half of the words as pseudowords (e.g. cheerlace, jealoos), while the other half were real emotion words for a total of 48 words per list. The tone of voice presentation for each word was randomized so that the emotional tone did not always correspond to the spoken word, for example the word scared was presented in a happy tone of voice. The neutral tone of voice was labeled as the baseline condition, words that had matching expressions were labeled as the congruent condition (e.g. the word happy was presented in a happy tone of voice), and the words that had a dissimilar expression presentation were labeled as the incongruent condition (e.g. the word happy was presented in the depressed tone). During each presented word, the participants decided whether the spoken word was real or a pseudoword by pressing the corresponding button, and response time was recorded. The results indicated that the older adults displayed significantly slower response times for the incongruent emotion-word condition compared to the congruent and baseline tone of voice conditions; whereas, the younger adults did not have significant differences between the three conditions. The results indicated that the older adults took longer to correctly identify the validity of the word when they were faced with an incongruent emotional tone. That is, the older adults had difficulty inhibiting the emotional tone of voice particularly during the incongruent condition.

The second experiment used the visual Stroop task, where the typed words were emotional terms (e.g. happy, angry) rather than color names (e.g. blue, red). Participants were presented words each typed in a particular color (e.g. blue, black, green, orange, red), and varied in emotional arousal (e.g. low, medium, high). Participants were told to indicate the color of the word and response times were recorded. The results indicated that the older participants had significantly longer reaction times for the highly emotion arousing words compared to the other two levels of arousal, whereas the younger participants did not display reaction time differences across the three levels of emotional arousal. In sum the older adults reaction time (i.e. speed) was compromised when high emotion terms were presented on the screen.

For both studies, the older participants exhibited an inability to inhibit aspects of the emotional information. These results demonstrate the effect of emotional arousal on the older adults' reaction times. Their inability to ignore (or inhibit) the "irrelevant" forms of information (e.g. emotionality of the presented words) resulted in slower reaction times, indicating that the emotional level was affecting the older adults' ability to ignore the relevant information. The following section describes the impact of poor inhibitory functioning within older adults.

Impact of Poor Inhibitory Functioning

Hasher, Zacks, and colleagues discuss how a decline in inhibitory processes may lead to age-related changes in cognition (Hasher & Zacks, 1988; Hasher et al., 1999; Zacks & Hasher, 1994). It is hypothesized that the decreased effectiveness of the inhibitory mechanism results in age-related decay of working memory under the executive functioning mechanism (Bowles & Salthouse, 2003). As the inhibitory component breaks down it

becomes less efficient, this will result in an increase in the number of goal-irrelevant, intrusive thoughts. This increase in the number of intrusive thoughts will consume the limited processing resources available. As a result the cognitive processes will not be able to perform at full capacity (Bowles & Salthouse, 2003). It can then be assumed that as the number of intrusive thoughts decrease, cognitive resources will free up. Therefore improved performance on multiple domains of cognitive functioning within executive functioning will arise.

Inhibitory functioning is an important component to the age-related decline in cognitive functioning, but it is not the sole explanation for all age-related declines (Bowles & Salthouse, 2003). The inhibitory functioning hypothesis is just one of the important facets that should be considered when examining cognitive change in intervention studies. The subsequent section describes an alternate explanation for changes in performance within cognitive intervention studies.

Alternative Intervention Mechanism

Mental Activity

Expressive writing interventions may in fact have an effect on cognition not because of a reduction in intrusive thoughts, but rather the result of the mental activity provided by the expressive writing task. If this is the case, improved cognition in expressive writing interventions has little to do with the number of intrusive thoughts, and more to do with the involvement of mental stimulation. The act of writing alone may be the reason for a finding of improved cognitive functioning.

Previous research has shown that individuals who engage in mental stimulation have better cognitive functioning compared to those that do not (Gold, Andres, Etezadi, Arbuckle,

Schwartzmam, & Chaikelson, 1995; Grover & Hertzog, 1991; Hultsch, Hertzog, Small, & Dixon, 1999). Consequently, the current study examined whether the act of writing (e.g. mental stimulation) is the sole explanation of improved cognition by including a non-emotional writing comparison group that wrote about mundane topics unrelated to a traumatic or stressful event. This allowed us to determine whether the intervention groups (emotional and non-emotional) improved performance just by writing in a daily journal or if it was a result of a reduction in intrusive thinking through the expression of emotion.

Summary

The current study attempted to improve cognitive functioning across multiple domains in an aging sample through the implementation of an expressive writing intervention. The study examined the degree to which the “purging” of emotion-related information impacts cognition. In addition, differences in how the inhibitory mechanism plays a role in the enhancement of cognitive functioning and the reduction of intrusive thoughts were examined. The following section offers a detailed description of the specific aims and questions that guided the current investigation.

Statement of the Problem

Cognitive Intervention

The field of cognitive aging has primarily focused on investigating improvements in cognition through the use of interventions that teach older adults specific techniques and strategies needed to successfully perform on a specific cognitive task (Ball et al., 2002; Baltes & Kliegl, 1992; Edwards et al, 2002; Kliegl, Smith, & Baltes, 1989; 1990; Saczynski, Willis, & Schaie, 2002). However by teaching to the test, participants have not exhibited transfer gains beyond the trained domain. It is important that cognitive aging research begin

to focus more on interventions that target underlying components (e.g. intrusive thoughts), which will perhaps impact performance across a broad range of abilities. The current study attempted to extend previous research on cognitive interventions in the following ways:

Specific Aims

Aim 1: Determine the extent to which expressive writing reduces intrusive thoughts in a sample of older adults.

Hypothesis: Those who are in the emotional expressive writing condition will exhibit a significantly larger reduction in the number of intrusive thoughts compared to those in the daily events writing condition.

Aim 2: Determine the utility of emotional expressive writing in improving older adults' performance on measures of cognitive functioning.

Hypothesis: Those in the emotional expressive writing condition will have significantly larger improvements in measures of cognitive performance compared to those in the daily events writing condition.

Aim 3: Evaluate whether or not expressive writing improves cognitive functioning in real-world outcomes such as everyday cognition, which are strongly tied to the maintenance of independence.

Hypothesis: Those in the emotional expressive writing condition will have significantly larger improvements in everyday cognition measures (i.e. Everyday Cognition Battery; see methods section) compared to those in the daily events writing condition.

Aim 4: Determine whether individual differences in the reduction of intrusive thoughts are related to changes in cognition and everyday cognitive functioning.

Hypothesis: Those who exhibit a larger reduction in the number of intrusive thoughts will have significant improvements in cognition and everyday cognitive functioning compared to those who exhibit little or no reductions in the number of intrusive thoughts.

Aim 5: Determine the extent to which a reduction in intrusive thoughts leads to improvements in cognition across participants that differ on performance of inhibitory functioning.

Hypothesis: Those who are identified as being “poor” inhibitors will benefit the most from the intervention by having a significant decrease in the number of intrusive thoughts and significant improvements in cognition compared to those who are characterized as “good” inhibitors at the pretest.

Method

Participants

The sample for the study consisted of 61 independently living older adults, 12 men and 49 women between the ages of 61 – 94 ($mean = 75.56$, $SD = 7.70$). Participants were recruited from four senior centers in the cities of Raleigh and Cary in North Carolina. The sample's ethnicity was 81% Caucasian. The average reported income range was \$20,000 - \$21,999 per year ($range = \text{under } \$4,000 - \text{over } \$50,000$ per year) and the average number of years of education received was 14.63 years ($range = 9 - 16$ years of education).

Design

A pretest, posttest experimental design was used that consisted of three phases. During Phase 1 (pretest) and Phase 3 (posttest) the participants were administered a multidimensional psychological battery. Immediately after the participants completed the pretest (Phase 1) they were randomly assigned to one of two groups: emotional expressive writing group ($n = 32$) or the daily events writing group ($n = 29$). For Phase 2 (the writing intervention), participants in both groups were instructed to write for 20 minutes on five separate days over the course of ten days. Within one week after the completion of Phase 2, all participants were asked to return to the testing site to complete the same testing battery that was given in Phase 1. For a timeline of the procedure refer to Table 3.

