PATTERNS OF RUMINATION BY YOUNG AND OLDER ADULTS

BY

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Abstract

A lot of attention has been given to the negative effects of both inhibitory deficits and rumination but little work has compared both: research on inhibitory deficits has focused on older adults whereas research on rumination has focused on young adults. This study examined the pattern of rumination by both young and older adults and compared rumination to working memory, inhibition, and mood. Based on findings from a small pilot study, it was hypothesized that older adults would ruminate less often than young adults and that the structure of rumination by young and older adults would differ, including the relationship between rumination, working memory, inhibition, and mood. These hypotheses were supported. Older adults reported less rumination than young adults and older adults' rumination could be modeled as a unitary construct whereas young adults' rumination was composed of two forms of rumination, a tendency toward brooding and reflection versus a more general form of rumination on sadness. The relationships between rumination and working memory, inhibition, and mood also change with age. Older adults' rumination was not associated with inhibitory deficits whereas both forms of rumination by young adults were. The implications of these findings for theories of inhibitory deficits and emotional regulation are discussed.

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PATTERNS OF RUMINATION BY YOUNG AND OLDER ADULTS

Table of Contents

List of Tables

List of Figures

Patterns of Rumination by Young and Older Adults

Chapter 1: Theoretical Introduction

Older adults commonly experience cognitive deficits affecting everyday actions such as remembering conversations, reading comprehension, recalling names, and driving. The reason why older adults experience such cognitive deficits is poorly understood. A better understanding of the underlying causes for age-related cognitive declines could contribute to the development of intervention strategies to overcome these deficits.

Two general psychology mechanisms have been shown to affect cognitive performance on a wide range of tasks. While some researchers (see Hasher, Zacks, & May, 1999) are convinced that inhibition can account for many cognitive aging deficits, others suggest that rumination can account for such cognitive deficits (see Davis & Nolen-Hoeksema, 2000). The current research will contribute to a better understanding of the reasons for cognitive deficits by comparing these 2 possibilities and examining the relationship between these 2 mechanisms. In this chapter, each hypothesis will be reviewed separately. The final section of this chapter will propose an integration of the inhibition and rumination accounts to suggest a general explanation of older adults' cognitive deficits. The subsequent chapters will examine methodological issues and report results from a pilot study on rumination and inhibition and describe the methods, results, and discussion of the current study.

Inhibition and Aging

A 1988 framework proposed by Hasher and Zacks, the Inhibition Deficit Theory (IDT), asserts that age-related processing deficits in a variety of cognitive skills can be accounted for by a decrease in the efficiency of inhibition including age-related deficits in

memory (e.g. Mueller, Kausler, Faherty, & Oliveri, 1980), language production (e.g. Obler, 1980), and visual selective attention (Madden, 1983). The Inhibition Deficit Theory proposes that inhibition is a central mechanism in determining the contents of working memory. Hasher, Zacks, and May (1999) propose three functions of inhibition, which are all directed at the contents of working memory: access, deletion, and restraint.

Inhibition controls access to working memory by preventing any activated but goal-irrelevant information from entering working memory. Thus, only goal-relevant information is available for the focus of attention and irrelevant information does not muddle processing in working memory. Inhibition also allows one to delete or suppress irrelevant or marginally relevant information within working memory to keep it out of attentional focus. The restraining function of inhibition prevents prepotent candidates for a response from immediately grabbing control so that alternative, less probable responses can be considered. This way, behavior can vary even in a situation which has a dominant response. IDT proposes that older adults have a breakdown in inhibition, such that older adults are more distracted by environmental influences as well as by internal thoughts (Layton, 1975; Hasher, Stoltzfus, Zacks, & Rypma, 1991). Specifically, IDT proposes that inefficient inhibition could result in ineffective selective attention so that irrelevant information gains access to working memory and is not effectively deleted. This inhibitory breakdown also allows the intrusion of task-irrelevant information into working memory. Increased processing time, intrusion of irrelevant information, and reduced recognition and recall of relevant information may result from inhibitory breakdown (Hasher, Zacks 1988; Kramer et al., 1994).

Hasher, Zacks, and their colleagues typically use a methodology where a participant is asked to respond to a target item which is simultaneously presented with a distraction item (see Kane et al. 1994, Hamm & Hasher, 1992; Darowski, et al. 2008). If participants can ignore the distraction, they should be able to process target information as rapidly and as accurately as when no distracters are present. Errors, longer response times, and worsened recall and recognition for target items are believed to indicate a breakdown in inhibitory mechanisms of selective attention. IDT is supported whenever distracters result in slower and/or less accurate performance. For example, in the reading with distraction paradigm (Carlson, Hasher, Connelly, & Zacks, 1995; Connelly, Hasher, & Zacks, 1991; Li, Hasher, Jonas, Rahhal, & May, 1998; Dywan & Murphy, 1996) participants read a passage which includes distracting words, which they are supposed to ignore. In the reading with distraction task, both young and older adults are slower to read paragraphs containing distracters than ones without distracters but older adults also have poor comprehension of the distracter paragraph. Carlson et al. (1995) found that the effect of distractibility was heightened when distracters were not in predictable places within the text and were related to the text material. They interpret these findings as support for IDT. Older adults may be very susceptible to distraction and hence, spend more time attempting to interpret the distracter with the text.

Recent studies link inhibition to higher-order cognitive processes, measured by performance on the Raven's matrix test and memory span tests (Darowski, Helder, Zacks, Hasher, & Hambrick, 2008). Older adults generally have shorter memory spans and worse matrix reasoning, meaning they have more difficulty in selecting the correct item to correctly complete a grid, than do young adults. Susceptibility to distraction, as measured

by longer reading times when distracters are present, partially mediates the effect of age on working memory span and matrix reasoning. That is, older adults who are more susceptible to distraction are also relatively worse at solving matrix problems or remembering strings of digits. This link between the failure to inhibit distracting information and poor cognitive performance in older adults is central to the IDT framework.

IDT has been challenged on a number of grounds (see Burke, 1997; Kramer, Humphrey, Larish, Logan, & Strayer, 1994; Tipper, Brehaut, & Driver, 1990; Filion, McDowd & Baylis 1992; McDowd & Filion, 1992). An alternate explanation for age differences in selective inhibition failures was separately proposed by Hartley (1993) and Arbuckle and Gold (1993). They suggest that age-related differences in inhibition will be observed to the extent a task depends on intact frontal lobe functioning. They argue that frontal lobe functions are more susceptible to aging than other areas of the brain since age-related atrophy is most prominent in the frontal lobes and connected areas.

The frontal lobe model accounts for age-related inhibitory failures in domains like motor learning and concept acquisition (Kramer et al., 1994), tasks that assess motor functions. Kramer and colleagues (1994) asked participants to perform a number of tasks that provide measures of inhibitory functioning such as the Wisconsin Card Sort Tasks (WCST), Cognitive Failures Questionnaire (CFQ), and negative priming. Relatively few age-related differences were found across the battery. In a stop-signal test, where participants respond to most trials and must inhibit an occasional response with a particular stimulus, older adults were slower than young adults at aborting a physical response once it was initiated. Older adults also had more perseverations on the WCST and therefore seem to

have a more difficult time learning and implementing new rules than the young adults. However, young and older adults produced equal negative priming effects, spatial precuing effects, and self-reported cognitive failures. Since age-related differences were found in two tasks (WCST and stop-signal task) that are linked to frontal lobe functioning, these results are compatible with the frontal lobe model, but do not seem to fit into the more general IDT framework.

Despite criticisms by Burke and others, IDT remains as a major theoretical account of a wide range of cognitive aging deficits. It is supported by evidence from a variety of experimental paradigms including studies of negative priming and reading with distraction and by neuropsychological evidence linking poor performance on texts of inhibition such as the WCST. However, an alternative account of cognitive deficits links poor performance, not to a breakdown of inhibition, but to excessive rumination.

Rumination

Rumination is repetitive and recursive thinking in response to a negative moods (Rippere, 1977) or life situations (Robinson & Alloy, 2003). Rumination has been proposed as a mechanism to account for a wide array of cognitive deficits. Although some research suggests that self reflection may be adaptive, most research assumes rumination is maladaptive. Martin and Tessner (1996) defined rumination as "recurrent thoughts instigated by a discrepancy between one's current position and a desired goal and a 'recurrent series of thoughts united by a common theme.'" In this definition, rumination is adaptive; it is proposed to be instrumental in reducing the discrepancies in one's life as one self-reflects and strives to make the current situation and goal match. However, the repetitive and passive focus on one's negative emotions is correlated with depressive

symptoms and depressive episodes (Treynor, Gonzalez, Nolen-Hoeksema, 2003; see also Just & Alloy, 1997; Nolen, Roberts, & Gotlib, 1998; Nolen-Hoeksema, 2000; Nolen-Hoeksema & Morrow, 1991; Nolen-Hoeksema et al., 1994, 1999.) Therefore, much of the literature on rumination views rumination as maladaptive in that the recurrent thoughts are not necessarily directed at resolving problems or reducing goal discrepancy but rather generally focused on one's negative affective states and problems. Nolen-Hoeksema views rumination as maladaptive and suggests that rumination is a "method of coping with negative mood that involves self-focused attention" (Lyubomirsky & Nolen-Hoeksema, 1995).

The tendency to ruminate has been related to cognitive and emotional disturbances, including impaired concentration (Lyubomirsky, Kasri, & Zehm, 2003), pessimistic thinking (Lyubomirsky & Nolen-Hoeksema, 1995), anxiety (Nolen-Hoeksema, 2000), anger (Rusting & Nolen-Hoeksema, 1998), shame (Cheung, Gilbert & Irons, 2004) depression (e.g. Just & Alloy, 1997; Spasojevic & Alloy, 2001), and decreased feelings of control over one's life (Nolen-Hoeksema & Jackson, 2001). Because rumination is linked to such a variety of cognitive and emotional disturbances, it can be a powerful and important predictor of mental distress and psychological functioning.

Rumination is generally assessed using self-report assessments that require participants respond to how often they behave according to the statement. A few examples include "How often do you try to understand yourself by focusing on depressed feelings?" or "How often do you think, 'Why can't I get going?'" or "How often to you think about how hard it is to concentrate?" Several of the assessments used to measure ruminative behavior reflect two factors. One factor, Brooding, consists of dwelling passively on the

unfavorability of a current situation and the other factor, Reflection, is purposely focusing on solving cognitive problems (Trapnell & Campbell, 1999; Trenor, Gonzalez, & Nolen-Hoeksema, 2003). The Response Styles Theory (RST; Nolen-Hoeksema, 1991) characterizes rumination as self-reflection as well as repetitive and passive focus on one's negative emotions (Nolen-Hoeksema, 1991, 2000; Morrow & Nolen-Hoeksema, 1990; Nolen-Hoeksema, Parker, & Larson, 1994). Studies of RST have typically measured ruminative coping using the Ruminative Responses Scale (RRS), which is a 22-item self-report measure of rumination (Nolen-Hoeksema & Morrow, 1991). There is an extensive body of research using this scale: RTS scores predict greater depressive symptoms, the onset of major depressive episodes, and mediate the gender differences in depressive symptoms (Nolen-Hoeksema & Morrow, 1991, Just & Alloy, 1997; Nolen-Hoeksema, 2000; Wood, Saltzberg, Neale, Stone & Rachmiel, 1990; Nolen-Hoeksema, Morrow, & Fredrickson, 1993; Nolan, Roberts, & Gotlib, 1998). However, rumination has not been clearly distinguished from depression. Some of the 22 items on the RTS overlap with depressive symptomology and items on the Beck Depression Inventory (BDI; Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Table 1 shows similar RRS and BDI items. Because of this overlap, the observed correlation between depressive symptoms and rumination is questionable: are the two constructs distinct?

Several researchers have suggested that the observed relation between rumination and depression is due to similar item content rather than an identity of the 2 theoretical constructs. Segerstrom et al. (2000) removed items from the RRS they deemed similar to BDI items and in three samples, found the shorter RRS version to still be significantly

Table 1. Examples of Similar RRS and BDI Items.

Sadness
RRS 17 – Think about how sad you feel
BDI 1 – I feel sad
Fatigue
RRS 3 – Think about your feelings of fatigue and achiness
BDI 12 – I get tired more easily than normal
Great effort required to perform simple tasks
RRS 4 – Think about how hard it is to concentrate
RRS 6 – Think about how passive and unmotivated you feel
RRS 9 – Think "Why can't I get going?"
BDI 11 – It takes extra effort to get started doing something

Note: From Treynor, W., Gonzalez, R., & Nolen-Hoeksema, S. (2003). Rumination reconsidered: A psychometric analysis. *Cognitive Therapy and Research, 27,* 247-259.

correlated with the BDI, but less strongly than the full RRS. This suggests that the item content is likely not the source of the relationship between depressive symptoms and rumination.

Conway, Csank, Holm, & Blake (2000) dealt with the item overlap by developing a new scale, the Rumination on Sadness Scale (RSS). This 13-item scale was developed to measure rumination on sadness, and therefore over half of the items contain the word "sad' or "sadness." In addition to considering the similarities to depression, Conway and colleagues wanted to differentiate their scale from the Automatic Thoughts Questionnaire, (ATQ; Hollon & Kendall, 1980) which is a measure of self-ideation, since some ATQ items seem to be similar to the items on the RRS (See Table 2). Conway and colleagues found a strong positive correlation between scores on their RSS and scores on the BDI, ATQ, and RRS (see Table 3).[1]

[1] They conclude that the RSS shares more variance with the BDI than does the RRS since the partial correlation for RSS scores and BDI scores, when controlling for the RRS, is significant, *r=.30, p<.001,* but the partial correlation between RRS and BDI scores when controlling for RSS was not significant, r=.08. Additionally, the RSS can be distinguished from the ATQ, since the RSS and BDI scores were significantly correlated when controlling for ATQ, *r(*210) – 0.19, *p=.005).* Two factors emerged after a Principal Components Analysis on RSS items, the first accounting for 47.7% of the

Table 2. Similarities between the RRS and the ATQ.

RRS items	
	I think about all my shortcomings, failings, faults, mistakes
	I think about how angry I am with myself
ATQ items	
	I'm a failure
	I hate myself

Table 3. Correlations between RSS and Measures of Depression and Self-Ideation.

Measure	*n*	*r*
Negative ideation (ATQ)	213	.59***
Rumination (RRS)	201	.81***
Depression (BDI)	188	.56***

Note. Adapted from Conway, M., Csank, P.A.R., Holm, S.L., & Blake, C.K. (2000). On assessing individual differences in Rumination on Sadness. *Journal of Personality Assessment, 75,* 404-425

In order to defend the RSS as a measure of rumination distinct from depression and negative ideation, Treynor, Gonzalez, and Nolen-Hoeksema (2003) performed a secondary analysis data from Nolen-Hoeksema et al. (1999). After removing depression-related items from the RRS, the researchers looked to see if a relationship still held between rumination and depression. They found two factors, Reflection and Brooding, similar to factors found by other researchers. The Reflection factor is related to the "RRS Self-focus" factor found in Cox et al. (2001) as well as the "Introspection/Self-isolation" factor found by Roberts et al. (1998). Cox and Roberts both were factoring the full RRS. The Brooding factor is similar to the "self-blame" subfactor in Roberts et al. (1998). A principle components analysis was also performed by Treynor and colleagues (2003) using the full RRS. Again, two factors emerged. One factor was the 5 items from the R factor in the short form, and all other

variance and the second accounting for 9% of the variance (Conway et al., 2000). A later scree test indicated that a one-factor solution for the 13 items was appropriate; all items had a factor loading of at least 0.60 on the single-factor. Therefore, all items seem to reflect one construct.

items (12 depression-related items and the 5 "brooding" factor items) loaded onto the second factor. A three-factor solution was then obtained. The first factor was the five Reflection items, a second factor included all 5 Brooding items along with four depression items, and a third factor contained the remaining items related to depression. Therefore, Treynor et al. (1998) concluded that the short 10-item scale has two subfactors, Reflection and Brooding. Both factors are correlated with depression, indicating that there is still a conceptual relationship between rumination and depression even after similar items are removed from rumination assessments. Treynor et al. also conclude that rumination is maladaptive since it is linked to depression.

Viewing rumination as having two components, reflection and brooding, may offer an explanation as to why rumination can be adaptive or maladaptive. Martin and Tesser (1996) argue that rumination is instrumental, and is generally adaptive in helping a person solve a problem. Carver and Scheier (1981) noted that rumination can become maladaptive when one cannot resolve the discrepancy between current and desired states and cannot relinquish goals. The most prominent researcher on rumination, Nolen-Hoeksema, has focused almost exclusively on the maladaptive consequences of rumination, suggesting that self-reflection can result in a negative cycle of thinking and worsening mood (Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Because more attention has focused on the maladaptive consequences of rumination, more is known about these outcomes than about the benefits and adaptive qualities of rumination. The two factor model from SRRS suggests that the way one operationalizes rumination can alter how it is viewed. The reflection factor of rumination was associated with less depression over time, although it was correlated more with concurrent depression. This suggests that reflection may

contribute to short-term negative affect but may lead to problem solving and therefore eventually help to reduce negative affect. In contrast, the brooding factor of rumination was associated with depression both concurrently and over time, suggesting is it not adaptive in reducing negative affect (Treynor, Gonzalez, & Nolen-Hoeksema, 2003).

A question that emerges from this contrast is why some individuals are able to engage in adaptive reflection while others fall into brooding. Nolen-Hoeksema et al. (1999) showed that people who had a lesser sense of mastery over important events in their lives and who were more overwhelmed by stress and strain were more likely to ruminate. This led them to argue that a loss of the sense of mastery and chronic strain leads individuals to feel as if there is little they can do to overcome persistent problems; the feeling of persistent problems provides fodder for one to ruminate about. In the secondary analysis of this data, Treynor and colleagues (2003), found that brooding was more strongly correlated with a sense of mastery and chronic strain, than was reflection. Therefore, a low sense of mastery contributes primarily to an individual's brooding of what is wrong in her life and how much one wishes it were better. It is, therefore, maladaptive. More evidence that rumination is maladaptive stems from the research that suggest ruminating about life stressors moderate the onset, duration, intensity, and number of dysphoric episodes in a variety of populations including nonclinical samples (Just & Alloy, 1997), clinical samples (Matheson & Anisman, 2003), and the bereaved (Nolen-Hoeksema & Davis, 1999; Nolen-Hoeksema, Parker, & Larson, 1994). There have also been links found between rumination and post-traummatic stress disorder and alcohol abuse (Nolen-Hoeksema & Harrell, 2002; Michael, Halligan, Clark, & Ehlers, 2007).

Rumination as State and Trait

In addition to being maladaptive, there is evidence that the tendency to ruminate is often a trait of an individual as well as a possible state a person may be in. Most rumination research focuses on rumination as a disposition of a person, and thus discusses rumination as a trait more often than a state. Several studies have indicated that self-reported levels of rumination remain fairly consistent over periods of 30 days (Nolen-Hoeksema, Morrow, & Fredrickson, 1993) and one year (Just & Alloy, 1997; Treynor, Gonzalez, & Nolen-Hoeksema, 2003). This supports the notion that rumination may be more of trait, a stable an individual difference, and independent of day-to-day fluxuations. Furthermore, there is some evidence that trait rumination has been linked to levels of perfectionism (Randles et al., 2010; Nepon, Flett, Hewitt, & Molnar, 2011). However, there are a few studies that suggest that a person may begin to have negative thoughts about a single, specific life event and that rumination may have a role in coping with a interpersonal transgression. Under this view, rumination is more state-like than trait-like. Wade and colleagues (2008) created a Rumination for Interpersonal Offense Scale that they suggest will help distinguish between rumination that is indicative of a trait and the rumination that may occur in response to a specific event. They argue that some events related to an interpersonal injury may trigger repetitive thought about the reaction even if the individual is not prone to ruminate in general, thus distinguishing state rumination from trait rumination.

There is also a body of research that suggests state rumination may also lead to further negative affect independent of the effects of trait rumination (Moberly & Watkins, 2008). Moberly & Watkins examined the impact of both trait and state rumination around negative daily events and the impact on negative affect using college students. To test for

state rumination, Puterman, Delongis, & Pomaki (2010) asked participants to describe "the most bothersome event or problem you had with someone in your family today. It might have been something as minor as your child's distress over something that happened at school or it might have been a major argument or disagreement" (p. 804). Participants answered this question each evening before bed for 7 consecutive days along with additional Likert scale questions that addressed the cognitive thoughts regarding this event. A few examples include, "Did you find it hard to stop thinking about the problem afterward?" and "When thinking about the problem afterward, did your thoughts tend to dwell on the negative aspects of it, or how badly you felt about it?" To test for Trait Rumination, participants completed the Rumination Reflection Questionnaire from Trapnell and Campbell (1999). The level of an individual's trait rumination moderated the effects of negative events on negative affect such that an individual reported experiencing more negative affect after a daily negative event if the individual was higher on trait rumination. However, independent of the levels of trait rumination, the level of state rumination predicted later negative affect in this sample. Puterman et al. found that high levels of social support attenuated the effect of state rumination on negative affect and also moderated the effect between trait rumination and state rumination. Those with lower levels of social support and higher levels of trait rumination predicted the higher levels of state, daily rumination.

