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THE IMPACT OF CHRONIC STRESS ON STRESS, RUMINATION, MINDFULNESS, AND AGING

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ABSTRACT

Theory suggests that rumination about stressful events can mediate the negative effects of stress by keeping stressful events active in the mind. Existing theories also suggest that increased age is associated with a decrease in rumination and perceived stress. The current study tests the relationship between rumination and perceived stress, as well as how these differ across age. The study uses survey information from individuals living in the Bronx, NY (N=240; 25-65 years old). Rumination and perceived stress were not significantly associated with age. Due to this unexpected result, demographic and chronic stress variables were tested as potential moderators between age and perceived stress. Chronic stress significantly moderated the relationship between age and perceived stress. These findings suggest that previously studied age differences in well-being may disappear in environments with high levels of chronic stressors. This supports a new theory of socioemotional aging that identifies conditions where older individuals do not experience higher well-being than younger adults.

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Chapter 1

Introduction

There are generally two styles of thinking. Thoughts can be present-focused or not "in the moment." Present-focused thinking is related to the concept of mindfulness, defined as "a heightened state of involvement and wakefulness or being in the present" (Langer & Moldoveanu, 2000, p. 2). Conversely, thinking may not be present focused but could instead center around the future or the past. This type of thinking can be positive and adaptive, such as reminiscing or planning ahead. However, it can often be negative. An example of negative past-focused thinking is rumination, or "a class of conscious thoughts that revolve around a common instrumental theme and that recur in the absence of immediate environmental demands requiring the thoughts" (Watkins, 2008, p. 164). Thinking can also be future focused; worry is a type of repetitive thinking about future potential threats, often negative in affect and uncontrollable (Watkins, 2008).

These different types of thinking tendencies are related to a range of physical and mental health outcomes. Mindfulness is generally related to positive outcomes, such as lower depression, anxiety, and even medical symptoms such as pain and functional quality-of-life (Grossman, Niemann, Schmidt, & Walach, 2004). Rumination and worry, on the other hand, are generally associated with negative outcomes. Worry is associated with increased negative affect, lower cognitive function, and deregulation of physiological processes (Watkins, 2008) as well as symptoms of stress (Roussis & Wells, 2008; Olatunji, Broman-Fulks, Bergman, Green, & Zlomke, 2010). Rumination is strongly correlated with worry (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Rumination is also associated with negative outcomes, including depressive symptoms and anxiety, inhibited problem solving and instrumental behavior,

reduction of social support, and escapist behaviors (i.e. binge eating, drinking, etc.) Of particular importance, both rumination and worry have been hypothesized to contribute to chronic stress through prolonging a negative response to stressful events (Brosschot, Gerin, & Thayer, 2006).

There are substantial individual differences in the proclivity to worry and rumination, as well as variability in their effects on health. One important factor that may contribute to these differences is age. This may occur in two ways: age may affect the tendency to engage in negative repetitive thinking (Gould & Edelstein, 2010; Giambra, 1977), and age may also moderate the relationship between negative thought tendencies and prolonged emotional distress (Blanchard-Fields, 2007). Thus, as people age, their style of thinking may change (i.e. they may ruminate more or less), as well as how their worries or rumination contribute to their stress. Theories of adult development and aging, such as Socioemotional Selectivity Theory, offer several reasons why age may have this effect. This paper examines the relationship between thinking styles, conceptualized as rumination and mindfulness, and perceived stress, with age as a moderating factor. This paper also examines factors that may explain age as a moderator of this relationship. Stress is a topic of major concern because it is related to detrimental health outcomes when prolonged (Rosengren et al., 2004). Age and rumination may be factors that affect whether stress becomes prolonged and thus are important topic to study in conjunction with one another.

Terminology

Before reviewing the literature, it is useful to review the terminology used to describe different types of repetitive thinking. *Repetitive thought* is often defined as the "process of thinking attentively, repetitively, or frequently about one's self and one's world" (Segerstrom,

Stanton, Alden, & Shortridge, 2003, p. 909). Repetitive thought can be constructive or unconstructive and can take many forms, including worry and rumination (Watkins, 2008). *Worry* is a type of repetitive thinking about future threats that may or may not exist. According to Watkins, it can also be constructive or unconstructive depending on its duration and controllability (Watkins, 2008). *Rumination* is also a type of repetitive thinking, defined as "the process of thinking perseveratively about one's feelings and problems rather than in terms of the specific content of thoughts" (Nolen-Hoeksema et al., 2008, p. 400). While worry tends to be more future-focused, rumination tends to concentrate on the past. Additionally, unlike worry, rumination is most often considered to be unconstructive. Its unconstructive nature and association with perceived stress in past studies contribute to its inclusion in this study as a variable related to stress and aging.

The Association Between Rumination and Stress

Rumination plays a key role in the stress process by keeping stressful thoughts in the mind even after the stressful event has occurred. This is known as the theory of perseverative cognition. Brosschot defines perseverative cognition as "the repeated or chronic activation of the cognitive representation of stress-related content" (Brosschot, Pieper, & Thayer, 2005, p. 1045). According to the theory, rumination is one type of thinking that leads to this repeated activation of stress. Perseverative cognition theory also states that the repeated activation of stress can eventually lead to disease by sustaining physiological responses to the stressor, such as increased heart rate (Brosschot et al., 2006). For example, an individual may experience a car accident that causes him a great deal of stress. During the weeks following the accident, he ruminates about the accident, playing over the details repeatedly in his mind. Every time he thinks about the

accident, his body responds physiologically to the stress of the accident, increasing his heart rate. This puts him at a higher risk for illness. Perseverative cognition theory suggests that not only is rumination related to stress, but this relationship may also be detrimental to one's health.