Table 3

Experiment Timeline

	Phase 1 Day 1	Phase 2 Days 2 - 12	Phase 3 Day 19
Emotional Expression Group	Pretest	Five 20-minute writing sessions	Posttest
Daily Events Group	Pretest	Five 20-minute writing sessions	Posttest

Procedure

Participants were recruited from the community and senior centers in both Raleigh and Cary. Each person was contacted and was given an explanation of the study. If the participants agreed to participate, the experimenter scheduled the pretest session. At the end of the pretest session, the experimenter scheduled the posttest session, which took place approximately 17 days after the pretest.

Pretest Session

The pretest (Phase 1) took place at one of four testing sites (Capital Towers, Sir Walter Raleigh Apartments, Cary Senior Center, and Glenaire Apartments). During this phase, testing was conducted in groups of three or four participants. Each participant completed a two-hour psychological battery of tests, as described in the measures section. Before each test, instructions were given and then the participants had a set amount of time to complete each task. After the cognitive portion of the battery was administered, participants completed a demographic form, health questionnaire, and the Impact of Events Scale (IES).

Before completing the IES form each participant chose an event that describes an upsetting experience. Once the event was chosen participants then filled out the IES according to the event. Upon the completion of the IES each participant was randomly assigned to one of the two experimental groups: emotional expressive writing group or non-emotional daily events writing group.

Intervention Instructions

After the group assignment, participants in the emotional expressive writing and non-emotional daily events writing groups were given their respective journals. The emotional expressive writing group was told to use the event chosen from the IES form as the event that

they would write about over the five journal writing occasions. They were then given a set of standard instructions that have been described by Pennebaker (1997). The instructions were as follows:

“During the next ten days, your task is to write for 20 minutes on 5 different days about the event you selected when you were asked to describe an upsetting experience or stressful life event that has been troubling you. Please make a note of that event in the space below. If you cannot recall the event you selected, let the researcher know now. You can write about different aspects and points of view pertaining to the event above. The important thing is that you write about your deepest thoughts and feelings that are still bothering you about the event. In your writing try to let yourself go and write continuously about your emotions and thoughts related to the event. Write about your experience in as much detail as you can. Do your best to “tie it all together” at the end of the writing. Do not worry about spelling or grammar. The important thing is that you really dig down and explore your thoughts and feelings about the experience.

Ideally each writing day should be followed by a day when you do not write. If your schedule doesn't allow you to write every other day, it is OK to write on successive days or skip more than one day between writing sessions. Before you begin to write find a quiet place where others cannot disturb you. Please write in the journal on your own; do not talk about what you write with anyone else. Please try and write for the full 20 minutes.”

The non-emotional daily events writing group was given a different set of instructions. The instructions were as follows:

“During the next ten days, your task is to write for 20 minutes on 5 different days about a specific event or activity that will be assigned to you and indicated on each day here

in your journal. For instance, on one day you may be asked to describe a trip to the grocery store. When writing please do not mention your own emotions, feelings, or opinions. Your description should be as objective as possible. Do not worry about spelling or grammar.

Ideally each writing day should be followed by a day when you do not write. If your schedule doesn't allow you to write every other day, it is OK to write on successive days or skip more than one day between writing sessions. Before you begin to write find a quiet place where others cannot disturb you. Please write in the journal on your own; do not talk about what you write with anyone else. Please try and write for the full 20 minutes.”

The topic assignments were also included in their journals, the five separate topics were: describe how to wash a car, explain what your bedroom looks like, describe your last trip to the grocery store, describe what your living room looks like, and describe what your neighborhood looks like (an example of a journal for both conditions is provided in the appendix).

All participants in the two conditions received a copy of their writing instructions described above. Shortened versions of the written instructions (reminding them of the topics they would be writing about) were typed at the top of each page that marked the separate five writing days. The emotional expressive writing group wrote down their stressful event topic, which was indicated during the Phase 1 in the assessment battery, on the second page of their journals. This allowed for the participants to refer to the event about which they were supposed to be writing, in case they forget. Both journals contained a page marked “Writing Log” in which they wrote down the date, start time, and end time for all of the five writing sessions. Each marked journal entry contained three blank pages of lined

paper. The journals were given to each participant after the writing assignments had been assigned; the journal was to be used for all of the five writing occasions.

During the intervention (Phase 2) each participant wrote for 20 minutes over five occasions in a ten-day period. Locating a quiet place where there were no intrusions was the first thing the participant was told to do each day they chose to write in the journal. A quiet place helps the participant concentrate solely on the writing task. Once the participant sat down, they were told to turn to the corresponding day in the journal (e.g., on the second writing occasion the participant turned to the page marked “Journal Entry #2”). The participants were instructed to turn to the “Writing Log” and write down the date and time at which they start writing. For the 20 minutes the participants wrote in a manner consistent with their designated instructions (e.g. non-emotional daily events verses emotional expression instructions). Once the writing time was up, the participant was to cease writing (whether or not the participant had filled up the designated writing space), and indicate the time in which they have finished, and then close their journal. The journal would then be put away and not be opened until the next writing session. They received reminder phone calls halfway through the ten days to make sure they had been keeping up with the writings.

Posttest Session

For Phase 3 of the study, this fell approximately one week after the final writing session, participants in both groups returned for the posttest. The participants were asked to turn in their journals if they chose to do so upon entering the testing site. The participants were given the option not to turn in their journals. They were informed that all entries within the journals were to be kept confidential, but if they felt that they did not want the

information shared they could keep their respective journals. They were then given the psychological assessment battery that was administered in Phase 1.

Measures

Cognitive functioning

The psychometric measures included in the battery of psychological assessments examined three abilities: inductive reasoning, processing speed, and memory. These abilities were selected because they exhibit negative age-related effects. In addition these abilities have been found to be the focus of numerous cognitive intervention-training studies in older adults and have shown significant training gains (Baltes & Kliegl, 1992; Edwards et al., 2002; Saczynski, Willis, & Schaie, 2002).

Computation Span task (Salthouse & Meinz, 1995). This working memory task was selected to assess basic working memory, which is defined as the ability to process information while simultaneously retaining the same information. In this task, participants were auditorily presented with simple arithmetic problems ($a + b = ?$; $c - d = ?$) using numbers between one to nine, and were then told to identify the correct answer from a choice of three response alternatives on an answer sheet. Once all computations were performed within a given span length, participants were then instructed to turn the page and recall the second number of each arithmetic problem in the exact order in which they were presented. This task included two trials for each span ranging from two to five arithmetic problems. Each trial at the differing span levels was scored either correct (participants correctly recalling all the numbers in order) or incorrect.

Letter Series (Thurstone, 1962). The task was used to assess inductive reasoning, which is defined as the ability to extract novel relationship in over-learned material. The test

consisted of 30 items that had the participants identify the letter that comes next in a series of letters. For example, if the letters are presented “a b a b c d c” the next letter in the series would be “d”. The score was the total number of items correctly as coming next in the letter series.

Number Comparison Test (Ekstrom, French, Harman, & Derman, 1976). This particular measure was used to assess processing speed. The test consisted of 48 items, where each item presented a pair of side-by-side number strings ranging from 3 to 13 digits in length. The participants were asked to compare each pair of strings and mark an “X” between each pair that does not match. For example the two number pairs “54732” and “54723” would not match so the participant would place an “X” between the two sets of numbers. The score was the total number of items correctly identified as matching or not matching.

Auditory Verbal Learning Test (AVLT; Rey, 1941). This task was used to assess memory. The participants were told to study a list of 15 semantically unrelated words for one minute. After the time was up, the participants were then told to write down as many words as they could remember. The score was the number of words correctly recalled; there was no penalty for intrusion or preservation errors.

Everyday cognitive functioning

Everyday Cognition Battery (ECB; Allaire & Marsiske, 1999). This battery was used to assess everyday cognition. An abridged version of the ECB was used to assess each participant’s ability to perform on cognitive tasks that they might face in their daily lives. The condensed version of the battery contained two assessments, one of inductive reasoning (ECB Inductive Reasoning) and one of declarative memory (ECB Declarative Memory)

within three domains of everyday functioning (i.e. medication use, financial management, and food preparation/nutrition). The score was the total number of items correctly answered.