Rumination, Vigilance, and Mind Wandering

Two related issues to the question of rumination and inhibition are the classic idea of vigilance and a newer issue of mindlessness and mind wandering. Traditionally, vigilance tasks require a participant to maintain attention for infrequent, unpredictable

events that occur over a long period of time. A vigilance decrement is a decline in performance with time on task, which is measured by a reduced detection rate, higher error rate, or increased reaction time. (Parasuraman, Warm, & See, 1999). Gerontological research on vigilance has found small vigilance decrements when the vigilance task is easy, meaning young and older adults perform similarly on these tasks (Giambra, 1993; Giambra & Quilter, 1988; Tomporowski & Tinsley, 1996). However, higher age-related vigilance decrements are found when the events occur at a fast rate of speed or when the spatial location of an event is uncertain (Mouloua & Parasuraman, 1995; also see Parasuraman & Giambra, 1991; Parasuraman, Nestor, & Greenwood, 1989).

Some researchers have argued that the vigilance decrement is due to the repetitive nature of the task. Watching a screen for 90 minutes waiting for a digit to appear can be quite repetitive and boring, allowing the participant to fall into a "mindless" lack of attentional focus (Brache, Scialfa,& and Hudson, 2010). This "mindlessness hypothesis" defines mindlessness as a thoughtless, automaton-like approach characterized by withdrawal of effortful attention from the task at hand (Manly, Robertson, Galloway, & Hawkins, 1999). In this view, mindlessness may impair inhibitory processes by increasing variability in attentional allocation or by an overreliance on routinized responses (Brache, Scialfa, & Hudson, 2010). Traditional vigilance tests asked the participant to respond to a rarely occurring stimulus. Recently, however, the trend has shifted to test the mindless hypothesis by altering a go/no-go task such that participants respond to most stimuli and inhibit response to a rare, particular stimulus, as in the Sustained Attention to Response Test (SART). Here, participants are asked to respond to repetitive stimuli, such as the digits 1-9, and inhibit responding to a particular stimulus, such as the digit 3. Manly et al.

(1999) found high error rates as participants failed to inhibit response to the digit 3. This effect was reduced by increasing signal frequency or decreasing the intertarget interval. Lapses of sustained attention in the SART task can manifest as failures to inhibit the routine "go" response when a critical event (the digit 3) presents itself and is mediated by frontal lobe function (Manly et al., 1999.)

Brache, Scialfa, and Hudson, (2010) had young and old participants complete a modified vigilance task, lasting approximately 90 minutes, where they were required to respond to common occurrences where 3 dots appeared on the screen. Similar to the SART procedure, the participant was to respond if the larger, middle dot was centered among the 3 dots , which occurred 95% of the time, and not respond to the 5% of trials where the larger, middle dot was off-center and closer to one of the smaller, flanking dots. Good performance requires both sustained attention as well as inhibiting a routine response. Older adults were slower to respond and but had a small vigilance decrement compared to younger adults, whose performance dropped over time. The Hasher and Zacks Inhibitory Deficit Theory would predict that older adults would have higher error rates and larger vigilance decrements as they would have difficulty inhibiting the response to the stimuli where the target was off-center but this was not supported by Brache and colleagues.

The classic vigilance and mindlessness literature may relate to rumination, but perhaps only peripherally. In vigilance, the person is trying to maintain attention over a long period of time, and vigilance is often measured by boring tasks. In rumination, the person's thoughts are repetitive but these repetitive thoughts aren't desired.

A third line of research on the mind and thinking that may also be peripherally related is the recent work on mind wandering. Mind-wandering occurs when participants

engage in a boring task such as reading a long, classic novel aloud, and are occasionally probed to determine if they were attending to the task or not (Smallwood & Schooler, 2006; Smallwood, McSpadden, & Schooler, 2008). Participants have been asked to read Sherlock Holmes vignette, *The Red-Headed League* (Smallwood, McSpadden, & Schooler, 2008) or excerpts from *War and Peace* (Sayette, Reichle, & Schooler, 2009; Sayette, Schooler, Reichle, 2010) for approximately 30 minutes. Participants are first given a description of what the authors termed "zoning-out": "At some point during reading, you realize that you have no idea what you just read" and that "not only were you not really thinking about the text, you were thinking about something else altogether." (Sayette, Reichle, & Schooler, 2009; p 28). Participants were asked to identify when they caught themselves "zoning out" and were given prompts while they were reading to determine if they were mind wandering. Reading comprehension questions were administered afterwards. The results are not too surprising in that when a participant is "zoning out", reading comprehension declines, which the authors attribute as "when we zone-out during reading we are not processing the text with enough detail to produce a viable situation model" (Smallwood, McSpadden, & Schooler, 2008 p. 1149).

There is some similarity in the descriptions of mind wandering and rumination. While rumination and mind wandering are not the same phenomena, they both include the assumption that the individual is not staying on task and instead is thinking about other things. Both rumination and mind wandering may impair a person's ability to stay focused and inhibit outside material.

Rumination and Inhibition

Consider an older adult who has difficulty seeing and hearing, has a limited income, suffers from many pains and aches, lives alone, and has no close family members nearby. All of these losses could lead a person to ruminate on all of the negative aspects of life. This person, unable to inhibit thoughts about his or her physical losses and limitations, may also have problems with performing simple tasks such as doing his or her finances, navigating through a grocery store, driving, or understanding the nightly news. Rumination and inhibition, while discussed in separate research literatures, could potentially be measuring similar processes.

Hasher and Zacks (1998) in their original formulation of IDT highlighted the negative consequences of "personalistic memories or concerns" (p. 213) that intrude into working memory as a result of inefficient inhibition. They suggest that "the increased presence of irrelevant thoughts in working memory (and the attendant consequences) may well be the factors that produce the behaviors that have made it appear as if older adults have reduced capacity for cognitive functions" (p. 216). They continue "the failure of older adults to inhibit non-goal-path thoughts comes from observations of their tendencies to infuse conversations with personalistic intrusions" (p. 216). While Hasher and Zacks have not specified the nature of these "personalistic memories or concerns," strong candidates are rumination on personal shortcomings, feelings of sadness, and recurrent thoughts.

The two literatures of inhibition and rumination must be considered together in order to determine if a concept such as inhibition, taken from the cognitive literature, overlaps with the concept of rumination from the clinical/social psychology literature. First, since there has been little research on rumination with older adults, basic questions

about aging and rumination must be addressed. There are 3 possibilities. (1) It could be that the distribution of ruminators and nonruminators in older adults is similar to that found with young adults. (2) Another possibility is that older adults ruminate more than young adults in response to the excess losses they encounter every day. If older adults were more prone to ruminate then young adults, the distribution of ruminators and nonruminators may become more highly positively skewed over the lifespan. (3) Finally, it is possible that in the absence of clinical depression or other disorder, older adults have accommodated to their losses and therefore do not ruminate as much as younger adults, shifting the distribution of ruminators and nonruminators negatively. Support for this last possibility comes from the work of Carstensen and colleagues. Carstensen finds that older adults have a positivity bias in their autobiographical memories, due to a greater focus on emotion regulation (see Mather & Johnson, 2000 and Kennedy, Mather, & Carstensen, 2004). In this research, Carstensen and colleagues find that older adults avoid attending to negative emotions (Mather & Carstensen, 2003) and that after reporting and discussing personal information, older adults experience a positivity effect in mood whereas young adults experience a negativity effect. Addtionally, older adults recall disproportionately fewer negative images than positive images when compared to young adults (Charles, Mather, & Carstensen, 2003). If older adults do not recall or focus on negative emotions, this could explain why older adults are not reporting experiencing ruminative thoughts on the rumination scales.

Identifying how the distribution of ruminators and nonruminators is affected by aging is an important first step to understanding the relationship of rumination and inhibition. The second step is determine if the factor structure of rumination changes with

age. Research with young adults has distinguished 2 component factors, brooding versus reflection. It is possible that aging has no effect on the factor structure and that rumination in older adults will have both brooding and reflection component factors. It is also possible that the factor structure of rumination may change with age, either differentiating into more factors or dedifferentiating into a single factor.

Understanding the distribution of ruminators and nonruminators in older adults and the factor structure of rumination must be addressed before the relationship of rumination to inhibition can be investigated. Then, in order to test whether the two constructs are the same, tests of inhibition, such as the WCST or Trail Making, or the Cognitive Failures Questionnaire, as well scales of rumination, such as the RRS and RSS, need to be administered to a common panel of young and older adults. A similar method could be used to differentiate rumination from inhibition as was used to distinguish depression from rumination: After assessing individuals on rumination and inhibition, a factor analysis could reveal whether the two constructs are separate, meaning that individuals who are frequent ruminators can still inhibit irrelevant information with relative ease, or whether the 2 constructs are related, meaning that they share variance and those individuals who are high ruminators are poor at inhibiting irrelevant information. Some support for this hypothesis comes from a study by Davis and Nolen-Hoeksema (2000) examining the relationship between cognitive inflexibility and rumination. They found that rumination is indeed associated with a tendency to perseverate as ruminators committed more perseverative errors on the Wisconsin Card Sort Task (WCST) than non-ruminators. Rumination also was associated with difficulty in maintaining an adaptive set, meaning that high ruminators failed to maintain a rule more often on the WCST than

nonruminators. This pattern suggests that rumination is linked to poor performance on the WCST, often used as the 'gold standard' for identifying problems with inhibition.

A further issue is whether individual differences in both rumination and inhibition are linked to cognitive performance deficits as suggested by Davis and Nolen-Hoeksema (2000). To do so, both tests of inhibition and rumination have to be assessed along with a measure of cognitive performance such as a digital pursuit rotor (Kemper, Schmalzried, Herman, Leedahl, & Mohankumar, 2009). Whitmer and Banich (2010) suggest that there is a link between rumination and cognitive performance via reduced inhibition. They suggest that a ruminator's inhibitory deficits affect retrieval of information from long-term memory.

Conclusion

Older adults are known to experience cognitive deficits in a variety of areas. Two explanations have been offered: first, that they have difficulty ignoring distracting information; second, that excessive rumination interferes with cognition. Recently, the cognitive literature has exploded with research on mind wandering, which seems to be a transitive state wherein off-topic thoughts interfere with on-task activities (Schooler, 2009; McVay & Kane, 2009). Inhibitory breakdown and rumination are, in contrast, characteristic traits of individuals that interfere with cognition.

To date, rumination and inhibition have been investigated in separate research literatures but examining the relationship between rumination and inhibition and how this relationship unfolds across the lifespan, is a timely area of research. Chapter 2 summaries a small pilot study that sought to investigate the use of two rumination scales, the RRS and the RSS, with older adults.

Chapter 2: Methodological Background and Pilot Study

There has been considerable interest in whether older adults are able to ignore distracting information as well as considerable interest in how excessive rumination interferes with cognition. However, little research has considered the relationship between inhibition and rumination, especially from a lifespan perspective. When considering how rumination unfolds across the lifespan, there are three questions to consider. First, the frequency of rumination could change across the lifespan, with older adults ruminating more or less than younger adults. Secondly, the factor structure of rumination could change such that the structure of rumination may differentiate into more factors or collapse into fewer factors than have been documented for young adults. Finally, the question of how rumination relates to other cognitive abilities such as inhibition must be addressed. This chapter will use data from a pilot study with 29 older adults to address these questions and suggest further questions that need to be addressed in a larger study.

Method

The 29 participants for this study were recruited from a database of prospective and previous research participants. They were paid for their participation. The participants (21 female, 7 male, 1 not reported) ranged in age from 62-94 years of age (M=76.04, SD=9.03) and on average, completed some college (M=16.04, SD=2.46; see Table 4).

Each participant completed a digitally-administered set of items from the Ruminative Response Scale (RRS) (Nolen-Hoeksema & Morrow, 1991) Rumination on Sadness Scale (RSS), (Conway, Csank, Holm, & Blake, 2000) and the Cognitive Failures Questionnaire (CFQ) (Broadbent, Cooper, FitzGerald, & Parkes, 1982). The RRS and RSS items were adapted from Roelofs et al. (2006) and the CFQ items were adapted from Broadbent et al.

(1982) and Wallace (2002). The participants were asked to respond to each item on a 5-point Likert-type scale (1=never, 2=very rarely, 3=occasionally, 4=often, 5=always). Participants also completed two classic neuropsychological tests of inhibition: the Stroop task and Trail Making. In the Stroop task, participants were given 45 seconds the ink color (red, blue, green) of blocks of Xs. Later, they were given 45 seconds to name the ink color (red, blue, green) of color-name words (RED, BLUE, GREEN) that was mismatched to the color of ink. A score of inhibition was calculated, using formula 1:

Formula 1: $$\left[\left(\frac{colorwords - colorXXX}{colorXXX}\right)*100\right]*(-1)$$

In the Trail Making test, participants were first asked to connect circles with numbers 1-25 which were dispersed irregularly around the page (Trails A). As a more difficult task (Trails B), participants were given a page with numbers and letters and had to switch between them connecting 1 to A to 2 to B to 3 to C etc. This classic neuropsychological test of executive function is thought to include inhibition as one has to inhibit the task set (numbers or letters) and switch between them in the second version (Arbuthnott, K. & Frank, J., 2000). The participants were timed on each of these tasks and an inhibition score was calculated using formula 2. Formula 1 was inverted so that higher scores on both Formulas 1 and 2 indicate more interference from the mismatched or switching information. Table 4 includes for a summary of rumination and inhibition performance and participant demographics.

Formula 2: $$\left(\frac{TrailsB - TrailsA}{TrailsA}\right)*100$$

Table 4. Means and Standard Deviations for Demographic and Performance Data.

	M	*SD*
Age (years)	76.04	9.03
Education (years)	16.04	2.46
Trails A sec (numbers only)	78.44	28.07
Trails B sec (letters &numbers)	109.56	58.43
Trails Inhibition	41.00	0.44
Stroop XXX	67.96	14.66
Stroop Color Words	35.32	10.65
Stroop inhibition	48.00	0.11
RRS Average response	1.89	0.57
RSS Average sum score	19.72	6.33
CFQ Average sum score	60.34	11.14

Note: RRS = Rumination Response Scale; RSS = Rumination on Sadness Scale; CFQ = Cognitive Failures Questionnaire.

Question 1: Frequency of Rumination

The first question is to consider whether or not older adults ruminate. Given that an older adult who has difficulty seeing and hearing may have difficulty paying bills, driving to the store to buy birthday gifts, comprehending the news articles, or navigating a grocery store, it is possible that this person may ruminate more than young adults about the misfortunes that accompany aging. It is also possible that this person may have learned, despite their losses, that negative events occur in life and choose to focus on the positive aspects, as Carstensen suggests (see Kennedy, Mather, & Carstensen, 2004). Or, it could be that the distribution of rumination is the same in young and older adults. The distribution of rumination in young adults is unclear, since most studies using a rumination scale report correlations between the scale and another measure, such as depression (Levens, Muhtadie, Gotlib, 2009; Watkins & Moulds, 2009), OCD (Grisham & Williams, 2009), bipolar disorder (Johnson, McKenzie, & McMurrich, 2008), or worry (Raes, 2010). However, it

appears that rumination varies across young adults and Roelofs et al. (2006) consider rumination to be more trait-like than state-like.

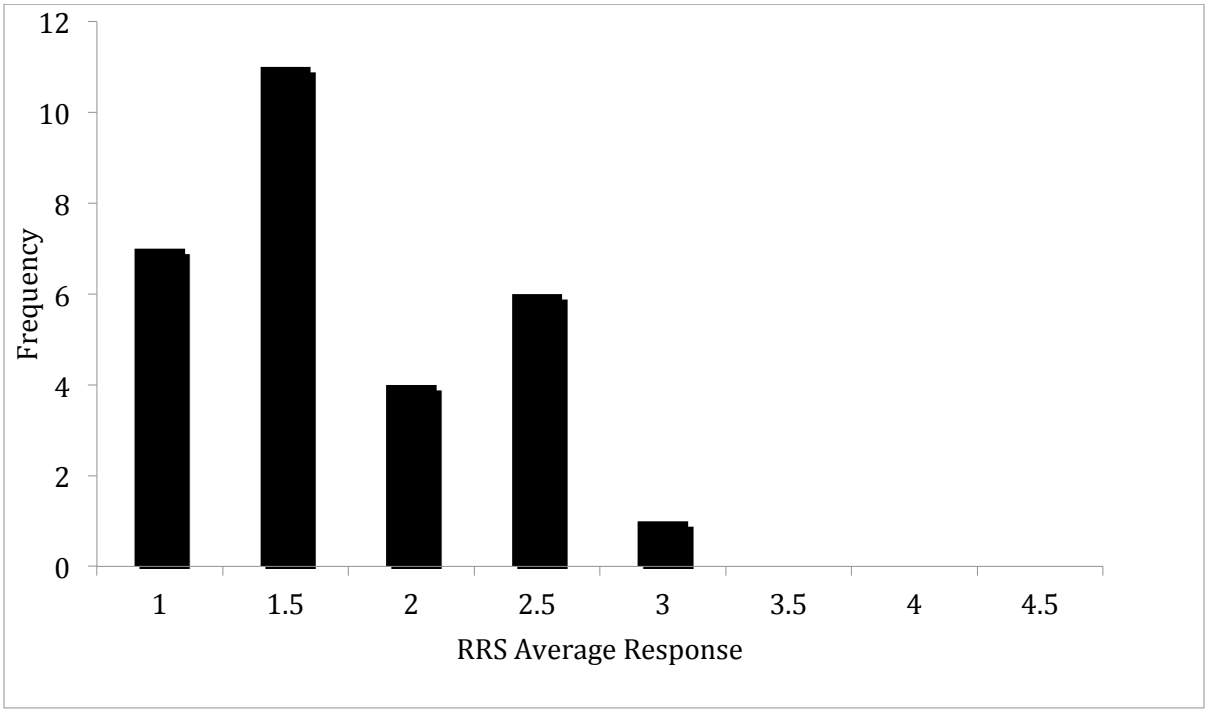
The pilot data for the RRS revealed a negative skew for older adults: only one person had an average response of "occasionally" to "often" and the remaining 28 participants had an average score falling between "never" and "very rarely" (see Figure 1). The maximum total score on this scale was 110 and the minimum score was 22. Participants in this sample scored between 24 and 66. Individual item means and standard deviations are reported in Table 5. Comparable information for young adults is unavailable. Because the focus of this pilot study was to determine if older adults ruminate and the structure of that rumination, no data on young adults was collected.

The responses to the RSS were even more negatively skewed, as 7 participants answered "never" to all 13 items and the remaining 22 of the participants average response fell between "never" and "very rarely" on all 13 items (see Figure 2). Participants could score between 13 and 65 on this scale and this sample ranged from 13 to 32 (M=19.72, SD=6.33). In the original sample of 220 undergraduates, total scores ranged from 13 to 60 with a mean of 35.41 (SD=10.61) and a median of 35 (Conway et al., 2000). The original distribution was reported to approximate normal (skewness=.021, SE of skew = 0.164, kurtosis = 2.53, SE of kurtosis = 0.327), unlike the older adults in this pilot study. Means and standard deviations for RSS items are reported in Table 6.

Table 5. Rumination Response Scale Item Means and Standard Deviations.

I often. …	*M*	*SD*
1. Think about how alone I feel	2.45	1.00
2. Think I won't be able to do my job/work because I feel so Badly	1.79	0.77
3. Think about my feelings of fatigue and achiness	2.34	0.86
4. Think about how hard it is to concentrate.	2.24	0.87
5. Think about how passive and unmotivated I feel.	2.14	1.13
6. Analyze recent events to try to understand why I am Depressed	2.28	1.25
7. Think about how I don't seem to feel anything anymore.	1.48	0.57
8. Think Why can't I get going?	2.28	0.96
9. Think Why do I always react this way?	1.86	0.92
10. Go away by yourself and think about why you feel this way.	1.59	0.78
11. Write down what I am thinking about it and analyze it.	1.41	0.63
12. Think about a recent situation wishing it had gone better.	2.48	0.74
13. Think, 'Why do I have problems other people don't have?'	1.55	0.63
14. Think about how sad I feel.	1.79	0.82
15. Think about shortcomings, failings, faults, mistakes.	2.34	0.77
16. Think about how I don't feel up to doing anything.	2.28	1.10
17. Analyze my personality to try to understand why I am depressed.	1.79	0.86
18. Go someplace alone to think about my feelings.	1.52	0.74
19. Think about how angry you are with yourself.	1.66	0.72
20. Listen to sad music	1.66	0.72
21. Isolate yourself and think about the reasons why you feel sad.	1.28	0.46
22. Try to understand yourself by focusing on depressed feelings.	1.45	0.63

Figure 1. Average Responses for the 22 RRS Items by 29 Pilot Participants.



Note: 1 = never. 2= very rarely. 3 = occasionally 4= often and 5=always.

It is apparent from these two scales that older adults simply don't ruminate very often. This would be consistent with Kennedy, Mather and Carstensen's (2004) work with older adults and suggest that a positivity bias that enables older adults to reconstruct autobiographical memories as positive than they actually were and in turn, boost the mood of older adults (Levine, & Bluck, 1997; Kennedy, Mather, & Carstensen, 2004; Pasupathi & Carstensen, 2003.) However, with such a small sample size, more work needs to be done to find more powerful support that older adults seldom ruminate.