A second effect of rumination is that it may indirectly affect perceived stress by interfering with resources to handle stressful events. Nolen-Hoeksema theorized several mechanisms in which rumination prolongs distress: Rumination interferes with problem solving and instrumental behavior, leading individuals to respond more poorly to stress. Additionally, rumination is associated with a decrease in social support, an important resource in managing stressful events (Nolen-Hoeksema et al., 2008). In addition, Wrosch & Heckhausen found that intrusive thoughts, like rumination, are associated with decreased life satisfaction and self-esteem, which may impact problem solving (Wrosch & Heckhausen, 2002). There are also links between rumination and cognitive interference. Cognitive interference, similar to rumination, involves thought that is not present-focused, though not necessarily negative in valence. Stress-related cognitive interference occurs when thoughts of stress interfere with resources to perform other tasks. In a study of older adults, stress-related cognitive interference was strongly associated with poorer working memory, processing speed, and episodic memory (Stawski, Sliwinski, & Smyth, 2006). This inhibited cognitive function may interfere with the ability to handle stressful events.

There is a third link between rumination and stress in how both of these negative thought processes originate in the mind. According to self-regulation theories of rumination, "self-focused rumination is initiated by perceived discrepancies between one's current state or situation and a goal or desired state" (Nolen-Hoeksema et al., 2008, p. 414-415). For example, an individual who was recently fired from his or her job might very likely perceive a discrepancy

between the desired state of having a job and the current state without one. This discrepancy may function as a source of emotional distress as well as rumination. There have been several studies examining the concept of self-regulation as it relates to rumination, particularly in the achievement of goals. In one study, which measured rumination, goal importance, and goal success on a daily level, goal success was negatively associated with rumination. Furthermore, the interaction between goal importance and goal success was associated with rumination (Moberly & Watkins, 2010). In another study, using a daily diary method, participants reported more repetitive thinking on negative events related to personal goals rather than negative events that were not related to goals (Lavallee & Campbell, 1995). The origins of stress are similar to the origins of rumination as proposed by self-regulation theories.

A key feature of stress involves a discrepancy between perceived demands and one's capacity to meet those challenges. In both stress and rumination, there is a discrepancy between some aspect of current self and a future state. There is also an element of reappraisal in both stress and rumination. Stress involves an initial appraisal, which evaluates whether the event is a threat, and a secondary appraisal, which evaluates personal resources available to face this threat. An event will be considered stressful if an individual perceives an insufficient amount of resources to handle the threat. After the initial appraisal, there may be many subsequent secondary appraisals after any changes in environment or personal resources (Lazarus & Folkman, 1984). An individual iteratively weighs the demands of the stressor with his or resources, appraising the effectiveness of the response to determine the current level of stress. If the response has been effective, the appraisal is positive and the stress should go away. If the response has been ineffective, the appraisal is negative and the stress and reappraisal process will continue. Similarly, repetitive thinking, such as rumination, involves a "process of thinking

attentively, repetitively or frequently about one's self and one's world" (Segerstrom et al., 2003, p. 909). Rumination reappraisals differ from stress reappraisals in that they are not directed toward achieving a goal and thus are less likely to discontinue than stress reappraisals. Regardless, rumination and stress are both processes of reappraising environment and personal resources, as well as any discrepancies between them.

Mindfulness and Stress

In contrast to rumination, mindfulness is a style of thinking that focuses entirely on the present. It was defined by Bishop et al. as present-centered awareness in which an individual acknowledges and accepts each thought without judgment (Bishop et al., 2004). The concept of mindfulness was first applied to intervention science through interventions known as Mindfulness-Based Stress Reduction (MBSR). MBSR was first developed by Jon Kabat-Zinn in 1979, with the goal of reducing stress and the negative emotional and physiological effects associated with it, such as chronic pain and behavioral disorders (Kabat-Zinn, 2003). Since then, mindfulness has been shown to be an effective method to reduce stress in countless studies and populations. University students who receive MBSR have reported less perceived stress (Palmer & Rodger, 2009; Beddoe & Murphy, 2004; Weinstein, Brown, & Ryan, 2009). The same is true for adult hospital patients (Dobkin & Zhao, 2011; Baer, Carmody, & Hunsinger, 2012). A combination of mindfulness and cognitive behavioral therapy was shown to decrease stress in older adults as well (Splevins, Smith, & Simpson, 2009). MBSR has also improved health and psychological outcomes in older adults, such as immune regulation (Gallegos, Hoerger, Talbot, Krasner, et al., 2013) and depressive symptoms (Gallegos, Hoerger, Talbot, Moynihan, & Duberstein, 2013).

In a state of mindfulness, the focus on thoughts is intentional, contrasting with rumination in which focusing on thoughts happens outside of the individual's control. This is known as self-regulation of attention (Bishop et al., 2004). Furthermore, whereas ruminative thoughts are negative in valence, mindfulness avoids judgment of thoughts. Teasdale suggests that mindfulness actively combats rumination by becoming aware of ruminative thoughts and intentionally dispelling these thoughts from the mind (Teasdale, 1999). In fact, Paul et al. found that during stressful events, mindfulness correlated negatively with rumination, suggesting that mindfulness protects individuals from rumination during stressful events (Paul et al., 2012). Though the positive psychological, emotional, and health benefits of mindfulness training have been well-established, there is little research on mindfulness as a *trait* and how this changes with age. Thus, it is less known whether older adults are more mindful than younger adults.

Rumination and Age

Several studies measuring similar constructs to rumination have shown that intrusive thoughts, such as rumination, decrease with age. Gould examined worry, which is correlated with rumination, as it relates to age. The authors found that older adults have lower levels of uncontrollable worry and also less frequent worry than younger adults. Older adults also worried less about interpersonal problems (Gould & Edelstein, 2010). Giambra examined daydreaming about the past, defined as an intrusion of a thought that reflects a tendency to think more about the past. Rumination is also an intrusive thought that is past-focused. Giambra's study found that older adults do not daydream about the past any more than younger people do (Giambra, 1977).