Intrusive thinking

Impact of Events Scale (IES: Horowitz, Wilner, & Alvarez, 1979). The IES was used to assess the amount of intrusive and avoidant thoughts associated with the recall of a negative, stressful event related to a major loss or disappointment. The IES is a 15-item self-report measure where participants were told to rate statements, on a 4-point scale ranging from “not at all” to “often.” An example of a statement on the scale is, “I avoided letting myself get upset when I thought about it or was reminded of it” and “I thought about it when I didn’t mean to.” Eight of the items assessed avoidant thoughts, while the other seven assessed intrusive thoughts. The reliability coefficients, as reported by Corcoran and Fischer (1994), the reliability ranged from .79 to .92. Attached to the front of the scale was a form for each participant to write down the stressful event that they were to use to answer the questions pertaining to the IES. Additionally, the participants wrote down the approximate date the stressful event began and ended (if applicable) (refer to the appendix for an example of this form).

Inhibitory Control

Stroop Test (Stroop, 1935). The Stroop task was used to assess inhibitory functioning. The participants were shown a series of names of color-words that were presented in various colors (e.g. blue, black, red, green, orange, and brown). Half of the words were printed as the same name of the color (e.g. the word brown will be printed in brown ink) and the other half were printed in a color that is different from the color word (e.g. the word brown will be printed in red ink). The participants were told to circle the

correct color that matches the printed color ink as quick as possible, in the allotted time of 45 seconds. The total correct number of responses was calculated as the score (refer to the appendix for an example of this task).

Affect

Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988). This 20- item questionnaire was used to assess individual's daily experience of positive and negative emotions. The participants were asked to rate to what extent they experienced 20 different emotions (e.g. 10 positive and 10 negative) during the past seven days. The ten items assessing positive emotion were averaged to create a Positive Affect variable and the average of the ten items assessing negative emotion was compiled into the Negative Affect variable.

Demographics

Each participant also filled out a personal data questionnaire. The questionnaire evaluated the participant's age, sex, marital status, educational level, hearing, vision, life dissatisfaction, and income.

Fidelity of the Intervention Protocol

A substantial time commitment and precise protocol adherence was required from each of the participants in the current study. Given the strict guidelines of the intervention it was important to examine individual adherence to the protocol of the study. It was particularly valuable to examine whether there were differences in protocol compliance between the emotional expressive writing group and the daily events writing group. It is important to note that the validity of what was recorded on the writing logs was also checked by examining each participant's journal content.

Completion of Writing Occasions

It was essential to determine whether each participant in the emotional expression and daily events writing groups wrote for all five occasions. Recall that a “Writing Log” was included in the journal packet for participants to record the date and time each writing session occurred. The writing log allowed for documentation of how many actual occasions a participant completed. Of the 28 participants in the daily events writing group 25 participants wrote for the full five required days of writing and adhered to the writing protocol. Three participants did not fulfill the instructions to the writing assignment. One participant recorded in their writing log as completing only three occasions of writing, which was verified by examining the turned in journal. In addition two participants did not return their writing log or their journal, rather they verbally reported to the experimenter that they did not complete the five writing occasions. For the emotional expressive writing group all 30 participants turned in their writing logs. Twenty-eight of the participants completed all five writing occasions. One participant in the expressive writing group wrote for four occasions, and another participant wrote for three occasions.

Adherence to Writing Assignment for Journal Condition

It was important for the participants in both journal conditions to follow the directions as close to as possible. For the daily events writing group, the participants were told to not include any emotional thoughts or feelings when completing each of their writing assignments. Each journal was thoroughly examined to verify that each participant kept his or her writing assignment strictly non-emotional. Only two of the 28 participants in the daily events writing condition included an emotional theme at one writing occasion. These two

participants did adhere to the correct daily event that was given on the assigned day even though they failed to follow the non-emotional guideline.

The emotional expressive writing group was given instructions to write about the stressful event they described on the Stressful Event form for all five occasions. The chosen event was written down in the journal at the pretest session so that the participant could refer to the selected topic at any time. Each individual journal was examined to determine whether or not the participant wrote about the stressful event during the entire writing session over all five occasions. Of the 30 participants in the expressive writing condition, ten participants did consistently write about their chosen stressful event, instead they wrote about another emotional event as well as the stressful event that was indicated on the form.

Preliminary Analyses

The following section examined whether the two intervention groups differed from each other on a set of demographic variables (e.g. age, education, and income). An Independent Samples T-test was run and the results indicated that the two groups significantly differed for income, where higher income was found in the daily events writing group compared to the emotional expressive writing group. The two groups did not differ significantly for age or education (see Table 4).

Table 4

T-test Comparing the Mean Differences between groups on Demographic Characteristics

Variables	<i>Daily Events Group</i> <i>M (SD)</i>	<i>Emotional Expression Group</i> <i>M (SD)</i>	<i>t</i>	<i>p</i>
Income	12.39(4.98)	8.80(5.56)	2.59	.01
Education	15.07(1.49)	14.20(1.86)	1.98	.05
Age	75.79(7.98)	75.33(7.55)	.23	.82

Next a Correlational Analysis was conducted to determine what cognitive measures at pretest were significantly correlated with income. As seen in Table 5, Letter Series and Number Comparison were significantly and positively associated with income. A significant, positive correlation was also found for both of the Everyday Cognition measures, ECB Reasoning and ECB Memory. As a result all subsequent analysis involving these measures was run both controlling and not controlling for the demographic variable income. If controlling for the variable did not change the results, only the analyses not controlling for income was reported.

Table 5

Correlations Between Income and Measures of Basic and Everyday Cognitive Functioning

Cognitive Measures	Income
Computation Span	.01
Letter Series	.38**
Number Comparison	.43**
AVLT	.20
ECB Reasoning	.51**
ECB Memory	.39**

Note: * = $p < .05$; ** = $p < .01$

Next a Correlation analysis was conducted to determine what measures were related at pretest. It is important to point out that none of the cognitive measures were significantly correlated with the IES Intrusions or IES Avoidance scales. See Table 6 for the correlation matrix. Additionally analyses were conducted examining the pretest means for each of the measures at pretest (see Table 7).

Table 6

Correlation Table for all Pretest Measures

	Computation Span	ECB Memory	ECB Reasoning	Letter Series	AVLT	Number Comparison	Stroop	IES Intrusions	IES Avoid
Computation Span	1	-	-	-	-	-	-	-	-
ECB Memory	-.01	1	-	-	-	-	-	-	-
ECB Reasoning	.12	.73**	1	-	-	-	-	-	-
Letter Series	-.02	.69**	.58**	1	-	-	-	-	-
AVLT	.10	.43**	.35**	.33*	1	-	-	-	-
Number Comparison	-.07	.54**	.53**	.48**	.44**	1	-	-	-
Stroop	.05	.31*	.28*	.40**	.50**	.53**	1	-	-
IES Intrusions	-.06	-.15	-.09	-.11	-.23	-.07	-.16	1	-
IES Avoidance	-.19	-.14	-.17	-.21	-.09	-.08	-.22	.71**	1

* p -value < .05 level; ** p -value < .01

Table 7

Pretest Means Comparing Expressive Writing to Daily Events Writing Group

Variables	Expressive Writing Group		Daily Events Writing Group	
	Mean (SD)		Mean (SD)	
IES ($n = 52$; Emotional group $n = 30$)	35.27 (10.04)		30.64 (9.70)	
IES (Intrusions)	16.87 (5.30)		14.32 (4.37)	
IES (Avoidance)	18.40 (5.47)		16.05 (6.24)	
Number comparison ($n = 52$; Emotion group $n = 26$)	18.92 (4.13)		19.96 (4.56)	
Letter Series ($n = 52$; Emotion group $n = 26$)	7.85 (5.55)		9.42 (4.59)	
AVLT ($n = 52$; Emotion group $n = 26$)	8.00 (2.15)		7.84 (2.96)	
Computation Span ($n = 52$; Emotion group $n = 26$)	25.58 (2.86)		25.04 (5.51)	
ECB Reasoning ($n = 56$; Emotion group $n = 28$)	62.61 (13.05)		64.64 (10.31)	
ECB Memory ($n = 56$; Emotion group $n = 28$)	22.18 (5.11)		22.86 (4.19)	

Participant Drop Out

Two participants dropped out of the study and were not included in the analysis. Both participants dropped out after the completion of Phase 1. Both participants were male with a mean age of 68.50 years old, a mean education of 17 years and mean income of \$22,000 – 23,999 per year. Compared to the entire sample these two participants were younger, had higher education, and higher reported income than the mean of the entire sample.