Older adults also did not report experiencing many cognitive failures (see Figure 3). The Cognitive Failures Questionnaire was designed by Broadbent and colleagues (1982) to

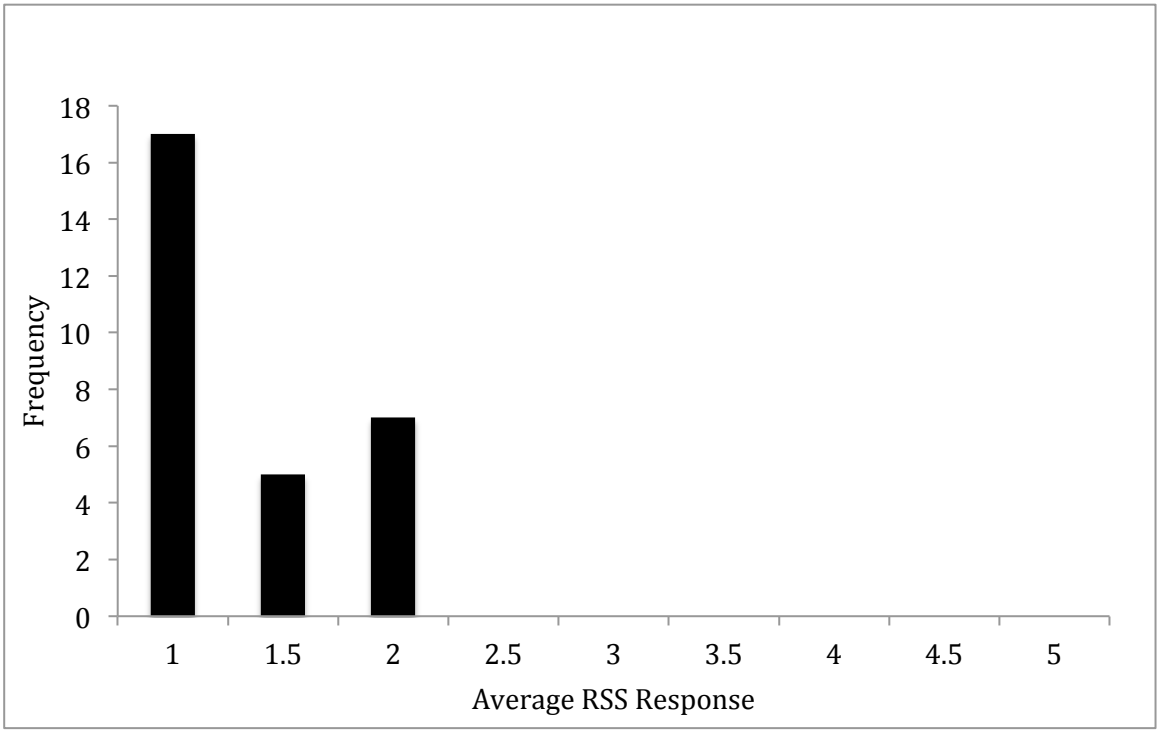
assess the frequency of lapses in three areas: perception, memory, and motor function (Wallace, 2002). With questions such as “Do you bump into people?” or “Do you find you

Table 6. Rumination on Sadness Scale Item Means, Standard Deviations, and Factor Loadings.

Rumination on Sadness Item	*M*	*SD*	*Factor loading*
1. I have difficulty getting myself to stop thinking about how sad I am.	1.45	0.506	0.85
2. I repeatedly analyze and keep thinking about the reasons for my sadness.	1.62	0.728	0.89
3. I search my mind many times to try and figure out if there is anything about my personality that may have led me to feel this way. .	1.72	0.996	0.67
4. I get absorbed in thinking about why I am sad and find it difficult to think about other things.	1.62	0.622	0.82
5. I search my mind repeatedly for events or experiences in my childhood that may help me understand my sad feelings.	1.86	0.915	0.46
6. I keep wondering about how I was able to be happy at other points in my life.	1.79	0.819	0.71
7. I lie in bed and keep thinking about my lack of motivation and wonder whether it will ever return.	1.69	0.967	0.70
8. If people try to talk to me or ask me a question it feels as though they are interrupting an ongoing silent conversation I am having with myself about my sadness	1.07	0.258	0.56
9. I question and keep wondering about the meaning of life to find cues that may help me understand my sadness.	1.48	0.785	0.78
10. I repeatedly think about what sadness really is by concentrating on my feelings and trying to understand them.	1.31	0.541	0.50
11. I get the feeling that if I think long enough about my sadness I will find that it has some deeper meaning and that I’ll understand myself better	1.31	1.712	0.69
12. I keep thinking about my problems and try to examine where things went wrong.	1.62	1.622	0.58
13. I exhaust myself by thinking so much about myself and the reasons for my sadness.	1.17	1.384	0.62

forget people's names" one might expect that older adults would report experiencing a lot of these cognitive failures, but this does not appear to be the case in this sample. Participants could score a total score between 25 and 125 on the CFQ and this sample ranged from 39 to 81. Nineteen of the 29 participants had an average answer that fell between "very rarely" and "occasionally." In the original sample of 335 undergraduates from Wallace and colleagues (2002), the young adults had a mean total score of 43.46 (*SD*=17.02) compared to the pilot group of older adults with a mean total score of 60.34 (*SD*=11.14). Table 7 reports means and standard deviations for the CFQ items in the pilot sample.

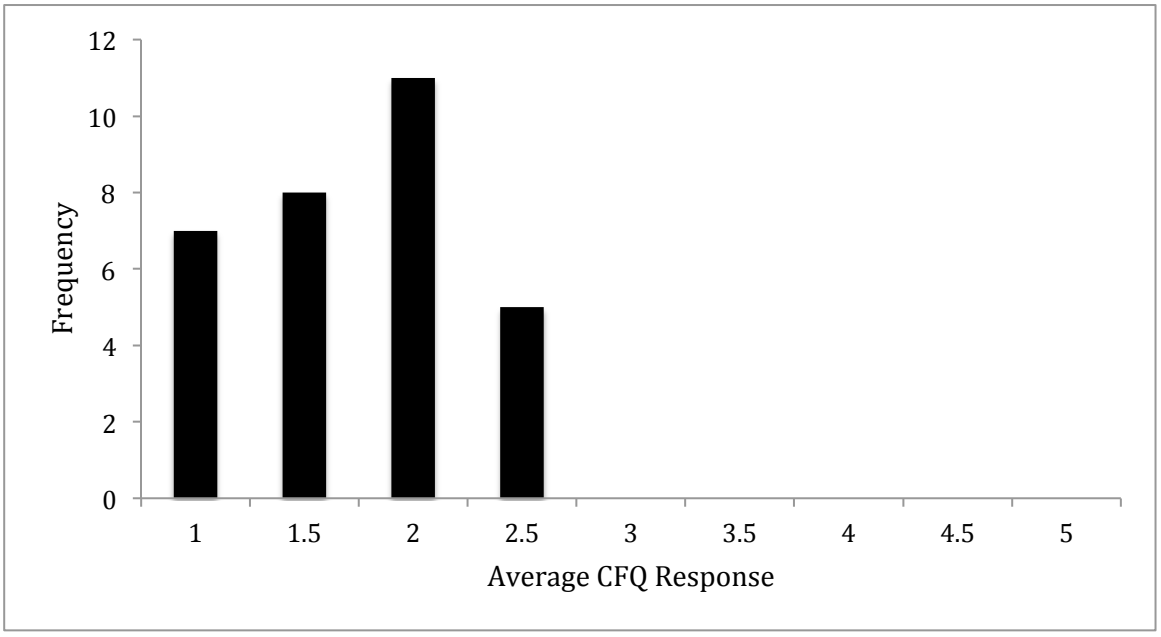
Figure 2. Average Responses for the 13 RSS Items by 29 Pilot Participants.



Note: 1 = never. 2= very rarely. 3 = occasionally 4= often and 5=always.

Overall, it appears that older adults very seldom ruminate or experience excessive cognitive failures. Anecdotally, several participants commented about the negative nature of the questions and how they couldn't imagine engaging in such thoughts because it was so negative and they would always be so sad.

Figure 3. Average Responses for the 25 CFQ Items by 29 Pilot Participants.



Note: 1 = never. 2= very rarely. 3 = occasionally 4= often and 5=always.

Question 2: Factoring Rumination

The second question is whether or not the factor structure that has been reported for young adults holds with older adults. It could be that the factor structure differentiates into more factors or collapses into fewer factors than is found in young adult samples. With young adults, two factors (Brooding and Reflection) emerged from the RRS after items that were deemed to be linked to depression were removed (Treynor, Gonzalez, & Nolen-Hoeksema, 2003). Twelve of the 22 items were removed by Treynor and colleagues,

Table 7. Cognitive Failures Questionnaire Item Means and Standard Deviations.

Cognitive Failures Item	*M*	*SD*
1. Read something and find you haven't been thinking about it and must read it again?	2.90	0.67
2. Find you forget why you went from one part of the house to the other?	3.28	0.80
3. Fail to notice sign posts on the road?	2.24	0.69
4. Find you confuse left and right when giving directions?	2.03	0.87
5. Bump into people?	1.76	0.64
6. Find you forget that you've turned off a lighter on the stove or locked the door?	1.76	0.87
7. Fail to listen to people's names when you are meeting them?	3.00	0.89
8. Say something and realize afterwards that it might be taken as insulting?	2.28	0.65
9. Fail to hear people speaking to you when you are doing something else?	2.69	0.93
10. Lose your temper and regret it?	2.07	0.59
11. Leave important letters unanswered for days?	2.21	1.15
12. Find you forget which way to turn on a road you know well but rarely use?	1.69	0.71
13. Fail to see what you want in a supermarket (although its there?)	2.17	0.81
14. Find yourself suddenly wondering if you used a word correctly?	2.24	0.83
15. Have trouble making up your mind?	2.41	0.73
16. Find you forget appointments?	2.00	0.71
17. Forget where you put something like a newspaper or book?	2.59	0.98
18. Do you find you accidentally throw away the thing you want and keep what you meant to throw away?	1.90	0.77
19. Daydream when you ought to be listening to something?	2.45	0.95
20. Find you forget people's names?	3.52	0.87
21. Start doing one thing at home and get distracted into doing something else (unintentionally)?	3.28	0.84
22. Find you can't quite remember something although its on the "tip of your tongue"?	3.34	0.81
23. Do you forget what you came to the shops to buy?	2.17	0.81
24. Drop things?	2.07	0.75
25. Find you can't think of anything to say?	2.31	0.97

which were almost identical to those removed by Segerstrom and colleagues (2000), leaving 10 candidate items that loaded onto two factors: Reflection and Brooding (see Table 8). These two factors accounted for 50.5% of the variance with the sample of 1,130 adults.

Eight of Treynor's candidate 10 items were used by Roelofs (2006) and given to the participants in the pilot study. A principal components analysis using Quartimax rotation revealed these eight items re-sorted into two different factors with Eigenvalues above 2.0. These factors, coping and self-analysis, account for 62% of the variance. How the factors sorted can be seen in Table 8. The self-analysis factor includes 4 items and accounts for 46% of the variance by itself. These four items include "Think 'Why do I have problems that other people don't have," "Analyze my personality to try to understand why I am depressed," "Think 'Why do I always react this way" and "Analyze recent events to try to understand why I am depressed." These items all seem to require the respondent to analyze his or her personality and how it fits in with the respondent's perception of others' lives. The second factor, coping, includes 4 items which all require a respondent to act upon a way to cope with his or her feelings. These include "Think about a recent situation wishing it had gone better," "Write down what I am thinking about and analyze it," "Go away by yourself and think about why you feel this way," and "Go someplace alone to think about my feelings."

Conway et al. (2000) found a 1-factor solution to be appropriate for the 13 items in the RSS. The original sample included 220 undergraduates and the single factor accounted for 47.7% of the variance. In the pilot sample of older adults, a single factor was also found and similarly accounted for 47.5% of the variance. The single factor indicates that all 13

Table 8. Factor Loadings for the Rumination Response Scale.

Rumination Response Item	Original Factor Loadings			New Factor Loadings		
	Depress	Reflect	Brood	Depress	Analyze	Coping
1. Think about how alone I feel	X			X		
2. Think I won't be able to do my job/work because I feel so badly	X			X		
3. Think about my feelings of fatigue and achiness	X			X		
4. Think about how hard it is to concentrate.	X			X		
5. Think about how passive and unmotivated I feel.	X			X		
7. Think about how I don't seem to feel anything anymore.	X			X		
8. Think Why can't I get going?	X			X		
14. Think about how sad I feel.	X			X		
15. Think about shortcomings, failings, faults, mistakes.	X			X		
16. Think about how I don't feel up to doing anything.	X			X		
19. Think about how angry you are with yourself.	X			X		
14. Think, 'I won't be able to concentrate if I keep feeling this way.'	X					
6. Analyze recent events to try to understand why I am depressed		X			X	
10. Go away by yourself and think about why you feel this way.		X				X
11. Write down what I am thinking about it and analyze it.		X				X
17. Analyze my personality to try to understand why I am depressed.		X			X	
18. Go someplace alone to think about my feelings.		X				X
9. Think Why do I always react this way?			X		X	
12. Think about a recent situation wishing it had gone better.			X			X
13. Think, 'Why do I have problems other people don't have?'			X		X	
5a. Think, 'What am I doing to deserve this?'			X			
16a. Think, 'Why can't I handle things better?'			X			
20. Listen to Sad Music						
21. Isolate yourself and think about the reasons you feel sad.						
22. Try to understand yourself by focusing on depressed feelings.						

Note. Original factors adapted from "Rumination Reconsidered: A Psychometric Analysis" by W. Treynor, R. Gonzalez, and S. Nolen-Hoeksema, 2003, *Cognitive Therapy and Research, 27,* p. 248. Items 5a & 16a were not administered to the pilot participants. Items 20, 21, and 22 were taken from "On the measurement of rumination: A psychometric evaluation of the ruminative response scale and the rumination on sadness scale in undergraduates" by Roelofs et al., 2006, *Journal of Behavior Therapy and Experimental Psychiatry, 37,* p. 306. Original factor loadings were not available for these items.

items seem to reflect one construct that revolves around rumination on sadness. Hence, the structure of RSS in older adults does not appear to differ from that obtained for young adults (see Table 8).

In terms of Cognitive Failures, Wallace and colleagues (2002) report a 4-factor solution with factors of Memory, Distractibility, Blunders, and Names when given to 335 undergraduates. These factors accounted for 54% of the variance. In the pilot study, a 3-factor solution was generated which accounts for 46% of the variance. The three factors seem to be a re-sorting and collapsing of the Memory, Distractibility, and Blunders factors found by Wallace (see Table 9). The Names factor collapses into the Distractibility factor. The original Memory and Blunders factors remain fairly consistent with only one or two items re-sorting onto one of the other factors.

Overall, the factor structure of rumination in older adults seems to be different from the factor structure of rumination in young adults. The shortest, most targeted scale – RSS – factored the same between the two groups but on both the RRS and CFQ, the factors either resorted or collapsed into fewer factors. The general pattern is one of dedifferentiation on the CFQ. With only 1 factor in the RSS and two factors in the RRS, little or no dedifferentiation is possible with these scales. In older adults, dedifferentiation is interpreted as the increase in correlations between abilities, thereby creating fewer factors or separate abilities and reflects declines in basic cognitive structures. Identifying the most basic function that declines with age would eliminate the need to identify process-specific mechanisms as changes are due to a common aging factor (Zelinksi & Lewis, 2003; Baltes, Cornelius, Sprio, Nesselroade, & Willis, 1980). IDT would propose that inhibition may be

Table 9. Alternative Factors from the Cognitive Failures Questionnaire.

Cognitive Failures Item	Original Factor Loadings				New Factor Loadings		
	Distract	Memory	Blunder	Names	Distract	Memory	Blunder
1. Read something and find you haven't been thinking about it and must read it again?	0.71						
2. Find you forget why you went from one part of the house to the other?	0.68					0.62	
3. Fail to notice sign posts on the road?	0.44				0.58		
4. Find you confuse left and right when giving directions?	0.41				0.74		
15. Have trouble making up your mind?	0.69						
19. Daydream when you ought to be listening to something?	0.54					0.58	
21. Start doing one thing at home and get distracted into doing something else (unintentionally)?	0.51						
22. Find you can't quite remember something although its on the "tip of your tongue"?	0.50				0.59	0.55	
25. Find you can't think of anything to say?	0.40				0.65		
6. Find you forget that you've turned off a lighter on the stove or locked the door?		0.48				0.53	
12. Find you forget which way to turn on a road you know well but rarely use?		0.66				0.46	
13. Fail to see what you want in a supermarket (although its there?)		0.57			0.52		0.47
16. Find you forget appointments?		0.73				0.74	
17. Forget where you put something like a newspaper or book?		0.66				0.87	
18. Do you find you accidentally throw away the thing you want and keep what you meant to throw away?		0.71				0.45	
23. Do you forget what you came to the shops to buy?		0.58				0.77	
5. Bump into people?			0.49				

8. Say something and realize afterwards that it might be taken as insulting?	0.68				0.82
9. Fail to hear people speaking to you when you are doing something else?	0.73				
10. Lose your temper and regret it?	0.67				0.82
11. Leave important letters unanswered for days?	0.43			0.76	
14. Find yourself suddenly wondering if you used a word correctly?	0.43				0.71
24. Drop things?	0.50				0.54
7. Fail to listen to people's names when you are meeting them?		0.71	0.73		
20. Find you forget people's names?		0.78	0.73	0.45	

Note. Original factors adapted from "Confirmatory Factor Analysis of the Cognitive Failures Questionnaire: Evidence for Dimensionality and Construct Validity," by J. Craig Wallace, 2004, *Personality and Individual Differences, 37,* p. 322. All new factor loadings > 0.45 are reported.

the most basic function responsible for dedifferentiation; now a key question is whether or not rumination is linked to one's ability to inhibit irrelevant information.

Question 3: Linking Rumination and Inhibition

The final question is how rumination relates to a cognitive ability such as inhibition. It is possible that if someone who is unable to block irrelevant information in tests of inhibition could have trouble blocking intrusive negative thoughts. Participants in this study were given classic tests of inhibition as well the rumination scales. However, in this sample, inhibition scores on the Stroop and Trails tests were not correlated with scores on any of the rumination scales (see table 10). The two inhibition measures were correlated and the rumination scales also correlate with each other; indeed, two of the rumination scales (RRS and RSS) have a near-perfect correlation.

Table 10. Correlations between Inhibition and Rumination Measures.

	Stroop	Trails	CFQ	RRS	RSS
Stroop Inhibition	1				
Trails Inhibition	0.470*	1			
CFQ Average	0.230	-0.49	1		
RRS Average	0.204	-0.227	0.689**	1	
RSS Average	0.216	-0.218	0.576**	0.910**	1

* $p<.05$; ** $p<.01$

Note. CFQ = Cognitive Failures Questionnaire; RRS= Rumination Response Scale; RSS= Rumination on Sadness Scale

The lack of a significant correlation between rumination and inhibition is not consistent with Hasher and Zacks' Inhibition Deficit Theory (IDT; 1988). IDT would predict that inefficient inhibition results in ineffective selective attention, allowing irrelevant information (such as a negative thought) access to working memory. This process does not effectively delete the irrelevant information, thereby allowing it to remain in working memory. The IDT framework has argued that older adults are not able to ignore irrelevant thoughts. Such irrelevant thoughts seem similar to rumination, implying a link between rumination and a breakdown in inhibition. From their own work, Hartman and Hasher (1991) argue that older adults are poorer at blocking out irrelevant thoughts: "Apparently, inhibitory mechanisms involved in selection of targets and avoidance of distraction are less efficient for older adults" (p. 587). In the present sample for the pilot study, the older adults appeared to be rather good and efficient at blocking out intrusive negative thoughts, much more so than IDT would suggest.

Discussion

The purpose of this pilot study was to examine whether or not older adults ruminate, what factor structure rumination have in older adults, and whether or not older adults' rumination was linked to other cognitive abilities, such as inhibition. There is

strong evidence that older adults do not ruminate as much as young adults, even though it is plausible to suggest that they should have a lot of negative experiences about which to ruminate. It also appears from this sample that the factor structure of rumination has an overall pattern of dedifferentiation when compared to young adults'. And finally, contrary to what IDT would suggest, scores on rumination scales were not linked to an ability to block out irrelevant information on tests of inhibition.

The current pilot study, however, assessed rumination and inhibition in a very small sample of community dwelling older adults. With only 29 participants, it could be that the trend of dedifferentiation in the RRS and CFQ scales is influenced by the small sample size (Guadagnoli & Velicer, 1988). Some suggest a minimum of 100-200 observations is needed to conduct a factor analysis (Guadagnoli & Velicer, 1988) while other researchers suggest a ratio of sample size to number of factors as a criteria; recommendations for the ratio range from 2:1 up to 20:1 (Stanek, 1993). Clearly, a larger sample is needed to resolve the questions of the factor structure of rumination in older adults.

It is also important to assess rumination in a more diverse sample of older adults, because the lack of rumination could be due to selection bias of who volunteers to participate in a research study. The older adults who readily volunteer are more apt to be happy, outgoing individuals. As rumination has been linked to depression, it is possible that the older adults prone to rumination are less likely to want to participate and more likely to be reclusive.

If, even with a larger, more diverse sample, most older adults still do not report ruminating, there are two possible interpretations. On one hand, a lack of rumination by most older adults would lend support for Kennedy, Mather, and Carstensen theory (2004)

that older adults remember events more positively than they actually were; this 'positivity effect' in turn boosts their mood. In terms of rumination, an older adult may not perceive losses, problems, and declines to be as negative as they appear to young adults. In this case, a positivity bias protects older adults from rumination, from dwelling on negative thoughts. On the other hand, a few older adults may be chronic ruminators and they will be evident in a larger, more diverse sample of older adults. Chronic ruminators, after a lifetime of rumination, may develop clinical symptoms such as depression or Post Traumatic Stress Disorder.