Drawing from socioemotional theories of aging, age may also moderate the relationship between rumination and stress. Socioemotional Selectivity Theory suggests that older adults may

be less likely to ruminate because they are better at regulating emotions, particularly about the past. According to SST, as time remaining in life decreases (a result of aging), people emphasize feelings and emotions, pursuing emotion-focused social goals as opposed to knowledge-based goals (Carstensen, 2006). These emotion-focused goals are more often present oriented, as opposed to more future focused knowledge-based goals. Fredrickson and Carstensen performed a study in which younger and older adults were presented with a situation: the participants can have coffee with anyone on this list for a half an hour. The participants were then asked to sort the cards based on how much they would like to interact socially with the individuals on the cards. The cards ranged from close family and friends to strangers, such as favorite author or musician. Older adults ranked close family and friends higher, whereas younger adults ranked authors and musicians higher. The results of this study suggest that older adults may emphasize emotion-focused goals (being with family and friends) rather than knowledge-focused goals (meeting a favorite author) (Fredrickson & Carstensen, 1990). In another study, emotions of one hundred individuals age eighteen to ninety-four years were randomly recorded across a one week period in an experience sampling study (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000). Participants received prompts from an electronic pager five times each day and completed emotion response sheets on their current emotions. In older people but not younger people, periods of highly positive emotional experience were more likely to endure across measurements. Periods of highly negative emotional experience were less likely to endure across measurements. These findings suggest that older adults are better able to regulate negative emotions. The relationship between age and emotion regulation has even been reported in laboratory settings. When shown images with a positive valence, older adults showed greater amygdala activation than seeing negative pictures, which did not occur in younger adults. This

suggests that older adults process negative information less deeply than positive information (Mather et al., 2004).

Strength and Vulnerability Integration is an expansion of SST and states that emotional experience is determined by context (Charles, 2010). According to SAVI, there are certain contexts in which older adults will show advantages in emotion regulation and when they will show disadvantages. Before a negative event, older adults have higher emotional well-being. This is due to older adults' tendency to report higher well-being in general, a result of their relative strengths in emotion regulation. During a negative event, older people experience more stress due to age-related vulnerabilities in physiological flexibility. After a negative event, older adults have higher well-being because of attentional, appraisal, and behavioral emotion regulation strategies that are associated with advancing age, as described by SST. The fact that older adults tend to ruminate less may also contribute to older adults' superior post-event emotion regulation. Rumination also involves reappraising situations, and according to SAVI, older adults tend to positively reappraise memories of past events. SAVI suggests that older adults may ruminate less than younger adults.

Socioemotional Selectivity Theory postulates that older adults adjust their lives to have fewer negative experiences. But what about when older adults cannot avoid negative experiences? SAVI asserts that when older adults cannot use reappraisals, any age-related benefits in affective well-being will disappear (Charles & Piazza, 2009). Certain age-related changes in cognition, emotion, and physiology, such as processing speed and impaired mobility, may decrease older adults' ability to avoid stressful events (Charles & Piazza, 2009). Old age is also associated with an increase of stressful events that individuals have little control over, such as chronic illness, spousal caregiving, physical disability, and bereavement (Charles & Piazza,

2009). When this occurs, age-related benefits in emotion regulation will disappear, and older adults may even perform worse than younger adults. This is supported by Piazza, Charles, and Almeida, who found that when people with multiple health conditions experience a daily stressor, older adults with four or more chronic conditions reported the same levels of reactivity to stressors as younger adults (Piazza, Charles, & Almeida, 2007). For some older adults who experience continual exposure to stressors, age may not be associated with improved emotion regulation.

Protective Factors

Literature suggests that age is associated with less stress and less rumination. But why is this the case? One way to think about why age may be a protective factor is that older adults use conscious strategies to reduce distress. As people age, there is a shift from primary control strategies, which focus on actively changing situations, to secondary control strategies, which focus on changing emotional responses to situations (Wrosch & Heckhausen, 2002). For example, a younger adult who is distressed by a problem with a relative may exert primary control by confronting the relative directly in an attempt to solve the problem. Conversely, an older adult who is distressed by a problem with a relative may exert secondary control by choosing to accept the problem and manage his or her emotions in response to the problem. Age is associated with decreased opportunity to change situations due to decreased resources and time remaining (Wrosch & Heckhausen, 2002); thus older adults use secondary control as an adaptive strategy to protect against distress. This is supported by Wrosch, who found that older adults attribute internal control for regrettable incidences less than younger adults, particularly for long-term regrets (Wrosch & Heckhausen, 2002). The shift from primary to secondary

control appears to be beneficial to older adults. Charles and Almeida found that after successfully avoiding an argument, older adults reported less negative affect than younger adults (Charles, Piazza, Luong, & Almeida, 2009). These findings suggest that older adults benefit from shifting away from primary control, such as avoiding confrontations, more than younger adult.

Individuals do not exclusively use one strategy over another; individuals also report combining multiple strategies to solve problems. Similar to primary and secondary control, there is a distinction between instrumental strategies, which involve taking direct action to solve a problem, and passive strategies, which involve suppressing feelings, denial, and withdrawal, rather than trying to change an uncontrollable situation (Blanchard-Fields, 2007). For example, an individual who cannot afford a new car could use instrumental or passive strategies to deal with this problem. The individual could use instrumental strategies for this problem by researching loans and finance options. The individual could also use passive strategies for this problem by convincing himself that he did not want a new car anyway. In one study, older adults tend to use more instrumental strategies, which were more effective strategies, when dealing with instrumental problems such as shopping strategies. Conversely, older adults used more passive strategies during socioemotional problem situations than younger adults did. Older adults also used some instrumental strategies, reflecting an ability to used combined strategies to effectively solve problems (Blanchard-Fields, Chen, & Norris, 1997). It appears as though older adults use different types of strategies to solve problems depending on how controllable the problems are. Passive strategies are most effective for older adults because aging is associated with decreased ability to change events, but instrumental strategies are useful when the problem can be changed.

Another way to think about age as a protective factor is through a life course perspective. Decreased levels of distress are a by-product of normative changes that occur over the adult life course, as opposed to a result of any conscious strategies by older adults. One natural result of getting older is a change in social roles. Retirement is a milestone that occurs for most people in old age and is associated with less exposure to work-related stress, as well as more time to engage in rewarding experience (Charles & Piazza, 2009). Retirement is also associated with increased time to spend with family and has even been shown to improve marital quality when the retirement occurs after a high-stress job (Myers & Booth, 1996). In addition, people tend to treat older adults more kindly than younger adults, which may result in less stress for the older adults (Charles & Piazza, 2009).

Socioemotional Selectivity Theory can also be used to explain a natural shift associated with aging that results in decreased distress. According to SST, the size of social networks decreases with age (Carstensen, Isaacowitz, & Charles, 1999). However, these social networks are concentrated with social partners that older people feel emotionally close with, such as spouses, parents, and siblings. Thus, older adults are less exposed to negative social interactions and therefore may be less exposed to stressful situations that may lead to distress or rumination.