Results

The following section presents analysis aimed at examining the efficacy of the expressive writing intervention to improve performance across multiple domains of cognition. A repeated measures multivariate analyses of variance (MANOVA) was conducted for each set of measures. In order to decompose significant interactions, repeated measures analyses of variance were conducted separately for each measure as a follow-up test when the multivariate tests were significant. If evidence of an interaction was not found then focus was directed to the between- and within-subject main effects. The subsequent analyses were driven by the five specific aims.

Aim 1: Reduction of Intrusive Thoughts

In order to determine if the intervention reduced the amount of elders' intrusive thoughts, a Repeated Measures Multivariate Analysis of Variance (MANOVA) was conducted with the Intrusive Event Scale as the dependent variable. The within-subjects factor was occasion (pretest, posttest) and the between-subjects factor was intervention group (emotional expressive writing group, daily events writing group). Seven participants who did not complete the IES form either at pre- or at post-testing were excluded from the analysis.

Results indicated that there was no significant multivariate interaction effect for occasion by group, $F(1, 51) = .05, p = .82, \eta^2 = .01$. Further analyses revealed no multivariate main effect for occasion, $F(1, 51) = .30, p = .59, \eta^2 = .01$. A main effect for condition was found, $F(1, 51) = 4.75, p < .05, \eta^2 = .09$, indicating that the two groups differed overall on the IES collapsed across the two occasions. Specifically, the daily events writing group had lower scores overall on the IES ($m = 28.57, SD = 11.65$) compared to the emotional expressive writing group ($m = 35.07, SD = 10.74$).

In addition to the analysis examining the total IES score, analyses were conducted for each of the IES subscales: avoidance and intrusions. There was no significant multivariate interaction effect for occasion by group, $F(2, 50) = .27, p = .78, \eta^2 = .01$. A significant between-subjects effect was found for the avoidance subscale, $F(1, 51) = 4.08, p < .05, \eta^2 = .07$, such that the Daily Events writing condition had on average fewer avoidant thoughts ($m = 14.83, SD = 6.09$) compared to the emotional expression writing condition ($m = 18.23, SD = 6.08$) when collapsed across occasions. When the intrusion scale was examined there was also a significant between-subjects effect, $F(1, 51) = 4.45, p < .05, \eta^2 = .08$, such that the daily events writing group had lower intrusive thoughts ($m = 13.74, SD = 5.23$) compared to the emotional expression writing group ($m = 16.83, SD = 5.31$) when collapsed across occasions.

Aim 2: Examining Cognitive Change

The second aim of the study was to determine whether or not the intervention produced gains in cognitive functioning. A repeated measure MANOVA was conducted using the four cognitive measures (i.e., Letter Series, Number Comparison, AVLT, and Computation Span) as dependent variables. The within-subjects factor was occasion (pretest,

posttest) and the between-subjects factor was intervention group (emotional expressive writing group, daily events writing group). A significant occasion by group interaction was not found, $F(4, 47) = .98, p = .43, \eta^2 = .08$, which indicates that the posttest change on the set of measures did not vary by group. However, there was a marginally significant within-subjects' main effect for occasion, $F(4, 47) = 2.36, p = .07, \eta^2 = .17$, indicating that there was a slight pretest to posttest difference in performance on the set of cognitive measures. To decompose this marginally significant multivariate main effect, follow-up repeated measures ANOVAs were conducted. The results indicated that there was a significant univariate main effect only for the Number Comparison test, $F(1, 50) = 7.25, p < .05, \eta^2 = .13$. Specifically, there was a significant increase in mean performance from pretest ($m = 19.44; SD = 3.06$) to posttest ($m = 20.60; SD = 3.57$) collapsed across the two intervention groups.

Aim 3: Examining Change in Everyday Cognitive Functioning

In order to determine if the expressive writing improved everyday cognitive functioning, analyses were conducted examining pre- to post-test change by group for the two measures of the ECB. A repeated measures MANOVA was conducted for ECB Memory and ECB Reasoning tests, with the within-subjects factor being occasion (pretest, posttest) and the between-subjects factor being condition (emotional expressive writing group, daily events writing group). A significant occasion by group interaction was not found, $F(2, 53) = .57, p = .57, \eta^2 = .02$. There was, however, a significant within-subjects main effect for occasion, $F(2, 53) = 4.92, p < .05, \eta^2 = .16$. When the main effect for occasion was decomposed, there was a significant effect for the ECB Memory test, $F(1, 54) = 9.59, p < .01, \eta^2 = .15$, indicating an increase in mean performance from pretest ($m = 22.52,$

$SD = 3.33$) to posttest ($m = 23.68$, $SD = 3.07$). No significant effect for the ECB Reasoning test was found.

Aim 4: Exploring Cognitive Change as a Function of a Reduction in Intrusive Thoughts

Analyses next examined whether a reduction in intrusive thoughts, as measured by the Intrusive Event Scale, was associated with improvements in basic and everyday cognitive functioning. The following analysis was conducted to determine if *any* reduction of intrusive thinking for the emotional expressive writing group was associated with gain in cognitive functioning. Recall that in Aim 1 there was not a significant reduction in mean intrusive thoughts for the emotional expressive writing group as a whole. However, it is possible that within this group some participants did experience a decline while some either did not experience a decline or remained the same. It is important to note that this was exploratory analysis. These results could point to the fact that the act of writing impacts only certain participants by reducing the number of intrusive thoughts, which in turn freed up cognitive resources and improved functioning. In order to examine this aim only the Intrusions subscale of the IES was used. Initial analysis examined this question in the emotional expressive writing group only ($n = 30$) and then in the sample as a whole.

The first step of the analyses was to divide the emotional expressive writing group between those who had experienced a decrease in the number of thoughts and those who either did not experience a decline or those who had increased in the number thoughts as assessed by the Intrusions subscale. As a result a new variable was created, which represented a division between those that experienced a reduction in thoughts and those that either experienced an increase in thoughts, or those who did not change. A repeated measures MANOVA was conducted for the four measures of basic cognitive abilities as the

dependent variables, where the within-subjects factor was occasion (pretest, posttest) and the between-subjects factor was intrusive thought group (reduction, non-reduction)

The results indicated no significant interaction effect for occasion by group, $F(4, 21) = 1.11, p = .38, \eta^2 = .18$. Moreover there was not a significant within-subjects effect for occasion, $F(4, 21) = .95, p = .45, \eta^2 = .15$. A marginally significant between-subjects effect for intrusive thought group was found, $F(4, 21) = 2.25, p = .09, \eta^2 = .30$, which indicated that the two intrusive thinking groups differed on the measures of basic abilities collapsed across the two time points. When the main effect for the intrusive thinking groups was decomposed there was a significant between-subjects effect for Letter Series, $F(1, 24) = 4.93, p < .05, \eta^2 = .17$, with higher scores for the non-reduction group ($m = 9.37, SD = 4.49$) compared to the reduction group ($m = 5.41, SD = 4.48$). A marginally significant between-subjects effect was also found for Number Comparison, $F(1, 24) = 3.47, p = .08, \eta^2 = .13$, with higher scores for the group who did not experience a reduction ($m = 20.50; SD = 4.11$) compared to the group who did have a reduction in intrusive thoughts ($m = 17.46, SD = 4.11$).