This pilot study also raises a second question: whether the pattern of dedifferentiation of rumination may hold even with a larger, more diverse sample of older adults. Dedifferentiation has been commonly observed in a variety of assessments of cognitive functions (see Hertzog & Bleckley, 2001; Voss et al., 2009). Salthouse (1996) has proposed that general slowing underlies the dedifferentiation hypothesis of aging; Lindenberger and Baltes (1994) have suggested dedifferentiation is due to nervous system functioning; and Raz (2000) has suggested a neurological basis for dedifferentiation. However, others find little evidence for dedifferentiation (see Zelinski & Lewis, 2003; Tucker-Drob & Salthouse, 2008; Sims et al., 2009). Overall, the dedifferentiation hypothesis has mixed results and so far, there is no widespread agreement on the underlying explanation of dedifferentiation. Given the paucity of research on rumination with older adults, assessing the factor structure of older adults' rumination and the status of brooding and reflection or suppression is of interest.

A larger, more diverse sample is also needed to decipher the relationship between inhibition and rumination. In 2000, Davis and Nolen-Hoeksema (2000) examined the

relationship between cognitive inflexibility and rumination and found that rumination is associated with a tendency to perseverate as ruminators committed more perseverative errors on the Wisconsin Card Sort Task (WCST) than non-ruminators and high ruminators failed to maintain a card-sorting rule more than nonruminators. They suggested that rumination is linked to poor performance on the WCST. The WCST is often used as the 'gold standard' for identifying problems with inhibition. Hence, the Davis and Nolen-Hoeksema study establishes a link between rumination and inhibition. Further, poor performance on the WCST, has been linked to reports of frequent cognitive failures (Kramer et al., 1994). In the pilot study with older adults, higher CFQ scores were also correlated with higher rumination scores on both the RRS and RSS. Thus, ruminators should exhibit inhibitory deficits *and* experience more cognitive failures in everyday life. This relationship needs to be explicitly tested using other tests of inhibition.

Based on the pilot data, two hypotheses will be addressed (1) Older adults do not ruminate to the same extent as young adults, (2) rumination by young and older adults will not have the same underlying structure including its relationship to neuropsychological measures of inhibition and other aspects of cognition. The next chapter will describe the dissertation experiment that was designed to test these hypotheses.

Chapter 3: Design and Method

The current research was designed to address 2 questions about rumination: (1) whether or not older adults ruminate to the same extent as young adults, (2) whether rumination by young and older adults shares the same underlying structure including the relationship of rumination to working memory, inhibition, and mood. Based on the pilot data discussed in Chapter 2, it is hypothesized that (1) the older adults will not ruminate to the same extent as young adults and (2) that the factor structure of rumination is different in young and older adults.

Method

Participants

Participant needs for this research were determined using the power analysis utility created by Preacher and Coffman (2006) to determine minimal sample size. Sample size estimates were based on several considerations dictated by the proposed structural equation model of rumination. Little (2010a) suggests that around 150 total participants, with at least 50 in each group, is generally sufficient for multi-group models. Additionally, Little (in progress) suggests that an RMSEA of .08 represents an appropriate structural model with when each construct is just-identified. For a multi-group model with 46 degrees of freedom and where RMSEA= 0.08 and α=.05, the minimal sample size suggested by the Preacher and Coffman utility is 142.2, or a minimum of 72 young adults and 72 older adults. The current research recruited 82 older adults (61 female, 20 males and 100% white, non-Hispanic) and 81 young adults (40 females, 41 males, and 73% white, non-Hispanic). Data from one young adult and one older adult were dropped, leaving a final

sample of 80 young adults and 81 older adults. The older adult could not complete testing due to vision. The data from the young adult was lost due to collection errors.

The young adults were recruited at a large research university and paid $10 an hour for participation. Older adults were recruited from a database of former research participants, and from contacts through churches and community organizations in a small, rural town. Like the young adults, the older adults were paid $10 an hour for participation as well as an additional $5 to offset transportation costs, when appropriate.

All participants were given a battery of tests to determine individual and group differences in working memory, inhibition, and mood. Education and vocabulary was also assessed to provide comparative information about the two groups of participants.

Materials

Tests of Rumination

Ruminative Response Scale (RRS; Treynor et al., 2003). This 22-item subscale of the Response Styles Questionnaire (Nolen-Hoeksema & Morrow, 1991) assess a person's tendency to engage in ruminative thought in response to depressed mood. The questionnaire is typically answered on a 4-point Likert scale (0=almost never, 3=almost always) on how often a participant engages in a particular behavior. With young adults, there is a 5-item brooding subscale as well as a 5-item reflection subscale. The remaining 12 questions are related to depression and are often discarded in analyses. In the current research, the Likert scale was extended to a 5-point scale and labeled to match the other rumination scales with 1 = almost never and 5 = almost always. Items are provided in Appendix A.

Rumination on Sadness Scale (RSS; Conway, Csank, Holm, & Blake, 2000). The RSS is designed to be focused on sadness rather than depression. Over half of the items contain the word "sad" or "sadness." The 13 items, located in Appendix B, are answered on a 5-point Likert scale with 1 = almost never and 5 = almost always.

White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994). The WBSI includes 15 items and measures thought suppression. The items are scored on a 5-point Likert scale with 1 = strongly disagree and 5 = strongly agree. It identifies individuals who are more prone to develop chronic thought suppression, which is associated with depression and anxiety, as well as individuals who express wishing they were not depressed even though they are. See Appendix C for a list of items.

Cognitive Failures Questionnaire (CFQ; Broadbent, Cooper, FitzGerald, & Parkes, 1982). With 25 items, the CFQ is designed to measure the frequency of errors in three areas: perception, memory, and motor function (Wallace, 2002). It is answered using a 5-point Likert scale, with 1 = almost never and 5 = almost always. The maximum score is 125 and a minimum score is 25. Items are listed in Appendix D.

Vocabulary Tests

Shipley Vocabulary (Shipley, 1946). This 40-question multiple choice vocabulary test has participants choose the best synonym for a word. This test was administered digitally and all items appeared in the same order for each participant. The example is to select which of the following words is the best synonym for LARGE: (1) red, (2) big (3) silent, and (4) wet. Maximum score is 40.

National Adult Reading Test (NART: Nelson, 1982) This test asks participants to pronounce words aloud. All 45 words violate English spelling-to-sound rules. Hence, to

correctly pronounce each word, participants must be familiar with the word. An example word is "aisle." Maximum score is 45.

Tests of Working Memory

Digits Forward/Backward (Wechsler, 1955). In this test of working memory, participants are read a string of digits and they are asked to repeat the numbers. The strings in the digits forward version start with 3 numbers and increase up to a maximum of 9 digits; each string length, e.g., 3 digits, is tested twice. The maximum score is 14 if all 7 strings are repeated correctly. In the Digits Backward version, participants are read the string of numbers and they are asked to repeat them in reverse order. Here, string length starts at 2 increases to a maximum of 8. The maximum score is again 14.

Reading Span (RSpan: Daneman & Carpenter, 1980). In the Daneman and Carpenter test, participants read a string of sentences and then attempt to recall the last word of each sentences. As in the digit span tests, the number of sentences in each string increases from 2 to 9 and each sentence string length is tested twice. To facilitate test administration and data collection, a digital version (Conway et al., 2005) of the Reading Span test was used: participants read a sentence silently, then judged whether the sentence made logical sense or not. A letter then flashed on the screen and the participants were instructed to remember the letter. After a string a sentences, participants were then asked to recall the letters. Sentence string length, hence the number of letters to be recalled, increased from 3 to 7. However, unlike the original Daneman and Carpenter version, string lengths are randomly ordered and 3 trials at each length are tested.

Tests of Inhibition

Trail Making (Reitan, 1958). On the Trail Making test, version A, participants are given a sheet of paper with 25 randomly arranged dots labeled from 1 to 25. The total time in seconds required to correctly connect the dots in numerical order serves as the outcome measure. Trails B uses 24 dots, half labeled with numbers (1-12) and half with letters (A-L). The total time in seconds required to correctly connect the dots, alternating between numbers and letters (1-A-2-B-3-C-etc.) served as the outcome. The Inhibition scores were calculated using the formula that was given in Chapter 2.

Wisconsin Card Sorting Task (WCST; Heaton, 1980 and Heaton et al., 1993). The WCST was presented digitally. The test involves sorting cards varying in color (red, green, yellow, or blue), shape (triangle, star, cross, or circle) and number (1, 2, 3, or 4). Participants are shown a single card and asked to sort it onto one of 4 key cards; no rule or sorting criterion is explicitly given. The 4 key cards vary on all 3 properties: one red triangle, two green stars, three yellow crosses, and four blue circles. The participant must guess the rule s/he should use to sort each card. A predetermined sorting rule is used to provide feedback to the participant as to the correctness of each sort. After 10 consecutive correct sortings, the sorting rule changes, unbeknownst to the participant, and the participant has to figure out the new sorting rule using the feedback provided. The primary outcome measure is the number of preserverative errors. Preserverative errors occur when the participant continues to use a previous sorting rule even though s/he has received feedback that their sort is incorrect. Additional outcome measures include the number of cards sorting correctly, the number of categories (runs of 10 correctly sorted cards) completed, and the number of non-perseverative errors.

Stroop (Stroop, 1935). In the baseline Stroop task, participants have 45 seconds to name the color of the ink of a series of X's printed in 5 columns of 25 rows on a page, and number correct (max. = 125) served as the outcome measure. In the color words Stroop task, participants have 45 seconds to name the ink color of a color word (the word BLUE printed in red ink) printed in 5 columns on 25 rows. The number correct in the allotted time (max=125) served as the outcome measure. The Stroop Inhibition scores were calculated using the formula from Chapter 2.

Mood Assessments

Mood was assessed using 3 complementary approaches. First, positive outlook or "hope" was assessed. Second, traumatic life events were assessed. Third, negative outlook or "depression" was assessed. Self-report checklists were used.

The Hope Scale (Snyder et al., 1991), The Hope Scale is a 12-item scale which is answered on an 8-point Likert scale (1=definitely false; 8=definitely true) and includes 4 filler questions along with 4 items that assess agency and 4 items that assess pathways of hope. An example of an agency question is "I energetically pursue my goals" and an example of a pathways item is "I can think of many ways to get out of a jam." The total Hope score is the score of the 8 agency and pathways items. Higher scores indicate higher levels of hope. See Appendix E for the entire list of items. For this analysis, the Likert scale was shifted to a 5-point scale to match the other scales where 1 = strongly disagree and 5 = strongly agree. With this shift in scale, the maximum score on the Hope Scale is 40.

Life Events Checklist (LEC; Gray et al., 2004). The LEC is a 17-item checklist that asks participants to identify which of the potentially traumatic experiences s/he has experienced, witnessed, or learned about happening to someone close (see Appendix F).

The LEC is designed to screen for potentially traumatic events and does not establish if the individual has experienced an event that would meet *DSM-IV* diagnostic criteria for traumatic exposure. Participants answer the questions first to note if they have personally experienced the event or not, and then again to indicate whether or not they have witnessed it or learned about it happening to a close friend or family member. Two scores are used, the number (maximum = 15) of life events personally experienced and the number (maximum = 17) of life events that occurred to others.

Geriatric Depression Scale – Short Form. (GDS-SF; Shiek & Yesavage, 1986). The GDI-SF is a 15-item yes/no questionnaire. The scale helps separate depressed from non-depressed individuals. Scores greater than 5 are indicative of depression and scores greater than 10 are almost always indicative of clinical depression. This scale has been found to have excellent concurrent validity with the Beck Depression Inventory and so is appropriate for all participants in this study (Ferraro, & Chelminski, 1998).

Procedure

Two protocols were developed that pseudo-randomly ordered the individual tests. Individual rumination, working memory, inhibition, and mood assessments were distributed so that the longer tests, e.g., RSpan and WCST, were separated by 2 or more shorter tests, e.g., RRS or GDS and paper and pencil tests, e.g., the NART, Stroop, and Trail Making tests, were separated by computer-adminstered tests, e.g., rumination tests, WCST, and RSpan. The total administration time took about 2 hours on average for older adults and 1.5 hours for young adults.

Summary

In summary, a total of 15 tests were administered to each participant to test the following two hypotheses: (1) the older adults will not ruminate to the same extent as young adults and (2) that the factor structure of rumination is different in young and older adults. Table 11 compares the groups of young and older adults on these tests.

The groups of young and older adults did not differ significantly in education, $F(1,158) = 0.663$, $p=0.417$, or in verbal ability as evidenced by similar scores on the Shipley Vocabulary test, $F(1,158)=1.144$, $p=0.287$ and NART, $F(1,158)=0.625$, $p=0.430$. There were significant differences between the two groups on the working memory tests. On the Digits Forward test, young adults had higher scores, $F(1,158)=9.216$, $p<.01$. Young adults also had higher scores on the Digit Backward test than older adults, $F(1,158)=19.958$, $p<.001$. Young adults also had higher total Reading Span scores, $F(1,144)=58.889$, $p<.001$. Note that about 10% of the older adults were not able to complete this test and have missing data and data from an additional 5 subjects was lost due to technical failures. The digital version of the reading span test was particularly difficult for the older adults in this sample. In terms of the tests of inhibition, the groups differed in the Stroop inhibition score, such that with older adults were less able to inhibit reading the color words when asked to name the color of the ink, $F(1,158)=95.744$, $p<.001$. However, the two groups did not differ significantly in inhibition as measured by the Trail Making test, $F(1,158)=0.088$, $p=0.767$. On the Wisconsin Card Sort Task, young adults performed better in terms of percentage of correct responses, $F(1,158)=51.59$, $p<.001$. Similarly, young adults made fewer perseverative errors than older adults, $F(1,158)=30.128$, $p<.001$.

Table 11. Means and Standard Deviations on Tests of Vocabulary, Working Memory, Inhibition, and Mood for Young and Older Adults.

	Young Adults		Older Adults	
	M	*SD*	*M*	*SD*
Age (years)	20.65	2.71	74.19	7.33
Education (years)	14.67	1.92	14.35	2.92
National Adult Reading Test	29.52	5.91	30.35	7.23
Shipley Vocabulary	30.91	4.11	31.59	3.95
Digits Forward	9.57	2.30	8.43	2.43
Digits Backward	8.41	2.67	6.56	2.57
Reading Span Total	55.23	10.89	37.78	16.40
Trails A sec (numbers only)	46.11	12.60	81.28	27.68
Trails B sec (letters &numbers)	59.34	20.50	107.38	51.53
Trails Inhibition	31.40	30.32	33.08	40.63
Stroop XXX	84.91	11.67	67.37	12.56
Stroop Color Words	59.89	11.07	37.10	9.47
Stroop inhibition	29.44	9.24	44.79	10.55
Hope Scale	31.30	4.33	30.00	4.02
Life Events – experienced personally	3.08	2.29	3.57	2.49
Life Events – other experience	9.46	3.89	8.27	4.43
Geriatric Depression Scale	2.72	2.69	2.49	2.32

Table 11 also reports the means and standard deviations for the mood assessments: the Life Events Checklist, Geriatric Depression Scale , and the Hope Scale. In terms of the Life Events Checklist, there was no significant difference between the number of stressful events personally experienced by young and older adults, $F(1,158) = 1.693$, $p=0.195$. Similarly, both groups had statistically equivalent scores on the Geriatric Depression Scale, $F(1,158) = 0.329$, $p=0.567$. However, the groups did differ on the Hope Scale, $F(1,158)=4.43$, $p=0.037$ with young adults producing higher total Hope scores than older adults. This significant overall difference is driven by the Pathways factor. The average response means for the Pathways factor for the young adults was 3.94(SD = 0.59) and the

older adults had a mean average response score of 3.61(*SD* = 0.57) for the Pathways factor. This difference was significant, $F(1,158)=12.630$, $p<.01$. However, groups did not differ on the Agency subscale, $F(1,158)=0.059$, $p=0.808$. Group means for young adults on this subscale were 3.91 (*SD* = 0.65) for young adults and 3.88 (*SD* = 0.59) for older adults.

In order to test hypothesis 1, average scores on each of the rumination tests, the RRS, RSS, and WBSI, as well as component factors were calculated for each participant. Analysis of Variance (ANOVA) was used to test for group mean differences on items as well as factor scores. In order to test the second hypothesis confirmatory factor analysis tested a series of models: first, the structure of rumination in young adult was determined by fitting a 2-factor model of the WBSI and RRS tests, a 4-factor model of the CFQ, and a simple 1-factor model for the RSS first to the young adults' data, then to the older adults'. In addition, CFA was used to determine if the RRS, RSS, and WBSI load onto a common higher-order general rumination factor and the age-invariance of this model will be assessed. In addition, a 4-factor model of cognitive failures was evaluated and the relationship of rumination to cognitive failures was modeled. Further models assessed how working memory, inhibition, and mood, related to rumination. The final stage of the analysis assessed how the measures of hope, life events, and depression related to rumination.

Chapter 4: Results

This study was designed to test two main hypotheses regarding rumination by young and older adults: that older adults would not ruminate to the same extent as young adults and that the structure of rumination and its relationship to other neuropsychological measures of cognition would differ for each age group. The results pertaining to each hypothesis are discussed separately

Hypothesis 1

The first hypothesis was that older adults would not ruminate to the same extent as young adults. In order to test this hypothesis, all 160 participants were administered the Ruminative Response Scale, Rumination on Sadness Scale, the White Bear Suppression Inventory tests of rumination as well as the Cognitive Failures Questionnaire.

Table 12 summarizes the means and standard deviations for each question on the Ruminative Response Scale (RRS). The RRS is assumed to have 2 factors, Brooding ($alpha_{YA}$ = 0.683; $alpha_{OA}$ = 0.578) and Reflection ($alpha_{YA}$ = 0.796; $alpha_{OA}$ = 0.774). While the Brooding factor does not appear to be supported for either age group, as indicated by the low alpha reliability scores, young adults do appear to more prone to Brooding than older adults, $F(1,158)=37.630$, $p<.001$. Young adults also engage in Reflection more often than young adults, $F(1,158)=7.376$, $p<.01$.

The Rumination on Sadness (RSS) scale has a single factor, Sadness ($alpha_{YA}$ = 0.920; $alpha_{OA}$ = 0.902). On this test, older adults had a significantly lower score than young adults, $F(1,158)=17.148$, $p<.001$. The White Bear Suppression Inventory (WBSI) is assumed to have 2 factors, Suppression ($alpha_{YA}$ = 0.824; $alpha_{OA}$ = 0.648) and Intrusions ($alpha_{YA}$ = 0.803; $alpha_{OA}$ = 0.766). Scores for both groups did not differ on the

Suppression factor, $F(1,158)=0.847$, $p<0.359$ or on the Intrusion factor, $F(1,158) = 0.150$, $p=0.700$. RSS Item means and standard deviations can be found in Table 13 and WBSI item means and standard deviations are reported in Table 14.

The Cognitive Failures Questionnaire (CFQ) has 4 factors: Distractibility ($alpha_{YA}$ = 0.724 $alpha_{OA}$ = 0.809), Memory ($alpha_{YA}$ = 0.796; $alpha_{OA}$ = 0.744), Blunders ($alpha_{YA}$ = 0.567; $alpha_{OA}$ = 0.542), and Names ($alpha_{YA}$ = 0.695; $alpha_{OA}$ = 0.497). The low alpha reliabilities, especially for Blunders and Names, suggests that the 4-factor structure of CFQ does not hold for either young or older adults. Item means and standard deviations are reported in Table 15. There were significant group differences in 3 of the 4 factors of the CFQ. Young and older adults did not differ on the Distractability factor, $F(1,158) = 0.082$, $p = 0.780$. However, the two groups did differ on the Memory factor, with older adults reporting more frequent problems than young adults, $F(1,158) = 17.122$, $p<.001$. Similarly, older adults reported more cognitive failures on the Names factor than young adults, $F(1,158) = 17.792$, $p<.001$. On the Blunders factor, young adults actually reported more problems than older adults, $F(1,158) = 5.057$, $p=0.026$.

Summary. From these results, hypothesis 1 – that older adults would report less rumination than young adults – is supported. Older adults reported engaging in ruminative thoughts less often than young adults in items relating to Sadness, Brooding, and Reflection. However, the older adults report engaging in the suppression of negative thoughts equally often and report negative thoughts intrude equally often as young adults. Overall, cognitive failures are no more common for older adults than for young adults although the types of cognitive failures reported by the 2 groups do differ. However, it is

important to note that on two of the three scales of rumination (RRS and WBSI), previously reported factor structures were not clearly replicated.

Table 12. Means and Standard Deviations of Young and Older Adults' Responses on the Ruminative Response Scale (RRS).

I Often…	Young Adults		Older Adults	
	M	SD	M	SD
1. Think about how alone I feel	2.16	1.03	2.19	1.00
2. Think I won't be able to do my job/work because I feel so badly	1.66	0.82	1.88	0.83
3. Think about my feelings of fatigue and achiness	2.05	0.92	2.80	0.95
4. Think about how hard it is to concentrate.	2.90	1.21	2.53	0.92
5. Think about how passive and unmotivated I feel.*	2.33	1.05	2.32	0.88
6. Analyze recent events to try to understand why I am depressed.$_R$*	2.35	1.13	2.07	0.92
7. Think about how I don't seem to feel anything anymore.	1.77	1.04	1.95	0.84
8. Think Why can't I get going?	2.41	1.12	2.65	0.94
9. Think Why do I always react this way?$_B$	2.51	1.21	2.41	0.89
10. Go away by yourself and think about why you feel this way.$_R$	2.10	0.90	1.91	0.83
11. Write down what I am thinking about it and analyze it.$_R$	1.87	0.95	1.68	0.84
12. Think about a recent situation wishing it had gone better.$_B$*	3.27	1.05	2.84	0.73
13. Think, 'Why do I have problems other people don't have?'$_B$	2.20	1.09	2.07	0.85
14. Think about how sad I feel.	2.00	0.88	2.07	0.80
15. Think about shortcomings, failings, faults, mistakes.	2.92	1.08	2.63	0.87
16. Think about how I don't feel up to doing anything.*	2.30	0.98	2.78	0.87
17. Analyze my personality to try to understand why I am depressed.$_R$	1.97	1.04	1.96	0.89
18. Go someplace alone to think about my feelings.$_R$*	2.35	1.06	1.91	0.88
19. Think about how angry you are with yourself.	2.01	1.08	2.25	0.78
20. Listen to sad music.	2.39	1.10	1.68	0.70
21. Isolate yourself and think about the reasons why you feel sad.	2.01	0.91	1.79	0.70
22. Try to understand yourself by focusing on depressed feelings.	1.91	1.03	1.75	0.80

*Difference between age groups significant at $p < .05$.
Note. B = Brooding factor, items 9, 12, and 13; R = Reflection factor, items 6, 10, 11, 17, and 18.