The Present Study

This study will examine the relationships among rumination, mindfulness, and perceived stress, as well as how and why these relationships changes across age. There are three main aims for this study: the first aim will be to examine how rumination and mindfulness relate to perceived stress. The second aim of this study will be to compare two competing hypotheses on how rumination and mindfulness change with age. First, the study will test the hypothesis that

rumination is negatively associated with age, and that mindfulness is positively associated with age. Drawing from research suggesting that constructs similar to rumination, such as worry, decrease with age, it may be that the tendency for more present-focused thinking increases with age. Second, the study will test the hypothesis that age moderates the relationship between both rumination and mindfulness and perceived stress. Theories such as Socioemotional Selectivity Theory and Strength and Vulnerability Integration, as well as research on normative age-related milestones that may decrease stress, suggest that there may be something about getting older that protects individuals from experiencing stress after rumination. The third aim of this study will be to explore any age-related differences in perceived stress and rumination, exploring socioeconomic factors and chronic stress as moderators.

Chapter 2

Methods

Data

The study uses data from the Effects of Stress on Cognitive Aging, Physiology, and Emotion (ESCAPE) study. ESCAPE is an ongoing study designed to measure how unconstructive repetitive thought is related to the effect of stressors on cognition. The study will measure participants every six months for a total of eight "bursts" of measurement, totaling to four years. The current study uses the first burst of data for analysis.

Sample

Participants were recruited by the Albert Einstein College of Medicine. Participants resided in Co-Op City, a housing complex located in the Bronx, NY, at the time of the study. The recruitment procedure consisted of obtaining Registered Voter Lists (RVL) from the New York City Board of Elections for the Co-Op City zip code. A random sample of individuals on the RVL was approached via telephone for participation in the study. To supplement recruitment, newspaper advertisements and community flyers were also used to recruit participants.

Procedure

Participants were contacted via telephone one to two weeks before their lab visit. During this phone call, researchers provided the participant with information about the study, determined participant eligibility, scheduled the first visit, and sent the participant four survey packets. The survey packets contain questions measuring a variety of constructs relating to emotions, stress,

affect, and demographic information. The presemt study uses information from these four packets. During the first visit, participants returned the four survey packets and completed a baseline survey, as well as two cognitive tasks. Participants were also provided with smartphones for completing their daily assessments, as well as saliva collection kits for collecting cortisol information.

If participants successfully completed a trial period, participants were invited to complete fourteen days of phone surveys, identified as daily burst assessments. Each day, the smartphone beeped to prompt the participant to complete a waking survey, end of day survey, and five surveys spread randomly throughout the day. The smartphone surveys measured participants' daily emotions and cognition. Participants also collected saliva samples in order for salivary cortisol information to be analyzed.

During participants' second lab visit, participants returned the smartphones and salivettes. Physiological measures were also taken during this visit, including blood pressure, body measurements, and a blood draw. (Smartphone data, cortisol data, and physiological data are not included in this study.) Participants then completed a debriefing session and a feedback survey, and they received compensation for their participation.

Measures

Rumination. Rumination was measured using the Rumination-Reflection Questionnaire (RRQ) (Trapnell & Campbell, 1999). This 24-item scale assesses the extent to which participants experience unconstructive repetitive thoughts. The scale includes two subscales: rumination and reflection. This study uses the rumination subscale (12 items). Each item is assessed on a scale from 1 (strongly disagree) to 5 (strongly agree). Examples of rumination items include, "I often

find myself re-evaluating something I've done" and "It is easy for me to put unwanted thoughts out of my mind" (reverse-coded). The rumination subscale is scored by calculating the mean of the twelve rumination items. Reliability information for the RRQ can be found in the results section.

Perceived Stress. Perceived stress was measured using the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983). The PSS is a 14-item scale that measures participants' levels of subjective stress during the last month. Each item is scored on ascale from 1 (never) to 5 (very often). Example items include "How often have you been upset because of something that happened unexpectedly?" and "How often have you felt that things were going your way?" (reverse-coded). The total score for PSS is calculated by adding the scores for each item in the scale and subtracting 14 to this total, so a response of "never" for any item becomes a score of zero. Reliability information for the PSS can be found in the results section.

Mindfulness. Mindfulness was measured using the Five Facet Mindfulness Questionnaire (FFMQ) (Bohlmeijer, Klooster, Fledderus, Veehof, & Baer, 2011). The FFMQ is a 24-item scale that assesses five factors of mindfulness: observing (4 items), describing (5 items), acting with awareness (5 items), non-judging of inner experience (5 items), and non-reactivity to inner experience (5 items). Items are measured on a scale from 1 (never or very rarely true) to 5 (very often or always true). Example items include "I perceive my feelings and emotions without having to react to them" and "It seems I am 'running on automatic' without much awareness of what I'm doing" (reverse-coded). The total score for each factor is calculated as a subscale by adding all of the items included in the subscale and dividing by the number of items in the subscale. Reliability information for the FFMQ can be found in the results section.

Chronic Stress. Two chronic stress measures are included in this study: general chronic stress and chronic financial stress. Both of these measures come from the Wheaton Chronic Stress Measure (Turner, Wheaton, & Lloyd, 1995). General chronic stress was measured using the "General" subscale. This subscale consists of three items aimed at measuring global chronic stress. These items are, "You're trying to take on too many things at once"; "There is too much pressure on you to be like other people"; and "Too much is expected of you by others". Financial chronic stress was measured using the "Financial Difficulties" subscale. This subscale consists of five items aimed at measuring chronic financial difficulties. The scale includes subjective items such as "Your rent or mortgage is too much" as well as objective items such as "You have a long-term debt or loan". Reliability information for both subscales can be found in the Results section.

Chapter 3

Results

Analytic Plan

Descriptive statistics were performed on each variable included in the study to assess the means, medians, standard deviations, skewness, kurtosis, and alphas of the variables included in the study. Frequencies of sample demographics (age, gender, race, education, and income) were also calculated to gain a better understanding of the sample. Analysis is then divided into three aims. First, rumination and mindfulness are examined in relation to perceived stress. The relationships between these variables were determined by performing correlations. Second, age is explored as a moderator between both rumination and mindfulness and perceived stress. The moderating relationship was determined by regression analysis. Finally, socioeconomic factors were explored as contributors to this moderation.