Next a repeated measures MANOVA was conducted for the two measures of everyday cognition as the dependent variables, where the within-subjects factors were occasion (pretest, posttest) and the between-subjects factor was intrusive thought group (reduction, no-reduction). The results indicated no significant interaction effect for occasion by group, $F(2, 25) = 1.97, p = .16, \eta^2 = .14$. These findings suggest that the groups did not differ from one another other from pretest to posttest. When comparing the between-subjects effect, no significant effect was found, $F(2, 25) = 1.23, p = .31, \eta^2 = .09$, indicating that the two groups did not differ from one another on the measures of everyday functioning. Furthermore, there was a significant within-subjects' main effect for occasion, $F(2, 25) =$

4.42, $p < .05$, $\eta^2 = .26$, indicating that there was a pretest to posttest difference in performance on the set of everyday cognitive measures. Follow-up repeated measures ANOVAs indicated that there was a significant main effect of occasion for ECB Memory, $F(1, 26) = 7.71$, $p < .05$, $\eta^2 = .23$, with an increase in mean performance from pretest ($m = 21.95$, $SD = 4.97$) to posttest ($m = 23.51$, $SD = 4.71$) collapsed across the two groups.

Analyses of the Entire Sample

The next set of analyses examined the entire sample to determine whether a reduction in intrusive thoughts, as measured by the IES Intrusions subscale was associated with improvements on the four measures of cognition (Letter Series, Number Comparison, AVLT, and Computation Span) and on the two measures of everyday cognition (ECB Memory and ECB Reasoning).

The first step of the analyses was to divide the entire sample between those who had experienced a decrease of thoughts on the IES subscale and those who had either not experienced a decline or those that had increased the number of intrusive thoughts, eliminating those who did not complete the IES at either of the two testing occasions ($n = 7$). It is important to note that all seven participants eliminated from the analyses were in the Daily Events condition; the participants in the Expressive Writing condition all completed the IES forms at both occasions. A new dichotomous variable was created that represented those that experienced a reduction in thoughts and those who either experienced an increase or those who did not change as assessed by the Intrusions subscale of the IES. Next, a repeated measures MANOVA was conducted for the four measures of basic abilities (Letter Series, Number Comparison, AVLT, and Computation Span) as the dependent variables, the

within subjects factor was occasion (pretest, posttest) and the between subjects factor was group (reduction, no-reduction).

No significant interaction effect was found for the occasion by group interaction, $F(4, 42) = 1.22, p = .32, \eta^2 = .10$. These findings suggest that the pretest to posttest change on the set of measures did not vary by the reduction of intrusive thought groups. There was not a significant between-subjects effect for group, $F(4, 42) = 1.02, p = .41, \eta^2 = .09$, which suggests that the groups did not differ from one another collapsed across the two occasions. Analyses indicated that there was a marginally significant multivariate within-subjects' effect for occasion, $F(4, 42) = 2.07, p = .10, \eta^2 = .16$. Further analysis revealed a significant within-subjects difference for Number Comparison, $F(1, 45) = 6.55, p < .05, \eta^2 = .13$, with higher scores at post-test ($m = 20.84, SD = 5.35$) relative to pre-test ($m = 19.64, SD = 4.25$).

Next a repeated measures MANOVA was conducted on the entire sample for the two measures of Everyday Cognition (ECB Reasoning and ECB Memory) as the dependent variables, while the within subjects' factor was occasion (pretest, posts) and the between subjects' factor was reducer group (reduction, no reduction). A marginally significant interaction effect of Occasion by Reduction group was found, $F(2, 48) = 2.61, p = .08, \eta^2 = .10$. When the interaction was decomposed a significant effect was found for the ECB Reasoning test, $F(1, 49) = 4.26, p < .05, \eta^2 = .08$, refer to figure 1.

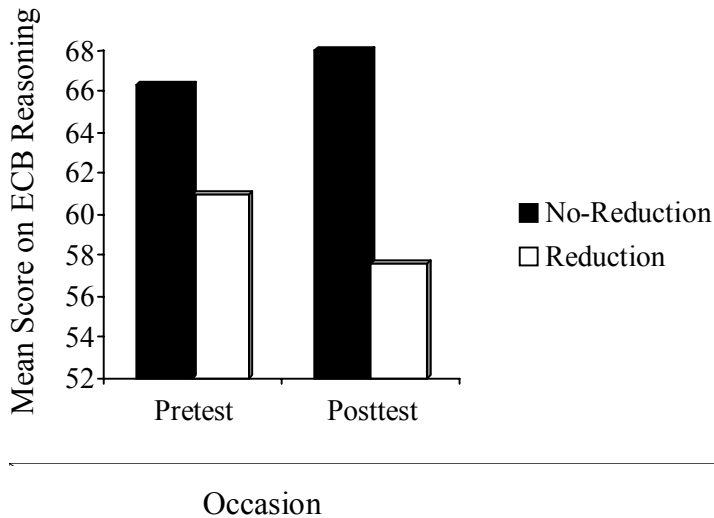


Figure 1. Mean Scores on the ECB Reasoning test for the Reduction Groups

A significant effect was found for the within subjects' main effect for occasion, $F(2, 48) = 4.19, p < .05, \eta^2 = .15$. When the main effect was decomposed a significant effect was found for ECB Memory, $F(1, 49) = 7.28, p < .05, \eta^2 = .13$, such that the average score improved from pretest ($m = 22.77, SD = 4.28$) session to posttest ($m = 23.85, SD = 4.07$) collapsed across the groups. The finding was not significant for the ECB Reasoning test.

A marginally significant effect was found for the between subjects' group variable, $F(2, 48) = 2.68, p = .08, \eta^2 = .10$. When the main effect was decomposed a significant effect was found for both ECB Reasoning, $F(1, 49) = 5.33, p < .05, \eta^2 = .10$ and ECB Memory, $F(1, 49) = 4.12, p < .05, \eta^2 = .08$. Individuals in the non-reduction group, on average, performed better on the ECB Reasoning test ($m = 67.14, SD = 15.92$) compared to those that did experience a reduction in thoughts ($m = 59.30, SD = 18.28$). The same pattern was shown for the ECB Memory test where individuals in the non-reduction group ($m = 24.43, SD = 5.21$) performed, on average, better than the reduction group ($m = 22.18, SD = 6.00$).

Aim 5: Exploring Cognitive Change as a Function of Inhibitory Performance

The final aim of the current investigation was to determine if participants who were identified as “poor” inhibitors would show greater improvements on the cognitive and everyday cognitive functioning tests when compared to those who were characterized as “good” inhibitors. To obtain an accurate assessment of inhibition, the effect of speed, as measured by Number Comparison, was regressed out of the Stroop performance task. The next step in the analysis was to determine what participants were “good” inhibitors and what participants were “poor” inhibitors. A new dichotomous variable was created that contained the standardized residuals of the Stroop task performance minus speed, where good inhibitors performed above the mean and poor inhibitors performing below the mean. The generated variable represented a division between those that were characterized as good inhibitors and individuals who were identified as poor inhibitors.

A repeated measures MANOVA was conducted for the four measures of basic cognitive abilities as the dependent variables, where the within-subjects factor was occasion (pretest, posttest) and the between-subjects factors were group (emotional expressive writing group, daily events writing group), inhibitory function (poor inhibitors, good inhibitors), and reducers (reduction of thoughts, no reduction of thoughts).

The results indicated no significant four-way interaction effect for occasion by group by inhibitory function by reducers for the measures of basic cognitive abilities, $F(4, 36) = .85, p = .50, \eta^2 = .09$. A marginally significant between-subjects group by inhibitory function interaction was found, $F(2, 42) = 3.01, p = .06, \eta^2 = .13$. When decomposing the interaction a marginally significant effect was found for the AVLT measure, $F(1, 39) = 3.65, p = .06, \eta^2 = .09$, where individuals who were characterized as being good inhibitors performed better

on the AVLT particularly for the daily events group (see Figure 2). No other significant between- or within-subjects main effects or interactions were found.