Table 13. Means and Standard Deviations of Young and Older Adults' Responses on the Rumination on Sadness Scale.

When I am down, sad, or feel blue…	Young Adults		Older Adults	
	M	SD	M	SD
1. I have difficulty getting myself to stop thinking about how sad I am	2.18	1.16	2.02	0.81
2. I repeatedly analyze and keep thinking about the reasons for my sadness*	2.32	1.20	1.96	0.77
3. I search my mind many times to try and figure out if there is anything about my personality that may have led me to feel this way	2.28	1.07	2.11	0.79
4. I get absorbed in thinking about why I am sad and find it difficult to think about other things	1.96	0.97	2.09	0.78
5. I search my mind repeatedly for events or experiences in my childhood that may help me understand my sad feelings	1.99	0.97	1.91	0.90
6. I keep wondering about how I was able to be happy at other points in my life.	2.01	1.16	2.07	0.92
7. I lie in bed and keep thinking about my lack of motivation and wonder whether it will ever return*	2.23	1.19	1.89	0.94
8. If people try to talk to me or ask me a question it feels as thought they are interrupting an ongoing silent conversation I am having with myself about my sadness	1.38	0.72	1.44	0.63
9. I question and keep wondering about the meaning of life to find cues that may help me understand my sadness	1.95	1.10	2.00	0.92
10. I repeatedly think about what sadness really is by concentrating on my feelings and trying to understand them	1.86	1.00	2.05	0.89
11. I get the feeling that if I think long enough about my sadness I will find that it has some deeper meaning and that I'll understand myself better*	2.20	1.16	1.80	0.86
12. I keep thinking about my problems and try to examine where things went wrong	2.89	1.21	2.53	0.91
13. I exhaust myself by thinking so much about myself and the reasons for my sadness*	2.00	1.10	1.83	0.85

* Difference between age groups significant at $p < .05$.
Note: All items loaded onto the single Sadness factor.

Table 14. Means and Standard Deviations of Young and Older Adults' Responses on the White Bear Suppression Inventory.

White Bear Suppression Item	Young Adults		Older Adults	
	M	SD	M	SD
1. There are things I prefer not to think about. S	3.72	1.27	3.73	0.90[1]
2. Sometimes I wonder why I have the thoughts I do.*	3.10	1.27	2.65	1.11
3, I have thoughts that I cannot stop.I	2.92	1.35	2.75	1.23
4. There are images that come to mind that I cannot see.I	2.22	1.09	2.36	1.00
5. My thoughts frequently return to one idea.I	2.96	1.07	3.05	1.01
6. I wish I could stop thinking of certain things.I	3.24	1.29	2.98	1.07
7. Sometimes my mind races so fast I wish I could stop it.I	2.70	1.30	2.65	0.90[8]
8. I always to put problems out of mind.	3.06	1.11	3.06	1.05
9. There are thoughts that keep jumping into my head.I	3.19	1.18	3.15	0.96
10. There are things thatI try not to think about.S	3.56	1.31	3.54	0.95
11. Sometimes I really wish I could stop thinking.S*	2.66	1.32	2.25	1.17
12. I often do things to distract myself from my thoughts.S*	2.99	1.26	2.61	1.09
13. I have thoughts that I try to avoid.S	3.14	1.32	3.07	1.21
14. There are many thoughts that I have that I don't tell anyone.S	3.41	1.41	3.56	0.96
15. Sometimes I stay busy just to keep thoughts from intruding on my mind.	2.77	1.18	2.81	1.07

* Difference between age groups significant at $p < .05$.

Note: S = Suppression factor items 1, 10, 11, 12, 13, and 14; I = Intrusion factor items 3, 4, 5, 6, 7, and 9.

Table 15. Means and Standard Deviations of Young and Older Adults' Responses on the Cognitive Failures Questionnaire.

Cognitive Failures Item	Young Adults		Older Adults	
	M	SD	M	SD
1. Read something and find you haven't been thinking about it and must read it again?$_D$	3.34	1.13	3.07	0.80
2. Find you forget why you went from one part of the house to the other?$_D$*	2.58	1.03	3.01	0.84
3. Fail to notice sign posts on the road?$_D$	2.04	0.78	2.31	0.66
4. Find you confuse left and right when giving directions?$_D$*	2.05	1.09	2.36	0.95
5. Bump into people?$_B$	2.05	1.09	2.07	0.65
6. Find you forget that you've turned off a lighter on the stove or locked the door?$_M$	1.91	0.84	2.14	0.72
7. Fail to listen to people's names when you are meeting them?$_N$	2.87	1.01	3.11	0.94
8. Say something and realize afterwards that it might be taken as insulting?$_B$	2.87	0.95	2.68	0.67
9. Fail to hear people speaking to you when you are doing something else?$_B$	2.72	1.17	2.85	0.84
10. Lose your temper and regret it?$_B$	2.33	1.05	2.23	0.66
11. Leave important letters unanswered for days?$_B$	2.24	1.22	2.37	0.86
12. Find you forget which way to turn on a road you know well but rarely use?$_M$	1.90	1.03	1.90	0.78
13. Fail to see what you want in a supermarket (although its there?)$_M$*	2.24	0.96	2.59	0.88
14. Find yourself suddenly wondering if you used a word correctly?$_B$	2.53	0.89	2.52	0.81
15. Have trouble making up your mind?$_D$*	3.39	1.08	2.91	0.88
16. Find you forget appointments?$_M$	1.92	0.86	2.04	0.70
17. Forget where you put something like a newspaper or book?$_M$	2.78	1.06	2.90	0.78
18. Do you find you accidentally throw away the thing you want and keep what you meant to throw away?$_M$	1.91	0.79	2.02	0.69
19. Daydream when you ought to be listening to something?$_D$*	3.25	1.06	2.84	0.90
20. Find you forget people's names?$_N$*	2.90	0.98	3.70	0.73
21. Start doing one thing at home and get distracted into doing something else (unintentionally)?$_D$*	3.42	1.00	3.11	0.76
22. Find you can't quite remember something although its on the "tip of your tongue"?$_D$*	3.03	0.85	3,31	0.70
23. Do you forget what you came to the shops to buy?$_M$*	2.32	1.06	2.64	0.75
24. Drop things?$_B$*	2.41	0.91	2.64	0.64
25. Find you can't think of anything to say?$_D$	2.65	1.03	2.60	0.75

* Difference between age groups significant at $p < .05$.

Note: D= Distractibility factor items 1, 2, 3, 4, 15, 19, 21, 22, and 25; M = Memory factor, items 6, 12, 13, 16, 17, 18, and 23; N = Names factor, items 7 and 20; B = Blunders factor items 5, 8, 9, 10, 11, 14, and 24.

Table 16 summarizes factor scores for young and older adults on the RRs, RSS, WBSI, and CFQ. Factor loadings for individual items are given in Table 17 for RRS items, Table 18 for RSS items, and Table 19 for WBSI items. These factor loadings suggest that the RRS may have a single factor, rather than separate Brooding and Reflection factors. And the WBSI also may have a single factor, rather than separate Suppression and Intrusion factors.

Table 16. Means and Standard Deviations of all Rumination Scales and CFQ Factors for Young and Older Adults.

Factor	Young Adults		Older Adults	
	M	SD	M	SD
RRS				
Brooding*	2.65	0.87	2.44	0.61
Reflection*	2.13	0.76	1.91	0.63
RSS - Sadness*	2.35	0.55	1.98	0.58
WBSI				
Suppression	3.24	0.96	3.12	0.63
Intrusions	2.87	0.86	2.82	0.71
CFQ				
Memory*	2.14	0.64	2.48	0.38
Blunders*	2.51	0.60	2.32	0.48
Distractibility	2.86	0.56	2.84	0.51
Names*	2.87	0.87	3.41	0.69

* Difference between age groups significant at $p < .05$.
Note: RRS = Rumination Response Scale; RSS = Rumination on Sadness Scale;
WBSI = White Bear Suppression Inventory; CFQ = Cognitive Failures Questionnaire.

Table 17. Item Factor Scores for Young and Older Adults on Key items from the Ruminative Response Scale.

I Often…	Young Adults		Older Adults	
	Brood	Reflect	Brood	Reflect
9. Think Why do I always react this way?	0.759		0.568	
12. Think about a recent situation wishing it had gone better.	0.750		0.775	
13. Think, 'Why do I have problems other people don't have?'	0.718		0.773	
6. Analyze recent events to try to understand why I am depressed		0.519		0.625
10. Go away by yourself and think about why you feel this way.		0.678		0.800
11. Write down what I am thinking about it and analyze it.		0.717		0.706
17. Analyze my personality to try to understand why I am depressed.	0.634	0.557	0.679	0.385
18. Go someplace alone to think about my feelings.		0.819		0.783

Note*:* Brood = Brooding factor, items 9, 12, and 13; Reflect = Reflection factor items 6, 10, 11, 17, and 18. Reported loadings are given for all items on original factors; an alternative (e.g., higher) loading is provided for item 17.

Table 18. Item Factor Scores for Young and Older Adults on Key items from the Rumination on Sadness Scale.

When I'm down, sad or feel blue…	Young Sad	Older Sad
1. I have difficulty getting myself to stop thinking about how sad I am	0.789	0.704
2. I repeatedly analyze and keep thinking about the reasons for my sadness	0.774	0.687
3. I search my mind many times to try and figure out if there is anything about my personality that may have led me to feel this way.	0.669	0.699
4. I get absorbed in thinking about why I am sad and find it difficult to think about other things.	0.807	0.736
5. I search my mind repeatedly for events or experiences in my childhood that may help me understand my sad feelings.	0.693	0.731
6. I keep wondering about how I was able to be happy at other points in my life.	0.756	0.618
7. I lie in bed and keep thinking about my lack of motivation and wonder whether it will ever return.	0.622	0.600
8. If people try to talk to me or ask me a question it feels as though they are interrupting an ongoing silent conversation I am having with myself about my sadness	0.664	0.347
9. I question and keep wondering about the meaning of life to find cues that may help me understand my sadness.	0.766	0.757
10. I repeatedly think about what sadness really is by concentrating on my feelings and trying to understand them.	0.685	0.726
11. I get the feeling that if I think long enough about my sadness I will find that it has some deeper meaning and that I'll understand myself better.	0.701	0.721
12. I keep thinking about my problems and try to examine where things went wrong.	0.636	0.740
13. I exhaust myself by thinking so much about myself and the reasons for my sadness.	0.780	0.705

Note. Sad = Sadness factor.

Table 19 Item Factor Scores for Young and Older Adults on Key items from the White Bear Suppression Inventory.

White Bear Suppression Item	Young Adults		Older Adults	
	Sup	Int	Sup	Int
3, I have thoughts that I cannot stop.	0.658	0.425		0.698
4. There are images that come to mind that I cannot see.		0.809	0.560	0.301
5. My thoughts frequently return to one idea.		0.586		0.697
6. I wish I could stop thinking of certain things.	0.787	0.356	0.572	0.542
7. Sometimes my mind races so fast I wish I could stop it.		0.696		0.664
9. There are thoughts that keep jumping into my head.		0.561		0.636
1. There are things I prefer not to think about.	0.765		0.719	
10. There are things that I try not to think about.	0.772		0.716	
11. Sometimes I really wish I could stop thinking.	0.604			0.636
12. I often do things to distract myself from my thoughts.	0.624		0.544	
13. I have thoughts that I try to avoid.	0.800		0.725	
14. There are many thoughts that I have that I don't tell anyone.	0.457	0.585	0.034	0.370

Note: Sup = Suppression factor items 1, 10, 11, 12, 13, and 14; Int = Intrusions factor items 3, 4, 5, 6, 7, and 9. Reported loadings are given for all items on original factors; alternative (e.g., higher) loadings are also reported.

Hypothesis 2

The second hypothesis was that the factor structure of rumination would be different for young and older adults. In order to evaluate Hypothesis 2, the factor structure of each test of rumination was first evaluated using Confirmatory Factor Analyses (CFA) with LISREL 8.80 (Jöreskog & Sörbom, 2007) separately for each age group. RSS was modeled as a single factor, Sadness; RRS was modeled as two factors, Brooding and Reflection; WBSI was modeled as two factors, Suppression and Intrusions. Table 20 reports model fit statistics for each of these CFA models for young and older adults. Three model-fit criterion were considered when determining the goodness of fit for the overall model: RMSEA, NNFI, and CFI. The Root-Mean-Square Error of Approximation (RMSEA)

estimates the amount of error of approximation per model degree of freedom. (Kline, 2005). While the X^2 value is reported, this measure is almost always significant with large sample sizes and so alternative measures have been developed (Kenny, 2011). A RMSEA value of less than or equal to .05 indicates a great fit and Little suggests that a value between .08 and .11 suggests an acceptable fit. The Non-Normed Fit Index (NNFI) is sometimes referred to as the Tucker-Lewis Index (Brown, 2006). The NNFI includes a penalty for adding freely estimated parameters that do not improve the model fit and since it is non-normed, values can fall outside the range of 0.0-1.0 but values close to 1.0 are viewed as having good model fit (Brown, 2006). The Comparative Fit Index, CFI, compares the user-specified model to the baseline, or null model where all covariances are fixed to 0. Fit for this index is similar to the NNFI where values typically range from 0.0-1.0 and values closer to 1.0 indicate good model fit.

Overall, model fit on individual Rumination scales for both groups was acceptable although the WBSI had somewhat worse model fit, particularly for older adults, as

Table 20. CFA results for Young and Older adults on 3 Rumination Scales.

	Young Adults					Older Adults				
	Df	X^2	*RMSEA*	*NNFI*	*CFI*	*Df*	X^2	*RMSEA*	*NNFI*	*CFI*
RSS	65	128.381*	0.117	0.944	0.954	65	127.763*	0.117	0.93	0.942
WBSI	53	104.320*	0.110	0.929	0.943	53	118.465*	0.118	0.819	0.855
RRS	19	17.154	<0.001	1.008	1.000	19	33.977*	0.099	0.898	0.931
All 3	4	1.353	0.001	1.053	1.000	4	8.279	0.116	0.950	0.980

* $p < .01$

Note. RSS = Rumination on Sadness Scale. WBSI = White Bear Suppression Inventory. RRS = Ruminative Response Scale. All 3 = all items from RSS, WBSI, and RRS combined into one model.

indicated by lower RMSEA, NNFI, and CFI values. When all three scales were considered in the same model, there was again very good model fit for both age groups, suggesting that items from all 3 tests load onto a common rumination factor in each age group.

While it is useful to run CFAs on each group separately, it is also important to consider both groups simultaneously in a two-group CFA. This approach tests for age invariance at several levels. The first level, configural invariance, determines whether the pattern of fixed and free parameters is equivalent across groups. A model has configural invariance is evaluated for model fit the same way a single-group's CFA is considered: CFI and NNFI values should be close to 1 and RMSEA less than .12 for acceptable model fit. The difference is that the model testing for configural invariance is considering data from both groups simultaneously. The second level, weak factorial invariance, determines if the factor loadings are equivalent across group and strong factorial invariance examines whether or not the indicator means are equivalent across groups. Here, if the difference in CFI between the configural invariant model and the weak factorial model is less than 0.01, then weak invariance is indicated (Cheung & Rensvold, 2002). The RMSEA can also indicate weak invariance if both RMSEA values fall within each other's confidence intervals. Weak invariance can also be referred to as equal factor loadings while the configural invariance model is sometimes referred to as equal form (Kline, 2005). The third level, strong factorial invariance, tests whether the indicator means are equivalent across groups (Brown, 2006). If this level is confirmed, then there is no need to consider each group separately because the pattern and loadings of each group's model are identical. As indicated in Table 16, group mean differences were found for the RSS sadness factor and

the RSS reflection and brooding factors so strong factorial invariance may be rejected *a priori*.

Table 21. Factorial Invariance for individual Rumination Scales.

	Configural Invariance Model					Weak Factorial Invariance Model				
	Df	X^2	*RMSEA*	*NNFI*	*CFI*	*Df*	X^2	*RMSEA*	*NNFI*	*CFI*
RSS	130	256.141*	0.117	0.938	0.949	142	272.368*	0.113	0.941	0.947
WBSI	106	225.954*	0.114	0.889	0.911	116	245.474*	0.112	0.891	0.904
RRS	38	56.281*	0.077	0.952	0.967	44	60.595*	0.069	0.962	0.970

* $p < .05$
Note: RSS= Rumination on Sadness Scale; WBSI = White Bear Suppression Inventory; RRS = Rumination Response Scale.

Each individual scale met the weak factorial invariance criteria, meaning that the factor loadings are similar across groups. See Table 21 for a summary of model-fit values for the RRS, RSS, & WBSI scales for configural and weak invariance. Each scale has a CFI that differs less than .01between the configural and weak invariance models, supporting weak invariance for each individual sub-scale. However, a single-factor model combining the Brooding, Reflection, Sadness, Suppression, and Intrusion scores from each test into a single model of Rumination failed the test for factorial invariance due to the fact the single-factor model did not fit the young adult data, (X^2 (5) = 29.592, $p < 0.001$ RMSEA = 0.225, NNFI = 0.607, CFI = 0.804). This poor model fit was driven by the two RRS factors – Brooding and Reflection – which were uncorrelated with the rest of the rumination factors (Sadness, Suppression, and Intrusion). As a result, 2 separate rumination models for young adults will be considered further: one model (Figure 4: RRScale) with 2 factors, Brooding and Reflection, and another model (Figure 5: General Rumination or GRum) with 3 factors, Sadness, Suppression, and Intrusions. Table 22 reports the young adult factor

score covariance matrix. For each of the young adult models, the model is saturated, or just-identified. This means that there are no degrees of freedom in the model and the RMSEA cannot be calculated. Additionally, the NNFI and CFI for saturated models are a perfect fit, 1.0, because the model has no degrees of freedom.

In contrast, a 5-factor model fit the older adult data moderately well, (X^2 (5) = 20.499, p < .01 RMSEA = 0.187, NNFI = 0.856, CFI = 0.928). Here, all the factors are positively related (see Table 23). For older adults, one model of rumination will be considered with 5 factors, Brooding, Reflection, Sadness, Suppression, and Intrusions following the analyses of the young adult data.

Table 22. Correlation matrix of young adults mean factor response scores.

	Brooding	Reflection	Sadness	Suppression	Intrusion
Brooding	1.000				
Reflection	0.557*	1.000			
Sadness	-0.009	-0.026	1.000		
Suppression	-0.093	-0.039	0.570*	1.000	
Intrusion	-0.093	-0.055	0.696*	0.765*	1.000

*$p < 0.01$

Table 23. Correlation matrix of older adults mean factor response scores.

	Brooding	Reflection	Sadness	Suppression	Intrusion
Brooding	1.000				
Reflection	0.506*	1.000			
Sadness	0.689*	0.567*	1.000		
Suppression	0.384*	0.462*	0.611*	1.000	
Intrusion	0.424*	0.294*	0.600*	0.638*	1.000

*$p < 0.01$

Figure 4. Model of RRScale for Young Adults.

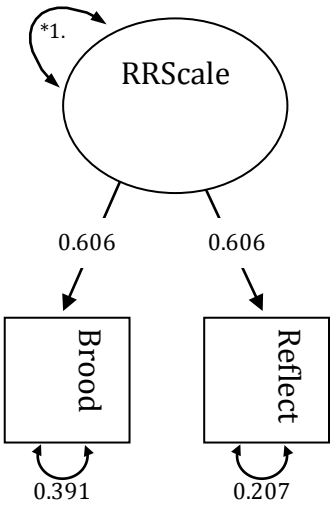


Figure 5. Model of General Rumination for Young Adults.