Descriptive Statistics

Descriptive statistics for the variables used in the study are displayed below in Table 1. The mean, median, standard deviation, skewness, and kurtosis were calculated for each variable. Perceived stress was unusually high for this sample (mean=25.43), compared to a national average calculated in 2009 (men=15.52; women=16.14) (Cohen & Janicki-Deverts, 2012). All variables have a skewness value of +/- 1. In addition, seven out of nine variables have a skewness value of +/- .50. One of the mindfulness subscales (awareness) has the highest skew (-.64). All variables except chronic financial stress have a kurtosis value of +/- 1.

Cronbach's alpha was also calculated for each measure included in the study. The alpha for each measure is included in Table 1. Out of nine measures, five had an internal consistency of .800 or higher. Several of the mindfulness subscales had lower internal consistencies between .60 and .75 (describing, nonreactivity, and observing). The low alpha score for the general chronic stress subscale could be attributed to the fact that this scale is only made up of three items.

Table 1
Descriptive Statistics

Variable	Median	Mean	Std Dev	Alpha	Skewness	Kurtosis
Rumination	3.17	3.07	0.87	0.92	-0.12	-0.56
Chronic Stress (general)	5.00	5.47	1.70	0.66	0.17	-0.81
Chronic Stress (financial)	10.00	10.05	3.13	0.82	-0.03	-1.14
Perceived Stress	26.00	25.43	7.60	0.84	-0.04	0.01
Describing	3.70	3.68	0.88	0.7	-0.36	-0.22
Awareness	4.00	3.87	0.94	0.81	-0.74	0.13
Nonjudging	3.60	3.61	1.03	0.81	-0.45	-0.46
Nonreactivity	3.20	3.16	0.78	0.61	-0.2	-0.12
Observing	3.75	3.71	0.94	0.74	-0.56	0.08

Sample

The sample represents a range of racial, gender, and age groups. Of the 240 participants, 58 are male (29%) and 145 are female (71%). The age of the sample ranges from 25 years to 65 years, with an average of 47 years. The age variable was split into four categories: younger than 35 years old, 35 to 45 years old, 45 to 55 years old, and over 55 years old. The distribution of ages was relatively uniform except for a slightly higher percentage of individuals in the older age ranges (59% older than 45 versus 39% younger than 45). Distributions for the four age categories are displayed in Table 2.

The majority of the sample is non-white (60%). The category of non-white is broken down further into Black, Hispanic-Black, Asian, and Other. Black is the predominant ethnicity in the sample, with over half of the sample reporting a Black ethnicity. The remaining third of the sample are White. This category is broken down into Caucasian (8% of the total sample) and Hispanic-White (23% of the total sample). When Hispanic-White and Hispanic Black are combined, Hispanic individuals represent 30% of the sample. More detailed information on ethnicity of the sample is displayed in Table 2.

Socioeconomic factors of participants are displayed in Tables 2. Income was split into nine categories, ranging from less than $4,999 to $150,000 or more. The median income was $49,500. Forty-two participants had an income of less than $20,000; eighteen participants had an income of over $100,000. Education was also split into categories: completed grade school or less, some high school or less, completed high school or received GED, some college, completed college, and graduate or professional degree. 95% of the sample completed high school; only ten participants did not complete high school. 41% of the sample completed college or higher.

Table 2

Demographics

Variable	Frequency	Percent
Age Category		
<35 Years	40	16.67
35-45 Years	56	23.33
45-55 Years	70	29.17
>55 Years	74	30.83
Gender		
Male	58	28.57
Female	145	71.43
Ethnicity		
Caucasian	19	7.92
Black	139	57.92
Hispanic, White	54	22.5
Hispanic, Black	18	7.5
Asian	1	0.42
Other	9	3.75
Income		
Less than 4,999	11	5.47
5,000-19,999	31	15.42
20,000-39,000	46	22.89
40,000-59,000	42	20.9
60,000-79,000	24	11.94
80,000-99,000	13	6.47
100,000-149,000	16	7.96
150,000 or more	2	1
Choose not to answer	16	7.96
Education		
Completed grade school or less	1	0.5
Some high school or less	9	4.46
Completed high school or received GED	32	15.84
Some college	76	37.62
Completed college	48	23.76
Graduate or professional degree	36	17.82

AIM 1: Examine how rumination and mindfulness relate to perceived stress.

The first aim of the study is to examine the relationship between rumination and stress, as well as the relationship between mindfulness and perceived stress. To test the relationship between rumination and perceived stress, a correlation was performed between these two variables. Correlations are displayed below in Table 3. As expected, rumination was positively and significantly associated with perceived stress (r=.63, p<.0001). To further illustrate this relationship, a scatterplot is included in Figure 1. As rumination increases, level of perceived stress increases as well. A correlation was also performed between the five factors of mindfulness and perceived stress. All five factors of mindfulness are significantly and negatively correlated with perceived stress: observing (r= -.18, p<.05), describing (r= -.40), p<.0001), awareness (r= -.44, p<.0001), non-judging (r= -.400, p<.0001), and non-reactivity (r= -.31, p<0001). The results show a strong positive association between rumination and perceived stress, as expected. The results also show a strong positive association between three out of the five factors of mindfulness, a relationship that was also expected.