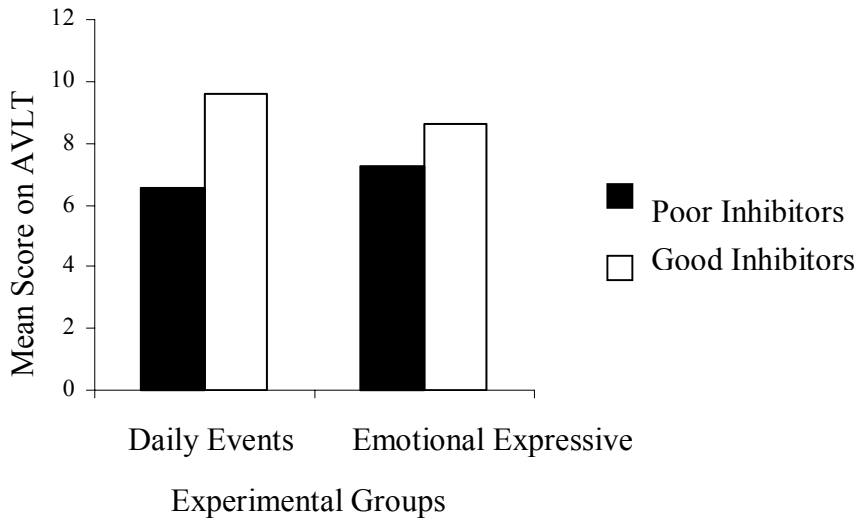


Figure 2. Mean Score Differences on AVLT Comparing Group X Level of Inhibitory Functioning

Next a repeated measures MANOVA was conducted for the two measures of everyday functioning as the dependent variables, where the within-subjects factors were occasion (pretest, posttest) and the between-subjects factors were group (emotional expressive writing group, daily events writing group), inhibitory function (poor inhibitors, good inhibitors), and reducers (reduction of thoughts, no reduction of thoughts).

The results indicated no significant four-way interaction effect for occasion by group by inhibitory function by reducers for the measures of everyday cognitive functioning ($F(2, 42) = 2.15, p = .13, \eta^2 = .09$). A marginally significant inhibitory function by group between-subjects effect was found ($F(2, 42) = 3.02, p = .06, \eta^2 = .13$). When the interaction was decomposed, no significant univariate effects were found. Additionally, no other significant within- and between-subject effects were found.

Discussion

The main goal of the investigation was to examine the efficacy of an expressive writing intervention to improve cognitive functioning in older adults. The expressive writing technique was hypothesized to reduce intrusive thoughts, which would in turn free up cognitive processing resources. This would result in an improvement across multiple domains of cognition and everyday cognitive functioning. Specifically, the investigation was driven by five specific aims. First, determine the extent to which expressive writing reduces the number of intrusive thoughts. Results indicated that the daily events writing group had a lower average scores compared to the emotional expressive writing group for the IES.

Second, examine the effectiveness of an emotional expressive writing intervention for improving performance on the four measures of cognitive functioning. Higher performance was found at posttest for processing speed compared to pretest when collapsed across the two intervention groups. Third, examine the utility of the emotional expressive writing intervention for improving performance on real world outcomes by using two measures of everyday cognition. On average, the participants improved performance on the ECB Memory subtest from pretest to posttest when collapsed across the two intervention groups.

Fourth, observe whether individual differences in the reduction of intrusive thoughts were related to changes in cognition and everyday cognitive functioning. Group differences were found for inductive reasoning and processing speed such that higher scores were found for the no-reduction group when collapsing across the two testing occasions. When everyday cognition was examined, average scores on the ECB Memory test were higher at posttest compared to pretest when collapsed across the two intervention groups.

The second step of this aim was to examine the entire sample. Although findings from this step cannot attribute gains in cognitive functioning to expressive writing, gains can be attributed through the mental exercise of writing in either of the two journal tasks. An effect was found for processing speed such that, higher average scores at posttest were found compared to the pretest session when collapsed across the entire sample. When the measures of everyday cognition were examined, results indicated that the non-reducer group improved across testing sessions, whereas those in the reducer group performed worse over time for the ECB Reasoning subtest. Additionally participants in the non-reduction group, on average, performed better on both the ECB Reasoning and Memory tests compared to the reduction group. Moreover the average scores on the ECB Memory task improved from pretest to posttest for the entire sample.

The final aim of the study was to examine whether a reduction in intrusive thoughts leads to improvement in cognition and everyday functioning by examining individual differences in inhibitory functioning. An effect was found memory, where “good inhibitors” in the daily events writing group performed better, on average, compared to the “poor inhibitors” in the same condition. When the measures of everyday cognition (ECB) were assessed no findings of interest were found. The following section discusses the interesting findings that are worthy of mention.

Review of the Interesting Findings

Even though the study fell short of the hypothesized effects, there were a handful of interesting results that require further discussion. The daily events writing group displayed lower scores on the Intrusive Events Scale compared to the emotional expressive writing group. That is, participants who wrote about an emotionally disturbing topic did not decrease

in the number of intrusive thoughts after the implementation of the intervention.

Additionally, further examination of the findings suggested that the emotional expressive writing group did not benefit compared to the daily events writing group when examining changes in performance on the cognitive tasks.

These findings can be interpreted in two ways: (1) the emotional writing intervention was not effective and may in fact hindered performance; (2) the follow-up was only a one-week after the intervention was completed. It is possible that there were beneficial effects, but they did not show in the current study because the follow-up assessment was too soon. This explanation is further discussed in the limitations section below.

The first possibility is that the intervention just did not work in this sample of older adults. Previous expressive writing interventions have shown to be effective in samples of participants that were experiencing a “crisis situation” such as cancer treatment, recent loss of a loved spouse, or recent diagnosis of HIV/AIDS (Segal, et al., 1999; Smyth, et al., 1999). It is presumed that these participants were experiencing an abnormal amount of intrusive and avoidant thoughts due to their current situation, which in turn inordinately taxed their cognitive processing system. In these samples, an expressive writing paradigm allowed for the release of these intrusive thoughts. In the current sample of healthy and independently living elders intrusive thoughts may not have been so prevalent.

One rationale for the lack of findings related to the scores on the IES in the current sample of older adults is offered by the Socioemotional Selectivity Theory (SST; Carstensen & Charles, 1998). This theory suggests that older adults tend to ignore negative emotions and place more emphasis on positive situations. As a result they invest more time seeking out emotionally meaningful information and goals. Situations that were stressful or harmful

in the past will become less intense overtime. Furthermore those who only focus on positive information will not experience a crisis situation that would lead to an increase in negative, intrusive thoughts, which would hinder cognitive functioning. They may not benefit from an intervention that requires one to evaluate a negative event (or crisis situation), because they do not place importance, or value, on such negative situations.

As a result, the participants who may have not been affected by negative thoughts prior to the study were now forced to search for an event that was upsetting. The result of a forced search may have produced intrusive thoughts that were not previously there. The “search” for a negative event may have possibly increased their current number of intrusive thoughts rather than decreasing them. Consequently, the newly introduced intrusive thoughts led to poor performance on the cognitive tasks. In sum, the intervention possibly worked in reverse, such that the journal writing increased the thinking of negative, intrusive thoughts that were previously ignored (successfully) and then became taxing to the aging mind and hindered overall cognitive performance. Taken together, the reason that the current study was not effective was because the older adults in the sample were not inundated with intrusive thoughts for reasons of their healthy status and tendency to focus on positive emotions over negative.

The second possibility is that the study failed to capture the intervention effects due to the narrow follow-up time period. Results from a previous meta-analytic review suggested although significant findings were found in a one-week follow-up the most beneficial effects occurred at the one-month follow-up time point (Kacewicz, Slatcher, & Pennebaker, in press; Smyth, 1998). As a result, it is possible that the beneficial effects generated by the current intervention might not be realized until four weeks after the intervention was completed. It is

possible that a participant in such an expressive writing intervention, particularly an older adult, will get worse before they get better. During the immediate posttest participants were still cognitively working through the thoughts and feelings associated with the negative event. As a result, this process of working through the situation may have overloaded the cognitive capacity thus creating no beneficial effects at the immediate post-testing session.