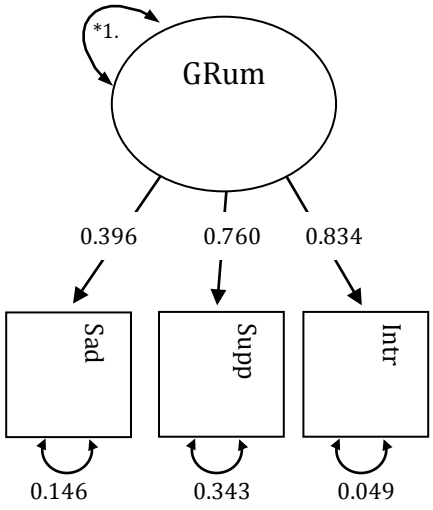
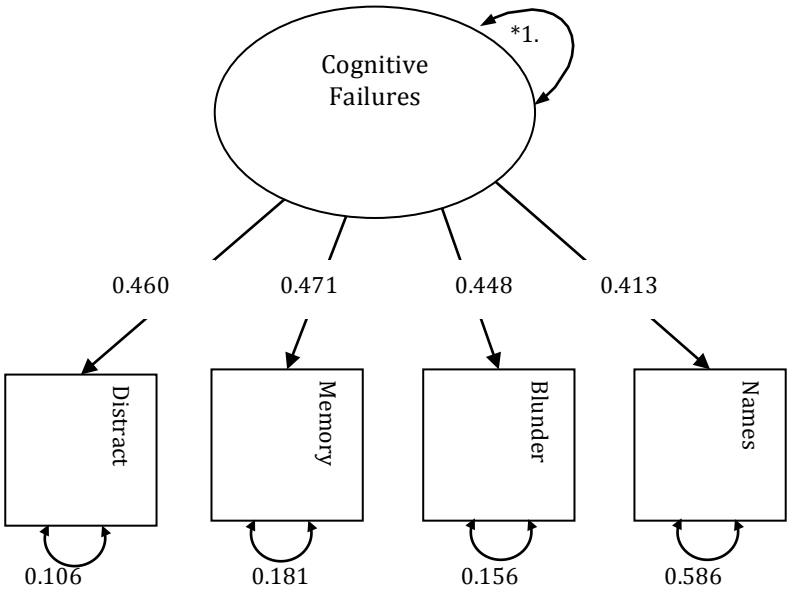


Figure 6. Model of Cognitive Failures for Young Adults.



X^2 (2, n=79) = 0.744, p>.05 RMSEA=0.001 NNFI=1.035 CFI-1.0

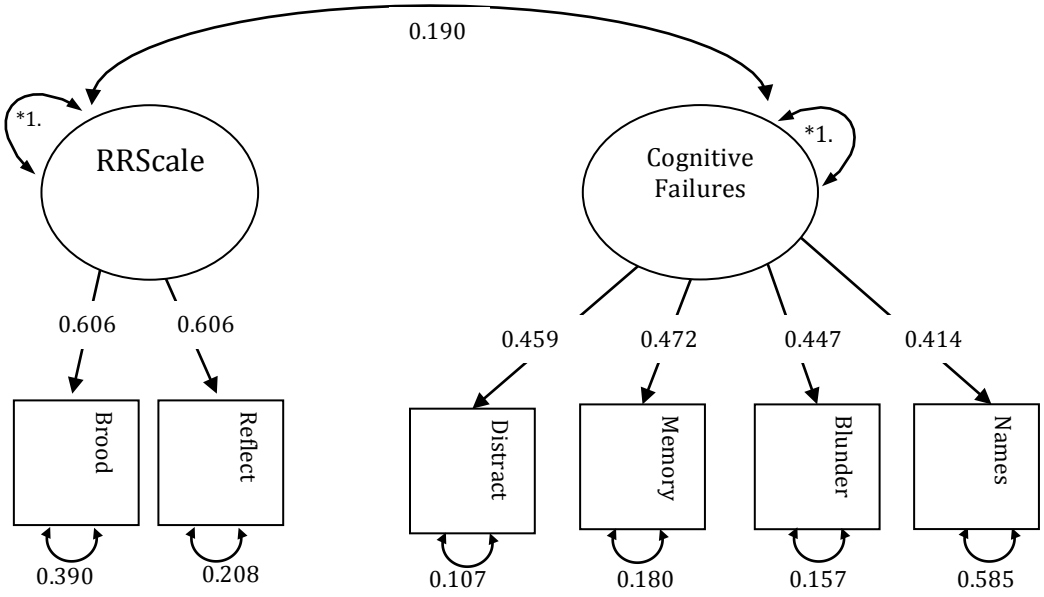
The next issue to be considered is how cognitive failures, inhibition, and working memory relate to rumination. These questions will first be considered for young adults and then reconsidered for older adults using the same general approach. Group invariance was not evaluated because each age group is being considered since different rumination models were obtained for young versus older adults. In the following models, only paths linking latent constructs significant at $p < 0.05$ or better were retained. Appendices H-M report further details regarding model specification, including non-significant paths.

Young Adults: First, the Cognitive Failures Questionnaire was modeled with 4 indicators, Distractibility, Memory, Blunders, and Names; the model (Figure 6) had excellent fit, ($X^2(2) = 0.744$, $p > 0.05$ RMSEA = 0.001, NNFI = 1.035, CFI = 1.000). The next step was to examine the relationship between CFQ and each of the young adult models of

rumination, RRScale and GRum. These models are shown in Figures 7 and 8. The model with GRum (Figure 8) has poor model fit, (X^2 (13) = 66.252, p < 0.001 RMSEA = .22, NNFI = 0.767, CFI = 0.856 and was therefore rejected. However, the model with RRScale (Figure 7) does fit, suggesting that cognitive failures are related to Brooding and Reflection in young adults (X^2 (9, n=79) = 5.656, p >.05 RMSEA < 0.01. NNFI = 1.044 CFI = 1.00).

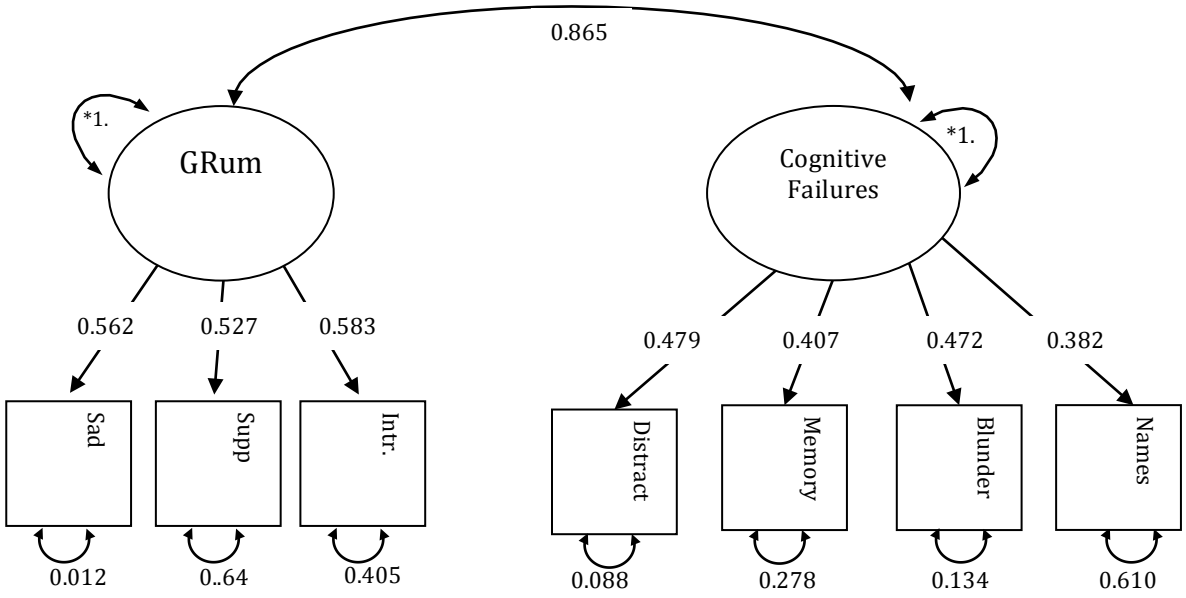
The question of how either rumination model relates to Working Memory was then examined. First, a model of working memory was developed. The first attempt had 3 indicators, RSpan, Digits Forward, and Digits Backward. This model would not converge. Further, since there were additional problems with missing data on the Reading Span test in the older adult sample, RSpan was dropped from subsequent analyses and a Working Memory model with two indicators, Digits Forward and Digits Backward, was used. This model is just identified so no model fit statistics are available for Working Memory alone. The young adult Working Memory model as it relates to each Rumination model is shown in Figures 9 and 10. The negative relationship in Figure 9 between RRScale and Working Memory indicates that individuals with longer working memory spans report slightly less tendency towards Reflection and Brooding (X^2 (3, n=79) = 2.98, p > 0.05 RMSEA < .001. NNFI = 1.001 CFI = 1.00). However, when GRum is considered (Figure 10), Working Memory appears to be unrelated to the tendency to ruminate, (X^2 (5, n=79) = 4.105, p > 0.05 RMSEA < 0.01. NNFI = 1.014 CFI = 1.00). The link between GRum and Working memory is not significant (ψ = 0.025, WALD = 0.182) and is represented with a dashed line.

Figure 7. Model of RRScale and Cognitive Failures for Young Adults.



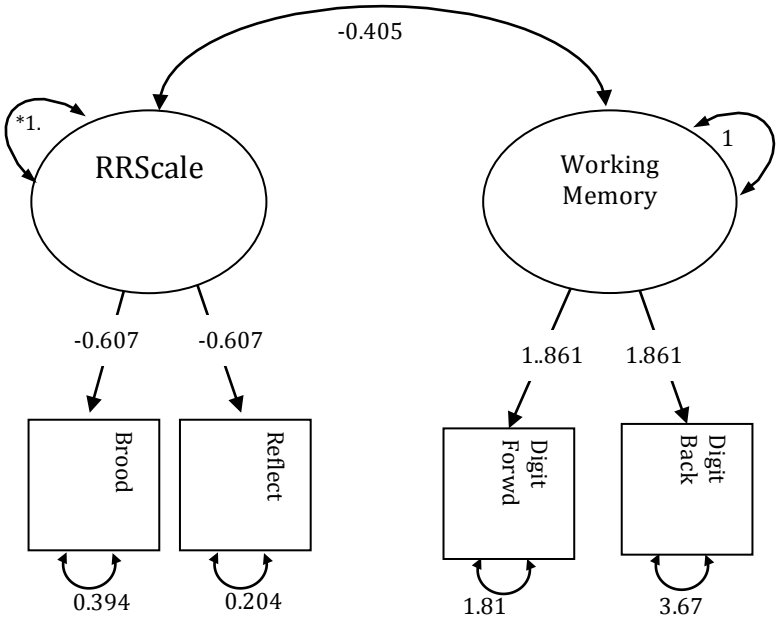
X^2 (9, n=79) = 5.656, P>.05 RMSEA<.01. NNFI=1.044 CFI=1.00

Figure 8. Rejected Model of General Rumination and Cognitive Failures for Young Adults.



X^2 (13, n=79) = 66.252 p<.001 RMSEA =0.22 NNFI=0.767 CFI=0.856

Figure 9. Model of RRScale and Working Memory for Young Adults.



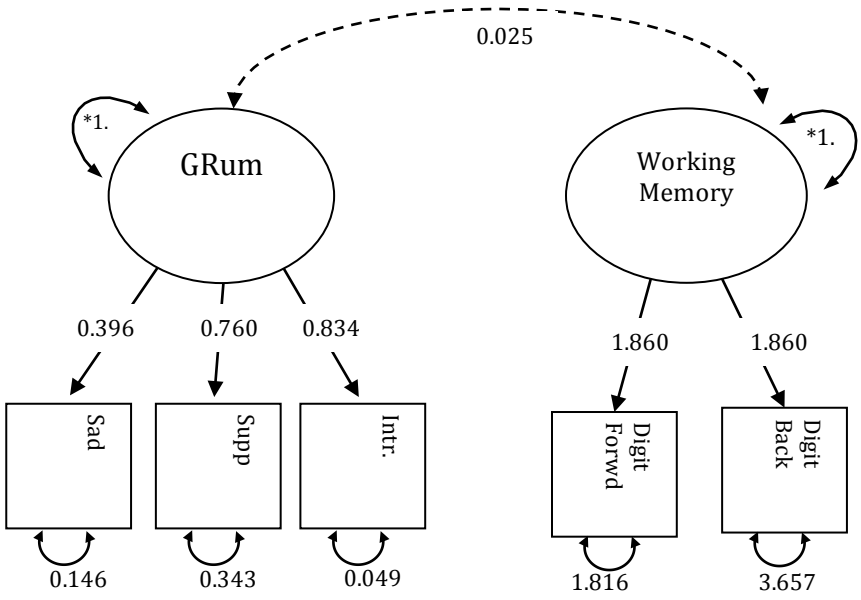
X^2 (3, n=79) = 2.98, p>.05 RMSEA<0.001 NNFI=1.001 CFI-1.00

The young adult rumination models were then related to a model of inhibition with 3 indicators: Stroop interference, Trail Making Interference, and Total Errors on the Wisconsin Card Sorting Task. The negative loading between inhibition and RRScale (Figure 11) indicates that those with better ability to block out irrelevant information, resulting in less interference, are less likely to rumination, (X^2 (5, n=79) = 9.459 p >.05 RMSEA<.10. NNFI = 0.736 CFI=0.868). Inhibition is also negatively related to GRum (Figure 12) again indicating that those experiencing less interference are less likely to ruminate, (X^2 (8, n=79) = 11.9, p > 0.05 RMSEA = 0.06. NNFI = 0.935 CFI = 0.965).

A final model for each rumination construct examined the relationships between rumination and cognitive failures, inhibition, and cognitive failures simultaneously. These models are shown in Figures 13 and 14. Further specification of both models is provided in

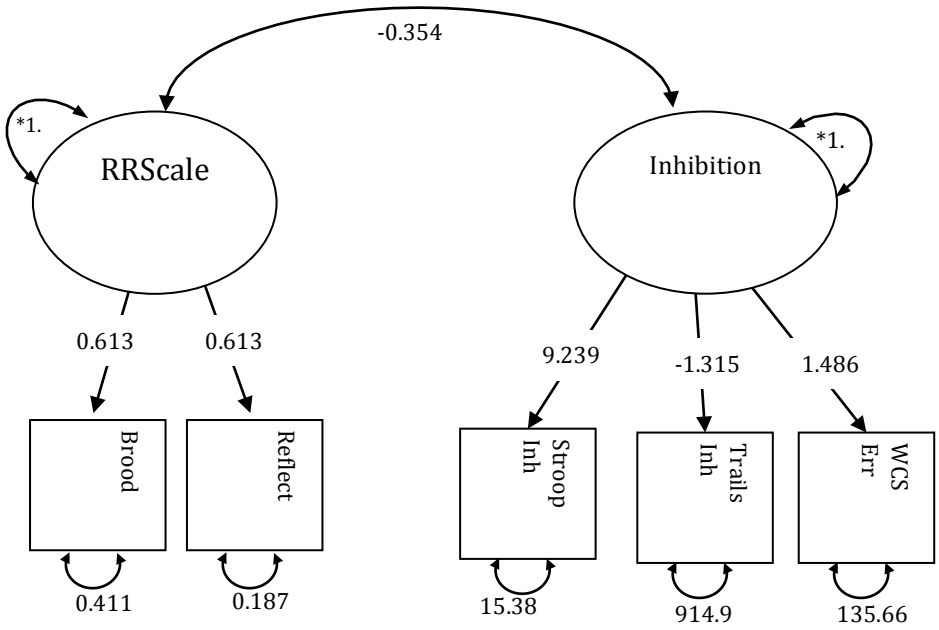
Appendices H & I, respectively. In both models, the rumination construct was negatively associated with inhibition and positively associated with cognitive failures, meaning that a young adult who experiences ruminative thoughts more often reports having more cognitive failures and is worse at inhibiting irrelevant information. The model with the RRScale (Figure 13: X^2 (40, n=79) = 35.517, p >.05 RMSEA < 0.001. NNFI = 1.028 CFI = 1.00) fit better than the GRum model (Figure 14: (X^2 (49, n=79) = 88, p < 0.001 RMSEA = 0.10, NNFI = 0.827 CFI = 0.871.) but both models had acceptable model fit. For young adults, RRS does not measure the same construct as GRum and it seems that the RRS Brooding and Reflection factors are related to other cognitive functions whereas the GRum factors of Sadness, Suppression, and Intrusions are not.

Figure 10. Rejected Model of General Rumination and Working Memory for Young Adults.



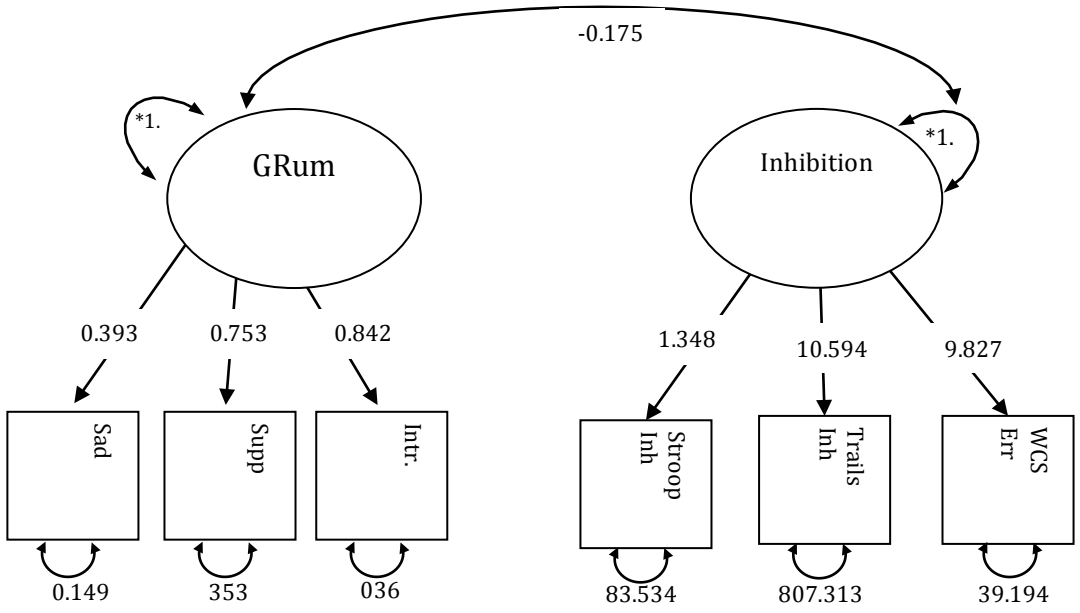
X^2 (5, n=79) = 4.105 p<>.05 RMSEA <.001 NNFI=1.014

Figure 11. Model of RRScale and Inhibition for Young Adults.



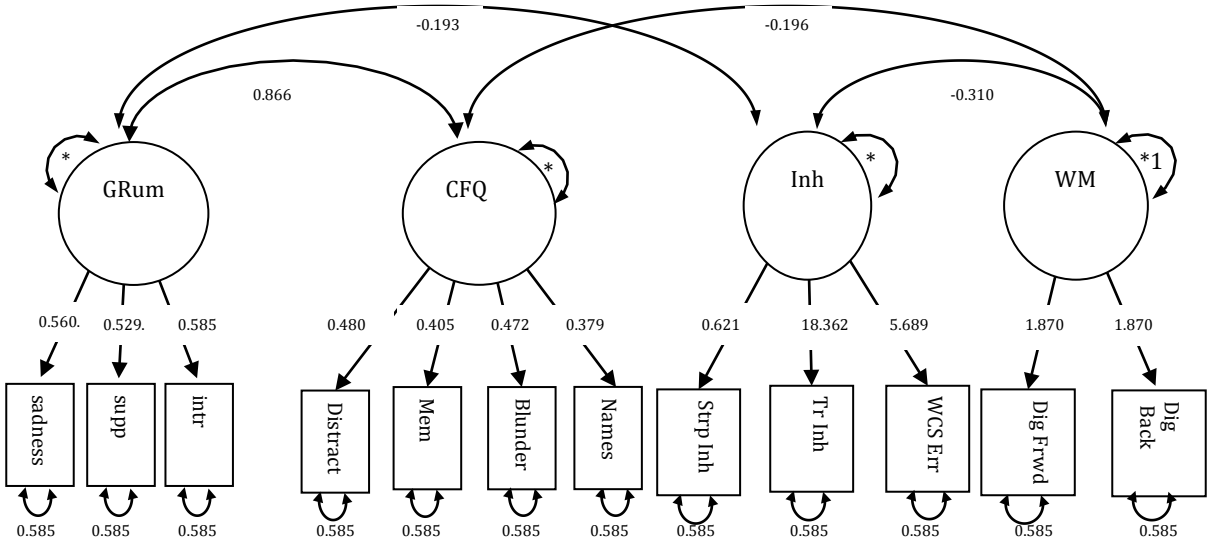
X^2 (6, n=79) = 9.459 p>.05, RMSEA =0.08 NNFI=0.803 CFI=0.882

Figure 12. Model of General Rumination and Inhibition for Young Adults.



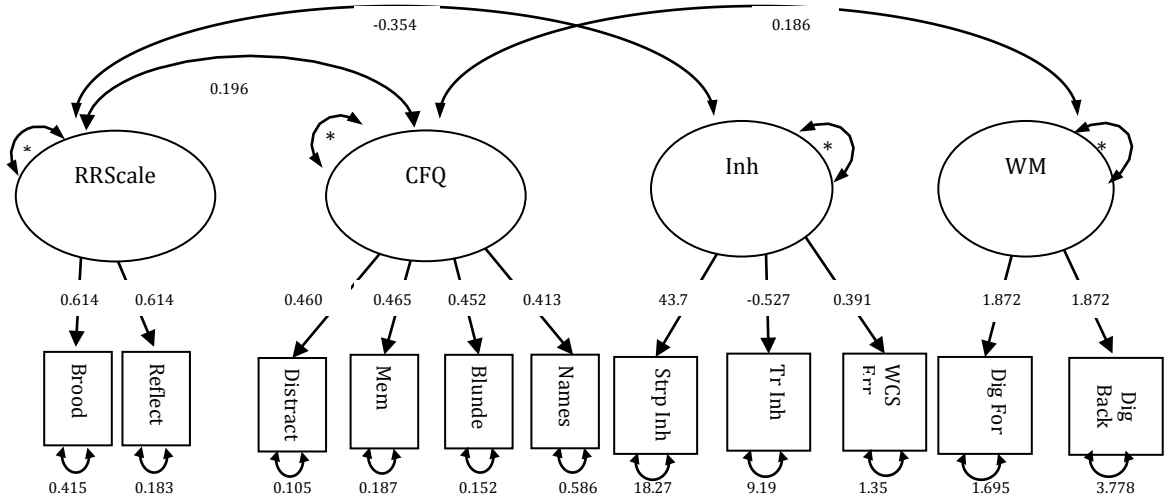
X^2 (8, n=79) = 11.9 p>.05 RMSEA =0.06 NNFI=0.0.935 CFI=0.965

Figure 13. Model of General Rumination, Cognitive Failures, Working Memory, and Inhibition for Young Adults.



