Daily Experiences of Older Adults with Mild Cognitive Impairment

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Daily Experiences in Stress, Memory, and Emotion
in Older Adults with Mild Cognitive Impairment

by

Elizabeth Anne Hahn

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
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Key Words: diary study, affect, MCI, older adults, everyday stressors

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Dedication

I want to thank Ian, my parents, and my sisters for their constant support and encouragement during the past four years. I would not be where I am today without them. Thank you Ian, for always telling me that I am smart and capable, that I can do whatever I set my mind to (even if I tell you I don’t think I can do it!). Thank you, mom and dad, for always reminding me that you are proud of my accomplishments and for constantly keeping me motivated by setting such a great example of work ethic and a commitment to doing the best you can do. Thank you, Erin and Jen, for keeping me sane, always giving the best sisterly advice, and being there when I need someone to talk to. I love you all so much, and I am so lucky to have all of you in my life!

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Abstract

Rationale and study aims: Persons with mild cognitive impairment (MCI) experience declines in everyday functioning and cognitive performance greater than what is experienced in normal aging but less than that of dementia. Daily stress and daily memory complaints associated with cognitive deficits may contribute to greater psychological distress in the day-to-day experiences of persons with MCI. However, research examining the occurrence of daily stressors, daily memory complaints and psychological distress in MCI is limited, and it is not clear how the daily processes of stress and affect in persons with MCI compare to cognitively healthy older adults. This dissertation examined the occurrence of daily stressors, daily memory complaints, retrospective and daily well-being in persons with MCI compared to cognitively healthy controls. Main analyses examined whether daily stressors and daily memory complaints were associated with worse daily affect in MCI participants compared to controls, and whether increased daily stress was associated with a greater number of memory complaints.

Methods: The study used a short-term repeated measures design, and included MCI and control participants recruited from a university-based memory clinic. The interviews consisted of a baseline interview and up to eight consecutive days of brief daily phone interviews. The interviews included both retrospective and
daily measures of psychological well-being, daily stressors, daily memory
complaints, and open-ended questions about daily experiences.

Results: Persons with MCI reported a greater number of daily memory
complaints and worse psychological distress, as measured by both retrospective
and daily reports. There were no significant differences between MCI and control
participants, however, in the frequency of daily stressors. In both unadjusted and
adjusted analyses, on days when a participant reported more daily stressors,
you had higher negative affect. The stress-negative affect relationship was
stronger for MCI participants compared to controls. MCI and control participants
who reported more memory complaints, on average, had higher negative affect.

Discussion: Daily stressors were disproportionally associated with greater
psychological distress in MCI participants as compared to cognitively healthy
controls. Interventions targeting the potential distress associated with daily life
may be beneficial for psychological well-being in persons with MCI. Future
research should examine other potential mechanisms of distress in daily lives of
persons with MCI in order to inform relatives and caregivers of persons with MCI,
clinicians who give diagnoses to their patients, and individuals providing
community support for individuals living with MCI.
Chapter One: Introduction

This dissertation study examined multiple aspects of psychological distress in persons with mild cognitive impairment (MCI). Specifically, the study examined whether daily stressors and daily memory complaints experienced by persons with MCI were associated with worse daily affect, whether daily stressors were associated with greater memory complaints, and the possibility of an interaction effect whereby daily stressors and memory complaints were particularly distressing in persons with MCI compared to cognitively healthy older adults. This dissertation first reviews the literature concerning MCI, psychological distress in MCI, and also potential mechanisms and consequences of stress and psychological distress in MCI. Following the introductory review, methods and procedures for the dissertation are described in detail, including study design, recruitment and sampling procedures, measures, and statistical analyses. Finally, results are presented and conclusions based on the findings are discussed.

Mild Cognitive Impairment

MCI is thought to be a state of cognitive functioning characterized by mild declines in cognitive functioning that may be a precursor to Alzheimer’s disease (AD) or other forms of dementia (Petersen, 2004). Compared to other cognitive domains, memory is most commonly affected in MCI (Petersen, 2004). Older adults with MCI have declines that are identified as greater than those of normal
aging processes but that do not qualify for dementia diagnosis (Petersen, 1999; Petersen et al., 2001). The Petersen definition of amnestic-MCI (a-MCI), the most common subtype of MCI, includes five criteria: 1) subjective memory complaints confirmed by informant (if possible), 2) objective memory impairment, 3) global cognitive functioning maintained, 4) functional activities maintained, and 5) no diagnosis of dementia.