Table 3
Correlations

	1	2	3	4	5	6
1 Perceived Stress						
2 Rumination	0.63**					
3 Observing	-0.18*	-0.01				
4 Describing	-0.4**	-0.41**	0.23*			
5 Awareness	-0.44**	-0.40**	-0.04	0.38**		
6 Non-judging	-0.33**	-0.44**	-0.11	0.34**	0.49**	
7 Non-reactivity	-0.31**	-0.22*	0.54**	0.35**	0.01	.07

Note: *p<.05 **p<.0001

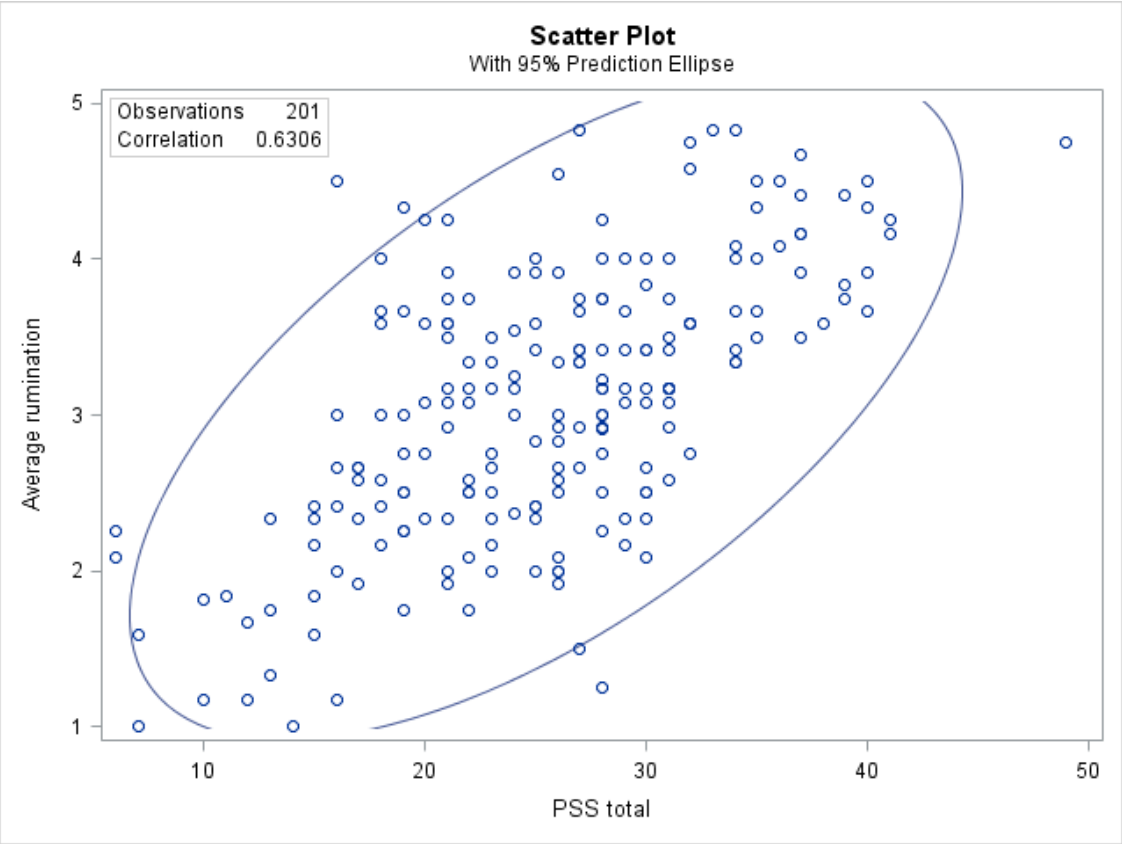

Figure 1. The relationship between perceived stress and rumination

AIM 2: Explore age as a moderator between both rumination and mindfulness and perceived stress.

The second aim of the study is to compare two competing hypotheses on how rumination and mindfulness change with age. The first hypothesis is that rumination is negatively associated with age, and that mindfulness is positively associated with age. The hypothesis was tested by calculating correlations. The results of the correlations are displayed in Table 4. When a correlation was calculated between rumination and age, there was no significant relationship between these variables. Similarly, when a correlation was calculated between age and the five factors of mindfulness, no significant relationships were found between age and any of the five mindfulness factors.

Table 4

Age Correlations

	Rumination	Perceived Stress	Observing	Describing	Awareness	Nonjudging	Nonreactivity
r	-0.06	0.01	0.05	-0.03	-0.02	0.02	0.06
p	0.41	0.90	0.49	0.72	0.81	0.73	0.44

Although age is not significantly correlated with rumination or mindfulness, age may still play a role in the relationships among these variables. The second hypothesis is that age moderates the relationship between both rumination and mindfulness and perceived stress. To test the moderating relationship between these variables, multiple regression analyses were performed between rumination, perceived stress, and age. The results of the regression are displayed below in Table 5. Age does not significantly predict the relationship between rumination and perceived stress (p=.839). Therefore, the hypothesis that age moderates the relationship between rumination and perceived stress was not supported.

Table 5

Age as a moderator between rumination and PSS and mindfulness and PSS

Variable	B	t	p
Rumination*Age	0.02	0.56	0.58
Nonreactivity*Age	.02	.38	.71
Nonjudging*Age	-.05	-.98	.33
Awareness*Age	-.08	-1.69	.09
Describing*Age	.00	.07	.95
Observing*Age	.02	.35	.73

Aim 3: Explore socioeconomic factors as potential moderators between age and perceived stress and rumination.

Although age did correlate with or moderate perceived stress and rumination, other variables may moderate these relationships. Since the sample is so diverse, socioeconomic factors and measures of chronic stress were explored as moderators between age and perceived stress. Multiple regressions were performed to test if education, income, ethnicity, general chronic stress, and chronic financial stress moderated the relationship between age and perceived stress. The results of these regressions are displayed in Table 6. Ethnicity, education, and income were not significant moderators. Both measures of chronic stress, however, significantly moderated the relationship between age and perceived stress. The results of this regression are displayed visually in Figure 2. Both measures of chronic stress also significantly moderated the relationship between age and rumination. The results of this regression are displayed visually in Figure 3. In environments with low chronic stress, older adults experience less perceived stress. In environments with average levels of chronic stress, there is no significant difference between younger and older adults. In environments with high levels of chronic stress, older adults experience more perceived stress than younger adults.