X^2 (49, n=79) = 88 p<.001 RMSEA =0.10 NNFI=0.827 CFI=0.871

Figure 14. Model of RRScale, Cognitive Failures, Inhibition, and Working Memory for Young Adults.



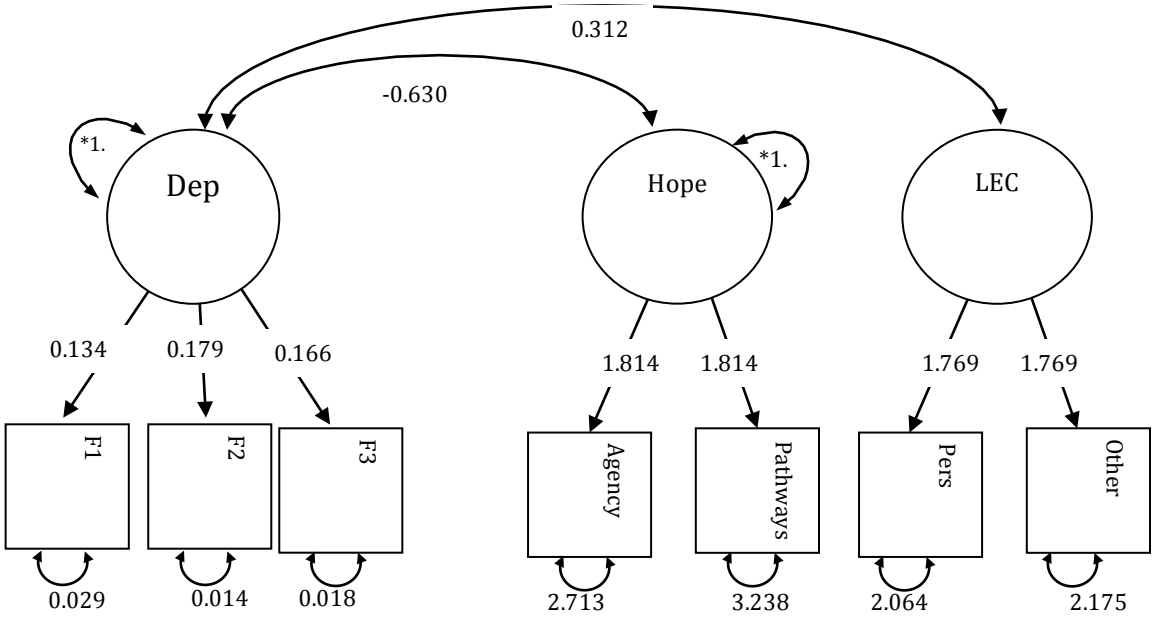
X^2 (40, n=79) = 35.517 p>.05 RMSEA<.001 NNFI=1.028

X^2 (40, n=79) = 35.517 p>.05 RMSEA<.001 NNFI=1.028 CFI=1.000

It was also of interest to see how mood is related to ruminative thoughts. The analyses started with a simple model of Mood, which had three indicators – LEC total events, Depression, and Hope. However, this model would not converge because of the inverted relationship between Hope and Depression. So, the model was adjusted to include three separate constructs – Hope, Depression, and Life Events (LEC). This model (Figure 15) had good model fit (X^2 (13, n=79) = 17.016, p > 0.05 RMSEA = 0.051, NNFI = 0.958 CFI = 0.974) and revealed a significant positive link between Depression and LEC and a significant negative relationship between Depression and Hope. The GDS items were randomly parceled to make 3 factor scores and the Hope scale had two indicators, Agency and Pathways. LEC also had two indicators: Personal (Pers) for those events the

participant experienced personally and Other for events experienced by someone they knew. The link between Hope and LEC was not significant and so it not represented in the model (ψ = -0.012, WALD = -0.069). Each rumination construct was then added to the Mood model (see Figures 16 and 17). In the model with GRum, (Figure 16: $X^2(31) = .38$ p <.01 RMSEA = 0.08, NNFI = 0.926, CFI = 0.949) there was a negative relationship between Depression and Hope as well as a positive relationship between Depression and LEC. Additionally, there was a significant positive relationship between GRum and Depression as well as GRum and LEC and a significant negative relationship between GRum and Hope. This means that the more rumination is associated with higher depression scores and more negative life events and less hope. In Figure 17, there were far fewer significant links but the model still fit well (X^2 (24, n=79) = 33.82, p > 0.05 RMSEA = 0.06, NNFI = 0.915 CFI = 0.943). The only significant links between the constructs included a negative relationship between RRScale and Hope and a positive relationship between Depression and LEC. The links between RRScale and Depression or RRScale and LEC were not significant. The RRS scale was designed to assess non-depresssive rumination and so it is not surprising that the relationship between the RRScale and Depression is not significant. Psychometric information for Figures 16 and 17 are available in Appendices J and K respectively.

Figure 15. Model of Mood for Young Adults.



X^2 (13, n=79) = 17.016, p>.05 RMSEA = 0.51 NNFI = 0.958 CFI = 0.974

Figure 16. General Rumination and 2-Construct Mood Model for Young Adults.

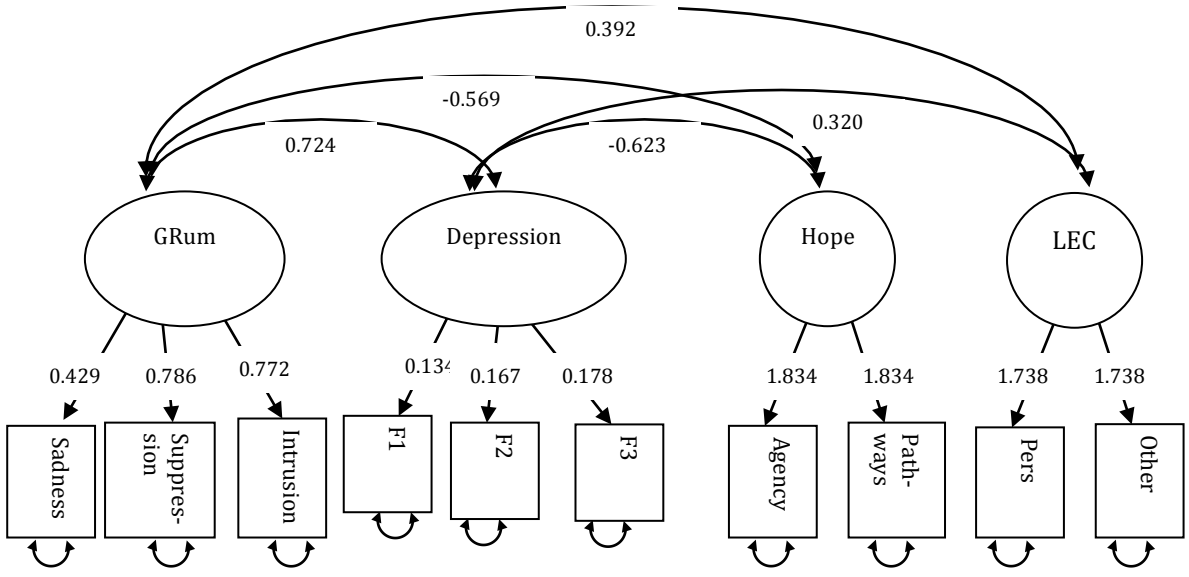
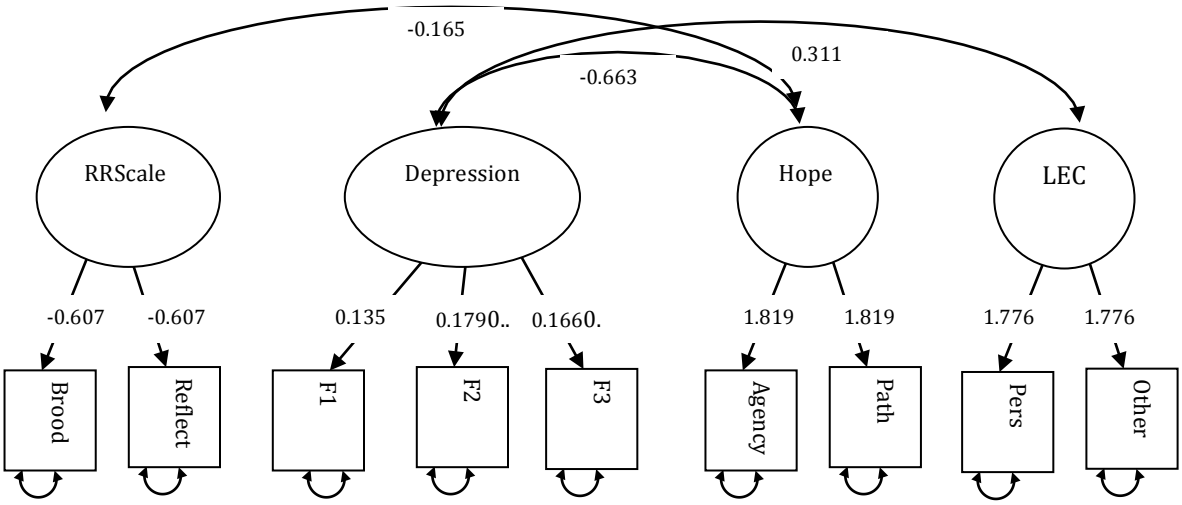


Figure 17. RRScale and 2-Construct Mood Model for Young Adults.



X^2 (24, n=79) = 33.82, p > 0.05 RMSEA = 0.06 NNFI = 0.0.915 CFI = 0.943

Older adults

The relationship between the single construct model of rumination for older adults (Figure 18) and cognitive failures, working memory, inhibition, and mood was then investigated. The older adult model for Cognitive Failures is presented in Figure 19 and the CFA fit the data well, (X^2 (2, n=81) = 0.59, p > 0.05 RMSEA < 0.01, NNFI = 1.022 CFI = 1.000). For older adults, rumination was linked to cognitive failures as it was in young adults, such that the older adult participants who reported higher frequency of ruminative thoughts also reported a higher frequency of cognitive failures (Figure 20). Model fit was good, (X^2 (26, n=81) = 53.94 p < 0.01 RMSEA = 0.11, NNFI = 0.934 CFI = 0.952).

In contrast to the findings for young adults, neither Working Memory nor Inhibition had a significant link to rumination by older adults. The 2-factor model with Rumination and

Working Memory (X^2 (14, n=81) = 25.38, p > 0.05 RMSEA = 0.09, NNFI = 0.928 CFI = 0.952) was acceptable but the path between the two constructs was not significant (ψ = 0.05; Wald = 0.394). Similarly the 2-factor model for Rumination and Inhibition was acceptable, (X^2 (20, n=81) = 37.52, p > 0.01 RMSEA = 0.10, NNFI = 0.886 CFI = 0.918) but the path between Rumination and Inhibition was nonsignificant (loading = -0.01; Wald = -0.145).

Figure 18. Model of Rumination for Older Adults.

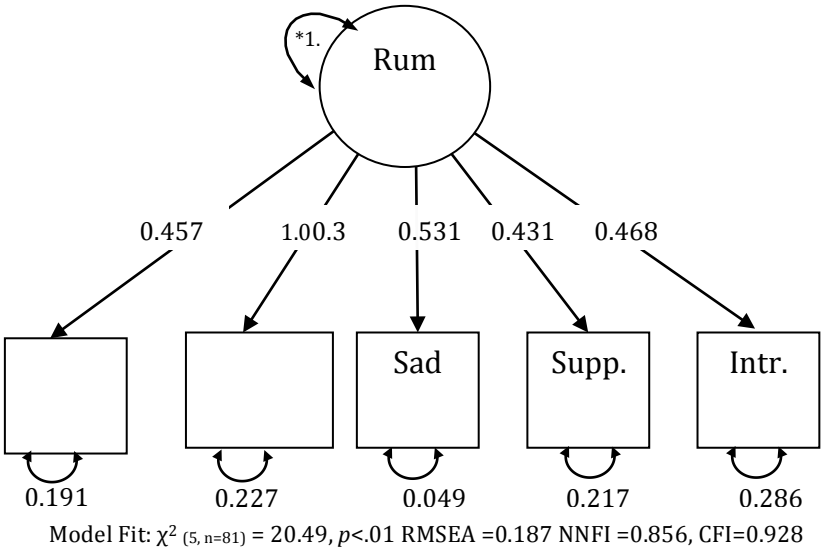
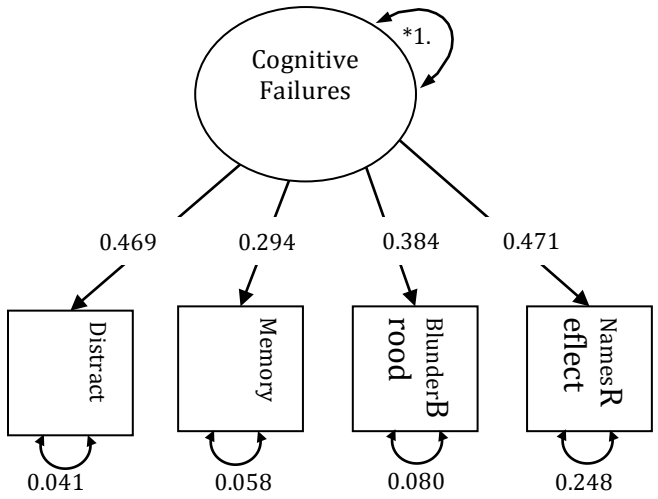
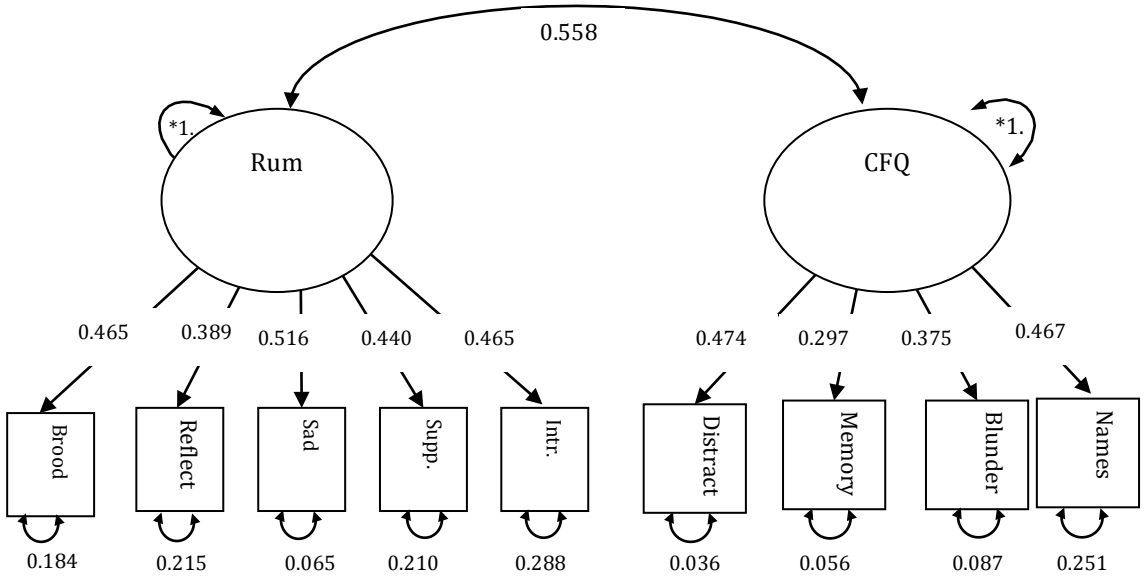


Figure 19. Model of Cognitive Failures for Older Adults.



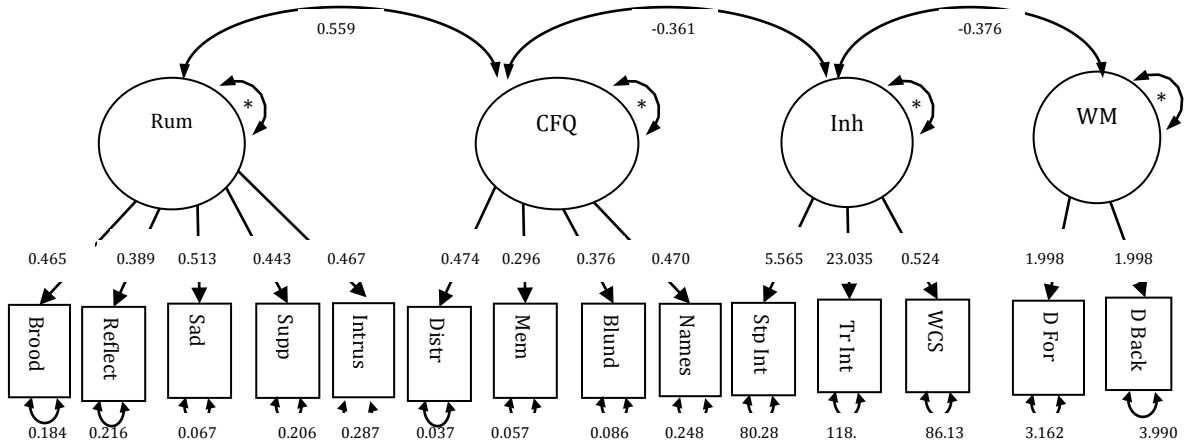
X^2 (2, n=81) = 0.591, p>.05 RMSEA=0.001 NNFI=1.022 CFI-

Figure 20. Model of Rumination and Cognitive Failures for Older Adults.



X^2 (26, n=81) = 53.935, p<.01 RMSEA=0.105 NNFI=0.934 CFI= 0.952

Figure 21. Model of Rumination, Cognitive Failures, Inhibition, and Working Memory for Older Adults.

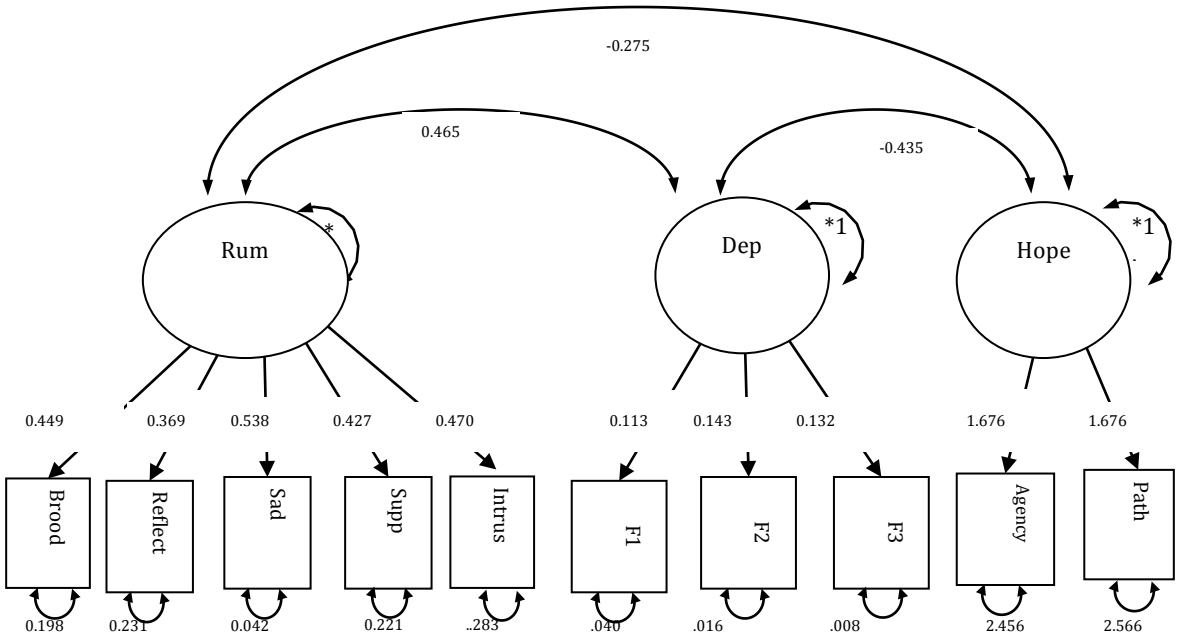


X^2 (72, n=81) = 96.27 p=.03 RMSEA =0.05 NNFI=0.957 CFI=0.961

A full cognitive model was also evaluated to simultaneously test the relationships existed between rumination, cognitive failures, inhibition, and working memory. The best-fitting model, in Figure 21 (X^2 (72, n=81) = 96.27, p = 0.03 RMSEA = 0.05, NNFI = 0.957 CFI = 0.961), included a positive association between rumination and cognitive failures and a negative relationship between cognitive failures and inhibition but there was no association between rumination and inhibition. Older adults with more cognitive failures reported more ruminative thoughts and older adults with more cognitive failures were also worse at inhibiting irrelevant information. There was also a negative relationship between inhibition and working memory but no direct association between rumination and working memory. Older adults with higher working memory spans had better inhibition and so experienced less interference from irrelevant information.