Recall that in aim 4 the participants who experienced a reduction in the number of intrusive thoughts were performing poorer on processing speed, basic reasoning, and everyday reasoning tasks compared to the participants who did not experience a reduction. One possible explanation for the poor performance by the reduction group is that they effectively reduced the intrusive thoughts but their cognitive overload had not yet subsided. It could be that it takes longer for the cognitive benefits to appear while the reduction in the number of intrusive thoughts is immediate. Even though there were some unexpected findings there are findings from the current study that did point towards the expected direction that are also worthy of note.

One final interesting finding is that the scores on the Impact of Events Scale (IES) were not correlated to any of the cognitive measures at pretest. It could be the case that the number of intrusive and avoidant thoughts was not related to cognition for the current sample. Therefore it can be argued that changes in the number of intrusive thoughts has no relationship to cognition in a sample of older adults, and that is why there were a lack of hypothesized findings. The following section will briefly summarize these findings.

Findings of Beneficial Effects

Regardless of intervention group, writing in a journal did improve everyday cognition, particularly in everyday memory. To date, there has been not been an intervention

study that has found improvements in everyday cognition. Additionally, elders who were in the top half of the performance distribution on the measure of inhibition performed significantly better on the measure of basic memory. What this suggests is that better inhibitory functioning is associated with better cognitive performance, but the amount of intrusive thoughts was not associated with the efficacy of the inhibitory mechanism in this sample. It could be the case that in a sample with excessively high intrusive thoughts, inhibitory control would play more of a central role in moderating the impact of intrusive thoughts on cognition. The following section will describe the limitations of the study.

Limitations

The small sample size, lack of adherence to the protocol, absence of a long-term follow-up, absence of intensity rating for the emotional expressive writing journals, and absence of a control group (non-writing) are considered limitations of the current study. The total sample consisted of 61 older adults, with fairly even numbers in the emotional expressive writing condition ($n = 32$) and daily events writing condition ($n = 29$). Given the sample size the study only had sufficient power ($\beta = .80$) to capture large effects. It is important to note that many of the effects in the current study were non-significant medium effects such that η^2 ranged from .13 all the way up to .30.

Although only a handful of participants ($n = 7$) were identified as not following the protocol, it is impossible to determine whether or not the rest of the 61 participants followed the instructions verbatim. Participants could have filled in the “Writing Log” after they had completed their writing and wrote in incorrect dates and times for fear of being penalized for not following instructions. If they did so there is no way of identifying whether or not they wrote in their journal on the requested days. It is possible that a participant decided to write

all their entries on a single day or just prior to coming to posttest. Unfortunately outside of the seven identified participants it can only be assumed that the other 54 participants did follow all the instructions perfectly. Adherence to the journal instructions is crucial for the expressive writing intervention to be effective.

Because of the study's time limitations only an immediate follow-up was conducted, which occurred seven days following the final journal entry for a total of seventeen days between pretest and posttest. Even though some studies have found positive results with an immediate follow-up, most studies have found better results when the follow-up took approximately 28 – 42 days after the final journal entry (Meads, Lyons, & Carroll, 2003; Pennebaker, 1997). It is possible that the beneficial effects of emotional expressive writing did occur but not until around four weeks after the journal writing.

Additionally, there was not a measure for the intensity rating of the stressful negative event. There is not subjective rating for how stressful and intense the event was for the person writing in the journal. As a result there is no way of knowing how traumatic the event was for each individual. If the event was not very traumatic the expressive writing intervention would not be as effective compared to a participant who felt their chosen event was extremely stressful.

Finally, the absence of a non-writing control group does not allow for a comparison of journal writing verses no journal writing. Described above in the results and discussion sections it is noted that mental exercise (i.e. act of writing) could be an explanation for the cognitive gains. Unfortunately without a non-writing control group there is no way to tell whether it was simply writing in a journal (mental exercise) that produced the cognitive gains.

These limitations described above are not exhaustive, but are the key weaknesses of the present study. Each of the four limitations can possibly be remedied for future research so that they can be ruled out as possible confounds of the study. Below is a description of how the current study's limitations can be resolved.

Future Directions

The findings from this study have answered some questions while opening the door for new questions to be addressed. Before the new questions are tackled it is important to attend to the present study's limitations and how they are to be remedied for future studies.

First a larger sample size is needed where there are at least three comparison groups instead of two. The three groups would consist of: (1) emotional expressive writing group (exploring a negative intrusive thought); (2) daily events writing group; and (3) no writing control group. A fourth group should also be added that consists of an emotional expressive writing group who meet the inclusion criteria about a pre-specified negative event (i.e. diagnosed with cancer, coping with the recent loss of a loved one). The addition of a fourth group will help to determine whether, or not the intervention is effective only in samples of people experiencing a crisis situation. A non-writing control group will be used as a no-writing comparison to determine if it is the simple act of writing that improves performance or just a practice effect.

An intensity rating of the chosen stressful event should also be included for each of the comparison groups. A subjective measure of how stressful the event weighs on each participant would be informative. In addition to an intensity rating, an analysis of the journal content should be implemented. By analyzing the narratives it can be determined how each participant worked through their chosen stressful event.

The lack of significant findings at the immediate posttest suggests that there needs to be a long-term follow-up session. The next study should include at least two posttest sessions where one occurs at least one month after the final journal session was completed. Previous studies examining cognitive interventions have found immediate posttest gains, while expressive writing interventions have found long-term gains (Meads, Lyons, & Carroll, 2003). These findings imply that there still needs to be an immediate posttest session with the addition of a long-term posttest follow-up.

Since the current study found that some participants did not follow the protocol even after a reminder call was given during the journal writing phase a more strict method for reminding the participant needs to be created. During the writing phase the participants could be given pagers, so that the participants are paged when their journal writing should begin and end. Through this method the participants are more apt to remember and follow the strict requirement for when the journal is to be completed.

According to the Socioemotional Selectivity Theory older adults place more focus on positive events rather than the negative (Carstensen, 1995; 1996). It could be possible that the older adults cognitive functioning, particularly those high in SES, was not interrupted by the negative events but rather the overabundance of positive ones. Older adults may not be impacted by negative events and in fact they are very successful avoiding them, therefore negative situations do not become intrusive thoughts. In contrast, the positive events could actually be the intrusive thoughts that are impeding on the cognitive resources. A future study should look at the effects of positive versus negative intrusive thoughts particularly in an older sample where their mental focus is primarily on positive events.

Conclusions

Although the present study did not successfully answer all the proposed questions, it did lead to some interesting counterintuitive findings particularly when examining the reducers' verses non-reducers for the number of intrusive thoughts. Those that did not experience a reduction had significant improvements on the tests of cognitive functioning whereas the reduction group did not.

Since this study is the first to examine the effects of an expressive writing intervention on a normal aging sample it is difficult to know why this study yielded far different results from other expressive writing studies. Do older adults' cognitive functioning respond to the expressive writing intervention differently than middle-aged and younger adults do? Now that these unexpected results have been discovered, future research needs to build off of these results to determine effects of an expressive writing intervention on a normal aging sample.

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Appendix

ID# _____

The Impact of Event Scale

Please think about an upsetting experience or stressful life event that has been troubling you and that has been on your mind. In the space below, briefly describe the experience.

Approximately when did this event begin?

Approximately when did this event end? (If the event is ongoing, please indicate 'ongoing')

Below is a list of reactions people have after stressful life events. Please read each item, and indicate how frequently you have experienced these reactions DURING THE PAST SEVEN DAYS, with respect to the event you described on the previous page. If they did not occur during that time, please mark the “not at all” column.

Frequency				
	Not at all	Rarely	Sometimes	Often
Any reminder brought back feelings about it				
I had trouble falling asleep or staying asleep, because of pictures or thoughts about it that came into my mind				
Other things kept making me think about it				
I avoided letting myself get upset when I thought about it or was reminded of it				
I thought about it when I didn't mean to				

	Not at all	Rarely	Sometimes	Often
I felt as if it hadn't happened or wasn't real				
I stayed away from all reminders about it				
Pictures about it popped into my mind				
I tried not to talk about it				
I was aware that I still had a lot of feelings about it, but I didn't deal with them				
My feelings about it were kind of numb				
I had waves of strong feelings about it				
I tried to remove it from my memory				
I had dreams about it				
I tried not to think about it				

ID# _____

Stroop Task

This is a test of how fast you can identify the words on the following pages. After I say begin, you are to circle the color of the written text across rows starting with the first one. You will be given 45 seconds, to circle as many of the correct colors as you can. Remember, do not stop the task until I say "Stop" and circle the correct color as quickly as you can. If you make a mistake, you may correct your error and continue on without stopping.