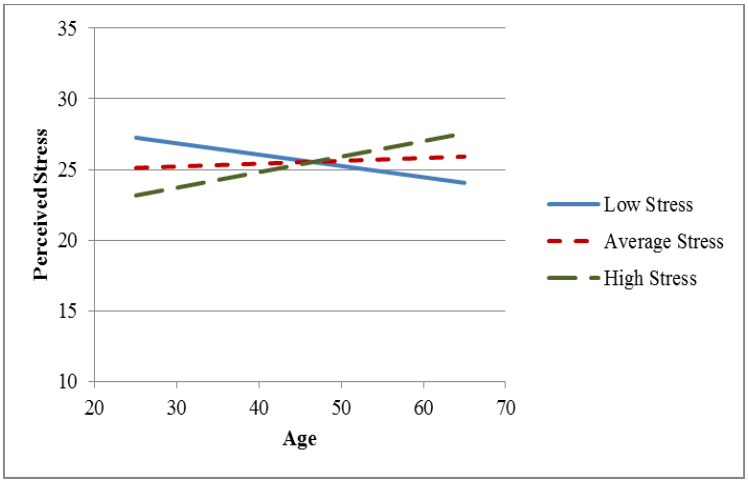

Figure 2. The relationship between age and perceived stress, with chronic stress as a moderator

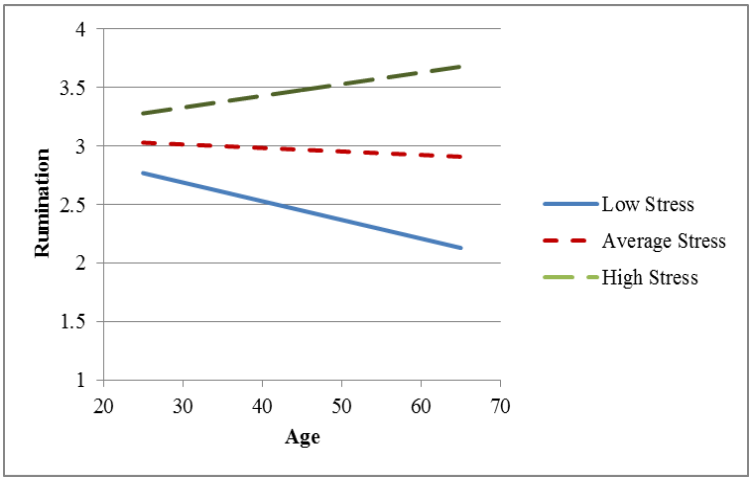

Figure 3. The relationship between age and rumination, with chronic stress as a moderator

Table 6

Socioeconomic and chronic stress moderations

Moderating Variable	B	t	p
Chronic Stress Measures			
Age	0.05	1.19	0.24
Chronic stress (financial)	0.94	5.89	<.0001
Age*Chronic stress (financial)	0.03	2.17	0.03
Age	0.02	0.4	0.69
Chronic stress (general)	2.16	7.59	<.0001
Age*Chronic stress (general)	0.06	2.36	0.02
Education level:			
Age	0.02	0.25	0.8
Less than high school vs. Completed college	-4.44	-1.54	0.12
Completed high school vs. Completed college	-0.06	-0.05	0.96
Age*Less than high school vs. Completed college	-0.02	-0.09	0.92
Age*Completed high school vs. Completed college	0.01	0.08	0.94
Ethnicity			
Age	0.03	0.23	0.82
Black vs. White	0.99	0.56	0.57
Hispanic vs. White	0.97	0.52	0.6
Age*Black vs. White	-0.06	-0.43	0.67
Age*Hispanic vs. White	0.02	0.15	0.88
Income			
Age	0.06	0.51	0.61
<5,000-19,999 vs. >80,000	2.83	1.48	0.14
20,000-39,999 vs. >80,000	1.6	0.86	0.39
40,000-59,999 vs. >80,000	0.02	0.01	0.99
60,000-79,999 vs. >80,000	2.18	1.01	0.31
Age*<5,000-19,999 vs. >80,000	-0.17	-0.96	0.34
Age*20,000-39,999 vs. >80,000	-0.17	-1	0.32
Age *40,000-59,000 vs. >80,000	-0.01	-0.04	0.97
Age*60,000-79,000 vs. >80,000	0.04	0.23	0.82

Chapter 4

Discussion

Discussion of Results

The purpose of the study was to examine how the relationship between rumination and perceived stress changes across age, as well as how the relationship between mindfulness and perceived stress changes across age. Rumination and perceived stress were correlated in the expected way: There was a strong significant positive relationship between rumination and perceived stress. This finding is consistent with perseverative cognition theory, which states that rumination leads to repeated activation of stress. Mindfulness and perceived stress were also correlated in the expected way, with a significant negative relationship between all five measures of mindfulness and perceived stress. This is also supported by literature, which suggests that teaching people to become more mindful can lower stress.

However, age was not related to rumination or mindfulness in the expected way. Literature on constructs similar to rumination, such as worry, suggests that these types of non-present-focused thoughts may decrease with age. As people get older, they may then think less about the past (rumination) and more about the present (mindfulness). In this study, age was not significantly correlated with rumination or any of the five factors of mindfulness. Older adults in this study do not seem to ruminate less than younger adults and are not more mindful than younger adults. However, Socioemotional Selectivity Theory and Strength and Vulnerability Integration, as well as research on age-related milestones, suggest that aging protects individuals from experiencing stress after rumination. In this study, age did not moderate the relationship

between rumination and perceived stress or mindfulness and perceived stress. This is not consistent with SST and SAVI.

In order to explain why age was not related to rumination or mindfulness in the expected way, socioeconomic factors, as well as measures of chronic stress, were explored as potential moderators of the relationship between age and perceived stress. Ethnicity, education, and income did not significantly predict the relationship between rumination and perceived stress or mindfulness and perceived stress. This indicates that the relationship between age and perceived stress does not change solely based on socioeconomic factors such as ethnicity or level of education and income. Two measures of chronic stress were also explored as potential moderators of the relationship between age and perceived stress. General chronic stress and chronic financial stress significantly predicted the relationship between age and perceived stress. These results indicate that in environments with high levels of chronic stressors, such as financial strain, people experience higher levels of stress as they age.