The final step was to examine how older adult rumination was related to mood. The first model tested included LEC along with Hope and Depression, (X^2 (50, n=81) = 85.60, p = 0.01 RMSEA = 0.08, NNFI = 0.882 CFI = 0.911) but none of the links between Rumination, Depression, or Hope with LEC were significant so LEC was dropped from the final model (Figure 22). The 3-factor model with Rumination, Depression and Hope fits moderately well (X^2 (33, n=81) = 59.31, p < 0.01 RMSEA = 0.10, NNFI = 0.870 CFI = 0.915). The results indicated that older adults' rumination was not related to negative life events personally experienced or reported by others. However, there was a significant relationship between Rumination and Depression: those older adults who reported more rumination also were more depressed. There was also a negative relationship between Depression and Hope, indicating that more depressed individuals have less hope, as well as a negative relationship between Rumination and Hope such that older adults who reported more rumination also have less hope.

Figure 22. Rumination and 2-Construct Model of Mood for Older Adults.



X^2 (33, n=81) = 59.31 p<.001 RMSEA =0.10 NNFI=0.870 CFI=0.905

Summary. The second hypothesis was that the structure of rumination and its association with other cognitive abilities would differ between young and older adults. The results using CFA support this hypothesis. Rumination in young adults is more complex than rumination in older adults in that it can be decomposed into both a general pattern of rumination, assessed by Sadness, Suppression, and Intrusions, as well as a specific type of rumination assessed by the RRS. Cognitive failures and working memory are unrelated to the first, general type of rumination, but both are associated with the second type of rumination, particularly Brooding and Reflection on past events. Inhibition was associated with both forms of rumination in young adults, such that those with better inhibition, who experience less interference on tasks like the Stroop task, are less likely to ruminate. Both

forms of rumination in young adults are also associated with increased depression and decreased hope.

Rumination by older adults is less differentiated and unrelated to working memory or inhibition. However, similar to the findings for young, adults, older adults who experience more cognitive failures also report more rumination. And older adults who ruminate also tend to be more depressed and to have less hope than non-ruminators; however, older adults' rumination was not linked to the number of stressful life events they or others have experienced.

Chapter 5: Discussion

This study set out to answer two questions about rumination and aging: Do older adults ruminate to the same extent as young adults? and Is the structure of rumination, including its relationship with inhibition and other cognitive abilities, the same in young and older adults? These questions were triggered by a review of the research literatures on aging, inhibition, and rumination. Research by Hasher & Zacks (Hasher, Ouig, & May, 1997; Hasher & Zacks, 1988; Hasher, Zacks, & May, 1999; Hasher, Stoltzfuz, Zacks, & Rypma, 1991) suggests that many age-related cognitive deficits arise from a breakdown of inhibition. Hasher and Zacks have suggested that inhibitory deficits leave older adults more susceptible to distractions (Carlson, Hasher, Connelly & Zacks, 1995), and inefficient at focusing attention and ignoring irrelevant information so that distracting thoughts interfere with processing task-relevant information (Hasher & Zacks, 1988; Kramer et al., 1994).

Rumination, or repetitive, recurrent thoughts, has also been linked by Davis and Nolen-Hoeksema (2000) to cognitive deficits as young adult ruminators had more perseverative errors on the WCST than non-ruminators. Research on rumination has generally focused on young adults and on the maladaptive properties of rumination and has linked it to a variety of emotional and behavioral disturbances including anger (Rusting & Nolen-Hoeksema, 1998), shame, (Cheung, Gilbert & Irons, 2004), anxiety (Nolen-Hoeksema, 2000) alcohol use (Nolen-Hoeksema & Harrel, 2002), and impaired concentration (Lyubomirsky, Kasri, & Zehm, 2003). Davis & Nolen-Hoeksema (2000) suggested a potential link between inhibition and rumination when they found that

ruminators produced more perseverative errors on the WCST, a classic test of inhibition, than nonruminators in a young adult sample.

In a preliminary test of the hypothesis that rumination by older adults may contribute to inhibitory deficits, a pilot study was conducted with 29 older adults who completed the Cognitive Failures Questionnaire (CFQ) and two scales of rumination: the Ruminative Response Scale (RRS) and the Rumination on Sadness Scale (RSS). The preliminary findings suggested that older adults do not ruminate: the modal response on both rumination scales was "never" in response to questions such as "How often do you isolate yourself to think about the reasons why you feel sad" and "I think about how I don't seem to feel anything anymore." Further analyses suggested that rumination by older adults was less differentiated than rumination by young adults into separate factors such as Brooding vs. Reflection.

To further test these hypotheses, a larger study was undertaken using a common battery of measures of rumination, working memory, inhibition and mood administered to a larger sample of participants (79 young adults and 81 older adults). Rumination measures included the Rumination Response Scale (RRS), the Rumination on Sadness Scale (RSS), White Bear Suppression Inventory (WBSI), and the Cognitive Failures Questionnaire (CFQ). Working Memory tests included the Digits Forward, Digits Backward, and a digital Reading Span task. The Trail Making test, the classic Stroop test, and the Wisconsin Card Sorting Task were administered as tests of inhibition. Additionally, a Life Events Checklist, the Geriatric Depression Scale, and the Hope Scale were also administered to all participants to investigate how mood would impact rumination. Analysis of Variance (ANOVA) tests were then used to determine group mean differences in the frequency of

rumination, Confirmatory Factor Analysis (CFA) was used to try to replicate previously reported factor structures for the rumination scales, and Structural Equation Modeling (SEM) was used to look for links between rumination and working memory, inhibition, and mood.

Hypothesis 1. The first hypothesis, that older adults would ruminate less than young adults, was partially supported. Older adults reported less rumination than young adults on the Sadness, Reflection, and Brooding scales of the RSS and RRS but equal rumination on the Suppression and Intrusion scales from the WBSI. This finding is consistent with suggestions from Socioemotional Selectivity (SSE) theory (Mather & Carstensen, 2003; Charles, Mather, & Carstensen, 2003; Mather & Johnson, 2000). SSE argues that older adults select not to focus on negative emotions and instead choose to focus on the positive aspects of their life (Mather & Carstensen, 2003). If rumination means that a person persistently thinks about the negative events or aspects of his/her life, SSE would suggest that older adults would choose not to engage in rumination and instead focus on positive emotions. The present results indicate that older adults are less likely to report engaging in the negative behaviors such as Brooding ("Why do I always react this way?" or "Why do I have problems other people don't have?") and thinking about Sad events ("I have difficulty getting myself to stop thinking about how sad I am" and "I keep thinking about how I was able to be happy at other points in my life") than the young adults.

Torges, Stewart, and Nolen-Hoeksema (2008) reported that older adults are more likely to resolve their regrets compared to young adults. Their sample was comprised of individuals who were recruited from hospices or who had a close relationship with a

person receiving hospice services. In the Torges et al. study, 39% of young adults and 64% of older adults indicated they had resolved their regrets in an open-ended response to a question such as "Looking back, is there anything you wish you'd done differently" or "Looking back, have there been any changes in the way you think about the process you've gone through?" If older adults are resolving their regrets and choosing to focus on positive aspects of life, consistent with SSE , they may indeed be less likely to ruminate than young adults.

Hypothesis 2. The second hypothesis, that the structure of rumination would differ between young and older adults, was also supported. Rumination by young adults could not be captured by a single construct but involved two types of rumination. One type of rumination, termed General Rumination, reflected questions pertaining to Sadness, Suppression, and Intrusion and included items such as "I question and keep wondering about the meaning of life to find cues that may help me understand my sadness," "I have thoughts that I try to avoid" and "Sometimes my mind races so fast I wish I could stop it." The other type of rumination, termed Ruminative Responses, reflected questions pertaining to Brooding and Reflection such as "I often think about a recent situation wishing it had gone better" and "I often go someplace alone to think about my feelings." Further, the second type of rumination was associated with cognitive failures and working memory whereas the first, General Rumination, was not. In contrast, rumination by older adults was a unitary construct encompassing all 5 factors derived from the 3 measures of rumination. Older adult rumination, like Ruminative Responses by young adults, was associated with cognitive failures although not with working memory. This dedifferentiation in the construct of rumination throughout the lifespan is intriguing and

merits further research. The finding that that rumination in young adults involves 2 separate constructs is also intriguing since prior studies of rumination have rarely administered all 3 rumination scales.

The structure of rumination in young and older adults also differed in other ways. For young adults, both types of rumination were negatively associated with inhibition. The findings suggested that those young adults who reported more rumination also experienced greater interference on the inhibition tasks, reflecting a breakdown of their ability to inhibit distracting or irrelevant information. These results are similar to those reported Davis and Nolen-Hoeksema (2000) who found that young adult ruminators made more perseverative errors on the WCST than nonruminators. However, rumination by older adults was not associated with inhibition. Since Hasher and Zacks (Hasher, Stoltzfus, Zacks, & Rypma, 1991; Hasher, Stoltzfus, Zacks, & Connelly, 1994; Li, Hasher, Jonas, Rahhal & May, 1998; Carolson, Hasher, Connelly, & Zacks, 1995) report that older adults experience a breakdown of inhibition, this finding is surprising. It suggests that although older adults may have learned to suppress negative thoughts and to avoid brooding on past events, they still experience other forms of inhibitory breakdown when distracting or irrelevant information is presented.

Rumination by young and older adults was similar in one regard. In both age groups, ruminators reported experiencing more cognitive failures than to non-ruminators. The persistent negative thoughts that a ruminator experiences may drain cognitive resources and cause them to forget people's names, misplace items, or fail to notice signs. It remains a challenge to distinguish these everyday cognitive failures from those due to

inhibitory breakdown as assessed by the Stroop, Trail Making, and Wisconsin Card Sorting tasks.

There have only been a handful of studies investigating rumination in older adults (D'Hudson & Saling, 2010; Ingersoll-Dayton, Torges, & Krause, 2010; Torges, Stewart, & Nolen-Hoeksema, 2008; Phillips, Henry, Hosie, & Milne, 2006). One of the biggest difficulties in investigating lifespan changes to rumination is the diversity of ways researchers define rumination. Some researchers approach rumination from a clinical perspective that emphasizes how maladaptive it is, focusing on its relationship to depression. These researchers tend to assess rumination using the RSS. Others distinguish rumination from depression and focus instead, on repetitive thoughts, assessing rumination using the RRS and its component factors of Brooding and Reflection. The results of the present study suggest that rumination by young adults may be differentiated into one form of rumination linked to depression, General Rumination, and another form, Ruminative Responses, that is not linked to depression. However, rumination by older adults is associated with depression.

This study also sought to extend this focus on emotional affect and rumination by including 2 other mood assessments, the Life Events Checklist and the Hope Scale. Both were associated with General Rumination by young adults but only Hope was associated with young adults' Ruminative Responses. Only Hope was associated with older adults' rumination. These findings help to confirm that it is not the objective occurrence of negative life events, such as serious accidents, assaults, or life-threatening illnesses, that leads to rumination and depression but subjective responses such as those captured by the Hope scale, e.g., worrying about health or feeling unsuccessful, that are maladaptive.

It is also worthwhile to note the difference between the pilot study and the larger full study reported here in the overall frequency of older adults reporting ruminative thought. In the pilot study, few of the participants reported any form of rumination. These participants all were recruited from a list of previous research participants and all are active members of the community. The larger sample of older adults, however, was recruited from a rural setting and most had never participated in research before. They were also younger and less well educated than the participants in the pilot study although their scores on the Trail Making and Stroop tasks were similar to those in the pilot study. It may be that repeated research participation by the participants in the pilot study had resulted in the self-selection of a happier, less reflective, less broody group of older adults.

There is still work to be done in understanding the effect of rumination on cognitive abilities and the pattern of rumination across the life course. The current study suggests that older adults do engage in rumination but less often than young adults and that the structure of rumination changes with aging. The answer to the initial question that prompted this investigation appears to be "No. An age-related breakdown of inhibitory processes does not result in excessive rumination." Somewhat surprisingly, young adults who experience inhibitory deficits are more likely to ruminate whereas older adults may adopt a positivity bias that reduces rumination yet does not protect from inhibitory deficits when they are confronted with distractions.

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Appendix A: The Ruminative Response Scale

1 – never 2- very rarely 3- occasionally
4- fairly often 5- very often

How often do you…

1. Think about how alone I feel
2. Think I won't be able to do my job/work because I feel so badly
3. Think about my feelings of fatigue and achiness
4. Think about how hard it is to concentrate
5. Think about how passive and unmotivated I feel
6. Analyze recent events to try to understand why I am depressed
7. Think about how I don't seem to feel anything anymore
8. Think Why can't I get going?
9. Think Why do I always react this way?
10. Go away by yourself and think about why you feel this way
11. Write down what I am thinking about and analyze it
12. Think about a recent situation wishing it had gone better
13. Think, Why do I have problems that other people don't have?
14. Think about how sad I feel
15. Think about shortcomings, failings, faults , mistakes
16. Think about how I don't feel up to doing anything
17. Analyze my personality to try to understand why I am depressed
18. Go someplace alone to think about my feelings
19. Think about how angry you are with yourself
20. Listen to sad music
21. Isolate yourself and think about the reasons why I feel sad
22. Try to understand yourself by focusing on depressed feelings

Appendix B: The Rumination on Sadness Scale

1 – never 2- very rarely 3- occasionally
4- fairly often 5- very often

When I am sad, down, or feel blue…

1. I have difficulty getting myself to stop thinking about how sad I am
2. I repeatedly analyze and keep thinking about the reasons for my sadness
3. I search my mind many times to try and figure out if there is anything about my personality that may have led me to feel this way
4. I get absorbed in thinking about why I am sad and find it difficult to think about other things
5. I search my mind repeatedly for events or experiences in my childhood that may help me understand my sad feelings
6. I keep wondering about how I was able to be happy at other points in my life
7. I lie in bed and keep thinking about my lack of motivation and wonder about whether it will ever return
8. If people try to talk to me or ask me a question it feels as though they are interrupting an ongoing silent conversation I am having with myself about my sadness.
9. I question and keep wondering about the meaning of life to find clues that may help me understand my sadness
10. I repeatedly think about what sadness really is by concentrating on my feelings and trying to understand them
11. I get the feeling that if I think long enough about my sadness I will find that it has some deeper meaning and that I will be able to understand myself better because of it
12. I keep thinking about my problems to try and examine where things went wrong.
13. I exhaust myself by thinking so much about myself and the reasons for my sadness.

Appendix C: The White Bear Suppression Inventory

1 – definitely disagree 2 – somewhat disagree 3 – neutral or I don't know
4- somewhat agree 5 – definitely agree

1. There are things I prefer not to think about.
2. Sometimes I wonder why I have the thoughts I do.
3. I have thoughts that I cannot stop.
4. There are images that come to mind that I cannot erase.
5. My thoughts frequently return to one idea.
6. I wish I could stop thinking of certain things.
7. Sometimes my mind races so fast I wish I could stop it.
8. I always try to put problems out of mind.
9. There are thoughts that keep jumping into my head.
10. There are things that I try not to think about.
11. Sometimes I really wish I could stop thinking.
12. I often do things to distract myself from my thoughts.
13. I have thoughts that I try to avoid.
14. There are many thoughts that I have that I don't tell anyone.
15. Sometimes I stay busy just to keep thoughts from intruding on my mind.

Appendix D: The Cognitive Failures Questionnaire

1 – never 2- very rarely 3- occasionally
4- fairly often 5- very often

How often do you…

1. Do you read something and find you haven't been thinking about it and must read it again?
2. Do you find you forgot why you went from one part of the house to the other?
3. Do you fail to notice sign posts on the road?
4. Do you find you confuse left and right when giving directions?
5. Do you bump into people?
6. Do you find that you forget that you've turned off a lighter on the stove or locked the door?
7. Do you fail to listen to people's names when you are meeting them?
8. Do you say something and realize afterwards that it might be taken as insulting?
9. Do you fail to hear people speaking to you when you are doing something else?
10. Do you lose your temper and regret it?
11. Do you leave important letters unanswered for days?
12. Do you find you forget which way to turn on a road you know well but rarely use?
13. Do you fail to see what you want in a supermarket (although it's there)?
14. Do you find yourself suddenly wondering whether you've used a word correctly?
15. Do you have trouble making up your mind?
16. Do you find you forget appointments?
17. Do you forget where you put something like a newspaper or book?
18. Do you find you accidentally throw away the thing you want and keep what you meant to throw away – as in the example of throwing the matchbook and putting the used match in your pocket?
19. Do you daydream when you ought to be listening to something?
20. Do you find you forget people's names?
21. Do you start doing one thing at home and get distracted into doing something else (unintentionally?)
22. Do you find you can't quite remember something although its on "the tip of your tongue"?
23. Do you find you forget what you came to the shops to buy?
24. Do you drop things?
25. Do you find you can't think of anything to say?

Appendix E: The Hope Scale

1 – definitely disagree 2 – somewhat disagree 3 – neutral or I don't know
4- somewhat agree 5 – definitely agree

1. I can think of many ways to get out of a jam.
2. I energetically pursue my goals.
3. I feel tired most of the time.
4. There are lots of ways around any problem.
5. I am easily downed in an argument.
6. I can think of many ways to get the things in life that are most important to me.
7. I worry about my health.
8. Even when others get discouraged, I know I can find a way to solve the problem.
9. My past experiences have prepared me well for my future.
10. I've been pretty successful in life.
11. I usually find myself worrying about something.
12. I meet the goals that I set for myself.

Appendix F: The Life Events Checklist

Have you personally experienced the following events:

1 = no
2 = yes

1. Natural disaster (for example, flood, hurricane, tornado, earthquake)
2. Fire or explosion
3. Transportation accident (for example, car accident, boat accident, train wreck, plane crash)
4. Serious accident at work, home, or during recreational activity.
5. Exposure to toxic substance (for example, dangerous chemicals, radiation)
6. Physical assault (for example, being shot, stabbed, threatened with a knife, gun, bomb)
7. Assault with a weapon (for example, being shot, stabbed, threatened with a knife, gun, bomb)
8. Sexual assault (rape, attempted rape, made to perform any type of sexual act through force or threat of harm)
9. Other unwanted or uncomfortable sexual experience
10. Combat or exposure to a war-zone)in the military or as a civilian)
11. Captivity (for example, being kidnapped, abducted, held hostage, prisoner of war)
12. Life-threatening illness or injury
13. Severe human suffering
14. Sudden, violent death (for example, homicide, suicide)
15. Sudden, unexpected death of someone close to you
16. Serious injury, harm, or death you caused to someone else
17. Any other stressful event or experience

These questions were then repeated with the following prompt and choices:

1. Witnessed it
2. Learned about it from a friend or family member
3. Not sure if it applies to me
4. Doesn't apply to me

Appendix G: Geriatric Depression Scale – Short Form

1. Are you basically satisfied with your life?
2. Have you dropped many of your activities and interests?
3. Do you feel that your life is empty?
4. Do you often get bored?
5. Are you in good spirits most of the time?
6. Are you afraid that something bad is going to happen to you?
7. Do you feel happy most of the time?
8. Do you often feel helpless?
9. Do you prefer to stay at home, rather than going out and doing new things?
10. Do you feel you have more problems with memory than most?
11. Do you think it is wonderful to be alive now?
12. Do you feel pretty worthless the way you are now?
13. Do you feel full of energy?
14. Do you feel that your situation is hopeless?
15. Do you think that most people are better off than you are?

Appendix H: Psychometric Information for Figure 13

Path	**Loading (ψ)**	**Std Error**	**Wald**
GRum – CFQ	0.866	0.050	17.37
GRum – Inhibition	**-0.138**	**0.161**	**-0.85**
GRum – Working Memory	0.119	0.127	0.93
CFQ – Inhibition	-0.193	0.179	-1.94
CFQ – Working Memory	0.196	0.139	1.91
Inhibition – Working Memory	-0.310	0.188	-1.96

Appendix I: Psychometric Information for Figure 14

Path	**Loading (ψ)**	**Std Error**	**Wald**
RRScale – CFQ	0.196	0.143	1.924
RRScale – Inhibition	-0.354	0.118	-3.001
RRScale – Working Memory	0.055	0.151	0.363
CFQ – Inhibition	-0.133	0.122	-1.084
CFQ – Working Memory	0.186	0.140	1.824
Inhibition – Working Memory	0.018	0.131	0.134

Appendix J: Psychometric information for Figure 16

Path	**Loading (ψ)**	**Std Error**	**Wald**
GRum – Depression	0.724	0.077	9.467
GRum – Hope	-0.569	0.111	-5.109
Grum – LEC	0.392	0.144	2.717
Depression – Hope	-0.623	0.111	-5.600
Depression – LEC	0.320	0.153	2.093
Hope – LEC	-0.015	0.173	-0.088

Appendix K: Psychometric Information for Figure 17

Path	**Loading (ψ)**	**Std Error**	**Wald**
RRScale – Depression	0.028	0.146	0.193
RRScale – Hope	-0.165	0.156	-1.957
RRScale – LEC	0.057	0.165	0.347
Depression – Hope	-0.633	0.111	-5.710
Depression – LEC	0.311	0.150	2.078
Hope – LEC	-0.013	0.170	-0.077

Appendix L: Psychometric Information for Figure 21

Path	**Loading (ψ)**	**Std Error**	**Wald**
Rumination – CFQ	0.559	0.090	6.183
Rumination – Inhibition	-0.002	0.175	-0.010
Rumination – Working Memory	0.042	0.134	0.312
CFQ – Inhibition	-0.361	0.164	-2.208
CFQ – Working Memory	-0.051	0.132	-0.383
Inhibition – Working Memory	-0.376	0.177	-2.125

Appendix M: Psychometric Information for Figure 22

Path	**Loading (ψ)**	**Std Error**	**Wald**
Rumination – Depression	0.465	0.109	.275
Rumination – Hope	-0.275	0.133	-2.061
Depression – Hope	-0.435	0.132	-3.287