Before we begin I would like you to identify the following colors:

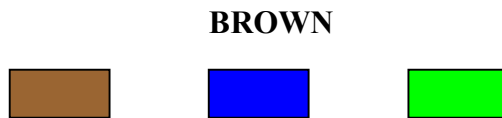


Circle of the correct color of the printed text for the following examples:

Example A:



Example B:



When I say begin you may turn the page and circle as many of the correct answers as you can in the allotted time. Any questions?

BLUE

RED



BROWN

BLUE



BLACK

RED



YELLOW

BLUE



RED

BLACK



BROWN

BLUE



You may proceed on to the next page.

Daily Emotional Expressive Writing Journal

ID # _____

Emotional Expressive Writing Journal

INSTRUCTIONS: During the next ten days, your task is to write for 20 minutes on 5 different days about the event you selected when you were asked to describe an upsetting experience or stressful life event that has been troubling you. Please make a note of that event in the space below. If you cannot recall the event you selected, let the researcher know now.

You can write about different aspects and points of view pertaining to the event above. The important thing is that you write about your deepest thoughts and feelings that are still bothering you about the event. In your writing try to let yourself go and write continuously about your emotions and thoughts related to the event. Write about your experience in as much detail as you can. Do your best to “tie it all together” at the end of the writing. Do not worry about spelling or grammar. The important thing is that you really dig down and explore your thoughts and feelings about the experience.

Ideally each writing day should be followed by a day when you do not write. If your schedule doesn't allow you to write every other day, it is OK to write on successive days or skip more than one day between writing sessions. Before you begin to write find a quiet place where others cannot disturb you. Please write in the

journal on your own; do not talk about what you write with anyone else. Please try and write for the full 20 minutes.

We've provided two pages for each day. You can write on the back of the pages if you like and you can add additional pages. It is important that you put your study ID on each page. If you add additional pages, please make sure your study ID is on each page as well as the date you did the writing. It is also important that you indicate the date, time you began, and the time you finished writing for each of the days you write in the journal. We would like you to record this information on the first page of the journal.

When you have completed five days of writing, please mail ALL the pages back to us in the postage paid envelope. Remember, your writing cannot be linked to you as an individual. If you do not want the researchers to have access to what you have written, just mail the envelope back with a note that says: "Study ID (your number) does not wish to make my writing available to the researchers" along with page 4 of the journal booklet that contains the date and the times you started and finished writing for each entry. Whether or not you return your writing to us, we hope very much you will participate in the next experimental session.

If you have any questions or problems, feel free to call me, Sarah Weatherbee (513-4854) or my advisor, Dr. Jason Allaire (513-7394). Thank you for your help!

Writing Log

ID # _____

It is important for us to know how many times you wrote in your journal and for how long. Therefore, each day you write in your journal we would like you to indicate the date, the time you started, and the time you finished.

DAY 1

Date _____ / _____ / 2005

Start Time: ____:____ End Time ____:____

DAY 2

Date _____ / _____ / 2005

Start Time: ____:____ End Time ____:____

DAY 3

Date _____ / _____ / 2005

Start Time: ____:____ End Time ____:____

DAY 4

Date _____ / _____ / 2005

Start Time: ____:____ End Time ____:____

DAY 5

Date _____ / _____ / 2005

Start Time: ____:____ End Time ____:____

PLEASE RETURN THIS PAGE TO US AT YOUR POSTTEST SESSION. You are not required to submit what you have actually written in your journal, but it would benefit our study greatly if you would. If you are willing to provide us with your journal entries please separate them from this sheet and mail them to us with the postage paid envelope we have provided.

DAY 1

ID # _____

Instructions: Before you begin please fill out the date and time you have started to write on page 4 of your journal. When you have finished writing please write the time you have stopped.

Please write for 20 minutes about the event you described on page 2 of the instructions. Before you begin to write find a quiet place where others cannot disturb you, this is important so you can focus on your thoughts and feelings. You can write about different aspects and points of view pertaining to the event that has been bothering you. In your writing try to let yourself go and write continuously about your emotions and thoughts related to the event. Do your best to “tie it all together” at the end of the writing. Do not worry about spelling or grammar. The important thing is that you really dig down and explore your thoughts and feelings about the experience.

The lined section below will be used as the space where you are to write. You do not have to fill up the entire journal use as much as you need for each of the 20-minute sessions.

Daily Events Writing Journal

ID # _____

Daily Events Writing Journal

INSTRUCTIONS: During the next ten days, your task is to write for 20 minutes on 5 different days about a specific event or activity that will be assigned to you and indicated on each day here in your journal. For instance, on one day you may be asked to describe a trip to the grocery store. When writing please do not mention your own emotions, feelings or opinions. Your description should be as objective as possible. Do not worry about spelling or grammar. The important thing is that you really dig down and describe as much as you can relating to each specific event or activity.

Ideally each writing day should be followed by a day when you do not write. If your schedule doesn't allow you to write every other day, it is OK to write on successive days or skip more than one day between writing sessions. Before you begin to write find a quiet place where others cannot disturb you. Please write in the journal on your own; do not talk about what you write with anyone else. Please try and write for the full 20 minutes.

We've provided two pages for each day. You can write on the back of the pages if you like and you can add additional pages. It is important that you put your study ID on each page. If you add additional pages, please make sure your study ID is on each page as well as the date you did the writing.

When you have completed five days of writing, please mail ALL the pages back to us in the postage paid envelope. Remember, your writing cannot be linked to you as an individual. If you do not want the researchers to have access to what you

have written, just mail the envelope back with a note that says: “Study ID (your number) does not wish to make my writing available to the researchers” along with page 4 of the journal booklet that contains the time you started and finished writing for each entry. Whether or not you return your writing to us, we hope very much you will participate in the next experimental session.

If you have any questions or problems, feel free to call me, Sarah Weatherbee (513-4854) or my advisor, Dr. Jason Allaire (513-7394). Thank you for your help!

ID # _____

Writing Log

It is important for us to know how many times you wrote in your journal and for how long. Therefore, each day you write in your journal we would like you to indicate the date, the time you started, and the time you finished.

DAY 1: Describe how to wash a car

Date _____ / _____ / 2005

Start Time: ____:____ End Time ____:____

DAY 2: Explain what your bedroom looks like

Date _____ / _____ / 2005

Start Time: ____:____ End Time ____:____

DAY 3: Describe your last trip to the grocery store

Date _____ / _____ / 2005

Start Time: ____:____ End Time ____:____

DAY 4: Describe what your neighborhood looks like

Date _____ / _____ / 2005

Start Time: ____:____ End Time ____:____

DAY 5: Describe what your living room looks like

Date _____ / _____ / 2005

Start Time: ____:____ End Time ____:____

PLEASE RETURN THIS PAGE TO US AT YOUR POSTTEST SESSION. You are not required to submit what you have actually written in your journal, but it would benefit our study greatly if you would. If you are willing to provide us with your journal entries please separate them from this sheet and mail them to us with the postage paid envelope we have provided.

ID # _____

DAY 1

DESCRIBE HOW TO WASH A CAR

Instructions: Before you begin please fill out the date and time you have started to write on page 4 of your journal. When you have finished writing please write the time you have stopped.

Today your task is to write for 20 minutes about the event listed above, which is describe how to wash a car. Before you begin to write find a quiet place where others cannot disturb you, this is important so you can focus on your thoughts. You can write about different aspects and points of view pertaining to the event. In your writing try to let yourself go and write continuously, in addition do your best to “tie it all together” at the end of the writing.

The lined section below will be used as the space where you are to write. You do not have to fill up the entire journal use as much as you need for each of the 20-minute sessions.