A review of the literature on stress and aging suggests that older adults experience lower levels of stress and rumination. However, the results of this study suggest that in environments with high levels of chronic stress, any age-related benefits in dealing with stress disappear. In other words, older adults are more affected by high levels of chronic stressors and are less able to cope with these stressors than younger adults. These results support Charles' theory of Strength and Vulnerability Integration, a theory that predicts when age will be associated with changes in well-being and when it will not (Charles & Piazza, 2009). Socioemotional Selectivity Theory suggests that older adults actively structure their environment to avoid negative circumstances (Carstensen et al., 1999). However, in situations when older adults cannot use reappraisals or change the situation, age-related benefits in emotion regulation will disappear. These types of

situations are chronic stressors that may increase in likelihood with age, such as chronic illness or disability, caring for a spouse, and losing a loved one. Research by Piazza, Charles, and Almeida, showing that older adults with multiple chronic conditions report the same levels of reactivity to stressors as younger adults, supports this theory (Piazza et al., 2007). Strength and Vulnerability Integration is also supported by Charles, Piazza, Luong, and Almeida, who found that older age was only related to less affective reactivity when arguments were avoided (Charles et al., 2009). However, when arguments were not avoided, these age-related differences in affective reactivity disappeared.

Gallo and Matthews present a framework for understanding the pathways between socioeconomic status, emotion and cognition, and health outcomes. The authors suggest that a low socioeconomic status leads to a decreased reserve capacity (Gallo & Matthews, 2003). This reserve capacity may then act as a moderator between socioeconomic status and increased negative emotion and cognition. In other words, low socioeconomic status is related to negative emotions and cognition because a low socioeconomic environment leads to decreased reserve capacity to handle stressors. Reserve capacity includes tangible factors, such as financial and material goods; interpersonal factors, such as marital stability; and intrapersonal factors, such as self-esteem. Charles and Piazza also allude to reserve capacity factors in the theory of Strength and Vulnerability Integration, suggesting that age-related changes in cognition, emotion, and physiology may impact older adults' ability to avoid stressful events. These changes include decreased processing speed, impaired mobility, and reduced physiological flexibility (Charles & Piazza, 2009).

The results of the current study support this theory of reserve capacity and age. A majority of the individuals in this study live in a low socioeconomic environment, reporting

lower levels of income and education. However, income and education had no effect on the relationship between age and perceived stress, indicating that it is not these socioeconomic factors alone that impact older adults in this study. The individuals in this study are living in a high stress environment, reporting high levels of perceived and chronic stress. Given theories of reserve capacity and Strength and Vulnerability Integration, it is therefore not surprising that the results of this study do not show any age-related benefits in emotional well-being. Under high levels of stress, coping abilities of older adults in this study do not look different from younger adults. Financial strain is a type of tangible factor of reserve capacity that is affected by the socioeconomic status of the individuals in this study and in turn affects ability to cope with high levels of stress.

Limitations

The major limitation in this study is that it only uses one wave of data. This limits the study to cross-sectional analysis. As a result, the study can only examine age differences in rumination, stress, and mindfulness, rather than age changes in these variables. Although all of the individuals in the sample live in the same community, there may be some cohort effects that make older adults living in this community different than younger adults living in this community.

The study also relies entirely on self-report measures and does not examine objective measures of stress, such as cortisol levels, or objective measures of demographic variables, such as income information from census data. Individuals may also be reluctant to report income, ethnicity, or education accurately. Furthermore, the study does not use objective measures of stress. People may report stress differently depending on cultural factors or socioeconomic factors. For example, someone in a middle-class environment may report being late to work as a

stressor, which someone living in extreme poverty may not consider this enough of a stressor to report because they are already overloaded with other, more threatening stressors such as having enough money to buy dinner.

There are no participants over sixty-five years of age in the study. This was done to limit the amount of retired people in the study as well as any participants who may be experiencing dementia. However, including participants over sixty-five years of age would support age-related results and help improve generalizability. Another sampling issue is that all individuals in the sample live in the same neighborhood. While this provides certain benefits, the study would benefit from including individuals living in other areas that may have a higher socioeconomic standard of living. By comparing people of all socioeconomic status levels, the study can say for sure that socioeconomic status, particularly the chronic stressors that are associated with lower status, makes a difference. The same would also be true for including more white individuals in the sample.

Implications for Future Research

The results of this study have major implications for stress research. Research has consistently shown that stress is related to negative health outcomes, including decreased immune function and poor health behaviors. When stress is prolonged, these outcomes may lead to more serious illnesses, such as cardiovascular disease. It is therefore important to understand factors that contribute to prolonged stress, as well as coping strategies that reduce stress. Previous research indicates that age is associated with better coping strategies to reduce stress, but the results of this study suggest that this may not be the case for individuals living with high levels of chronic stress, such as in low socioeconomic environments.

These results are not seen in non-diverse samples that are typically used in research. Studies typically use predominantly white, middle-class samples with low levels of chronic stress. It is therefore imperative to include individuals of diverse socioeconomic status in order to capture the effects of chronic stressors on age and well-being. Financial strain is one factor of reserve capacity that may moderate the relationship between age and stress. With more diverse samples, other potential factors of reserve capacity can be explored to identify exactly what it is about a low socioeconomic status that affects well-being.

Reserve capacity also provides a possibility for intervention. It may be difficult to intervene at the socioeconomic level, such as improving income and education levels, but it may be possible to intervene at the reserve capacity level. In particular, future research should focus on interventions to improve interpersonal and intrapersonal factors. Interventions that target these non-tangible factors, such as marital quality, self-esteem, and decision-making, might be able to lessen the deleterious effects of a low socioeconomic status on well-being. Mindfulness-Based Stress Reduction is another type of intervention that may intervene in the relationship between low socioeconomic status and well-being. In this study, individuals with higher levels of mindfulness reported lower levels of perceived stress. Interventions that teach individuals to become more mindful have consistently shown decreased levels of stress in the group that received the intervention. Future interventions, such as Mindfulness-Based Stress Reduction or interventions targeting reserve capacity, should target older adults experiencing high levels of chronic stress. There are numerous possibilities for groups to focus on, whether these are older adults in low socioeconomic statuses or middle-class older adults caring for an ailing spouse.

Although considerable research highlights positive features of socioemotional aging, such as improved emotion regulation and well-being, these outcomes may only be present for older

adults living in favorable environments. Older adults who live in more adverse settings that contribute to chronic stress do not exhibit these positive outcomes and may be at risk for stress-related physical and mental health problems. Older adults experiencing high levels of chronic stress are a highly overlooked group of individuals that deserve more attention in the field of aging research.

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