Research has demonstrated that persons with a-MCI have about a 44% chance of developing AD within 1-3 years (Schmidtke & Hermeneit, 2008). While almost half of persons with MCI convert to AD, others return to normal functioning and still others remain stable (Ganguli et al., 2011). Persons with MCI with only one cognitive domain affected are more likely to return to normal functioning, whereas those with multiple-domain deficits are more likely to remain stable or convert to dementia (Loewenstein et al., 2009). The heterogeneous nature of an MCI prognosis and an absence of a cure for AD can be overwhelming and potentially anxiety-provoking for patients and families (Whitehouse, 2007; Whitehouse & Juengst, 2005). Some researchers warn that the label may even potentially worsen psychological distress in persons with MCI (Werner & Korczyn, 2008). While there is an extensive literature on depression and other psychological distress among people with dementia (Porta-Etessam, Tobaruela-Gonzalez, & Rabes-Berendes, 2011; Wilson, Begeny, Boyle, Schneider, & Bennett, 2011; Wilson et al., 2003), less is known about psychological distress in MCI. The relatively mild cognitive deficits associated with MCI might be similar to those experienced by many older adults as part of
normal aging and might not be expected to be particularly distressing. However, persons with MCI may also experience distress from the relatively minor impairments and the prospect of these symptoms converting to dementia. MCI may have public health significance not only as a risk factor for dementia, but also as a condition associated with psychological distress and diminished quality of life. This is particularly important in that depression and psychological distress may be associated with greater likelihood of progression of cognitive impairment (Lyketsos et al., 2002; McEwen & Sapolsky, 1995; Simard, Hudon, & van Reekum, 2009). For example, previous research has identified that self-reported feelings of low mood, such as sadness, were associated with increased risk of AD in persons with a-MCI (Caracciolo, Backman, Monastero, Winblad, & Fratiglioni, 2011). Furthermore, while the progression and conversion to AD may have underlying genetic causes, the experience of stress or psychological distress during early stages of pre-dementia cognitive impairment may hasten the timing and onset of AD (Tran, Srivareerat, & Alkadhi, 2010). Given the projected growth in cases of MCI, lack of effective treatments to halt progression of MCI (Petersen et al., 2009), and risk of diminished well-being in relatives of persons with MCI (Blieszner & Roberto, 2010), there is a need for research to address the potential psychological distress that persons with MCI may experience.

**Psychological Distress in MCI**

A majority of the previous research that has examined psychological distress in MCI has focused on neuropsychiatric symptoms or other clinically
relevant measures, such as anxiety or depression (Lopez, Becker, & Sweet, 2005; Lyketsos et al., 2002). A review of 21 studies examining mainly neuropsychiatric symptoms in MCI found that anywhere from 35-75% of persons with MCI may experience at least one neuropsychiatric symptom, most commonly depressive, apathy, anxiety, or irritability symptoms (Apostolova & Cummings, 2008). While persons with MCI were more likely to experience a neuropsychiatric symptom compared to cognitively healthy controls, they were less likely than dementia participants to have such symptoms. Furthermore, approximately half of persons with MCI may have no neuropsychiatric symptoms (Lyketsos et al., 2002). Research suggests that the differences in clinically-significant psychological distress in persons with MCI compared to those with dementia or normal controls may be limited to only a few specific test items, to persons with MCI with more severe cognitive deficits, and the symptoms may be more pronounced in clinic-based samples.

Other, broader perspectives for evaluating psychological distress, such as quality of life, stress and coping processes, or the daily measures of well-being are scarce in the MCI literature. Given the fear some older adults have of a diagnosis of dementia in old age, a broader analysis of psychological distress experienced in early stages of cognitive decline (i.e. MCI) is warranted. A recent review of issues related to MCI addressed a need for future research to examine well-being in persons with MCI including their feelings of life satisfaction and broader measures of well-being (Werner & Korczyn, 2008). This type of research will be necessary to meet the forthcoming social and economic
resources required by an aging population to inform research and supportive services that should be adapted to meet the needs of persons with MCI and their families.

One community-based study examined psychological distress by comparing quality of life in four domains (physical, psychological, social relationship, and environmental) as measured by the World Health Organization Quality of Life scale (WHO QOL) in persons with MCI and controls (Muangpaisan, Assantachai, Intalapaporn, & Pisansalakij, 2008). Persons with MCI were lower in psychological quality of life than cognitively healthy controls. Two clinic-based studies included persons with dementia, persons with MCI and cognitively healthy controls, the MCI and control participants had similar quality of life scores as measured by the Alzheimer’s Disease Related Quality of Life scale (ADRQL; Missotten et al., 2008) and the Dementia Quality of Life Scale (Ready, Ott, & Grace, 2004). In both studies, persons with dementia had significantly lower quality of life than both MCI and cognitively healthy control participants. In a population-based study, persons with MCI were more likely than cognitively healthy controls to have worse mood, lower motivation, and higher anxiety as measured by the Comprehensive Psychopathological Rating Scale (CPRS; Palmer et al., 2007).

In a qualitative study, MCI participants reported feeling frustrated, uncertain about their diagnosis, and embarrassed about their cognitive changes (Frank et al., 2006). Persons with MCI reported greater awareness of changes compared to persons with dementia, and awareness of changes was also
associated with feelings of embarrassment for some participants (Frank et al., 2006). In addition to some studies which suggests risk for psychological distress in MCI, other research has reported relatively healthy levels of depressive symptoms, life satisfaction, sense of mastery, and health status, indicating that levels of some aspects of psychological well-being in MCI and their care partners may be similar to population norms for cognitively healthy older adults (McIlvane, Popa, Robinson, Houseweart, & Haley, 2008). Collectively, the limited research suggests that some aspects of psychological distress may be worse in persons with MCI than cognitively healthy controls but better than persons with dementia. However, research is needed which incorporates aspects of daily life that may contribute to psychological distress to help identify the persons with MCI most at risk for distress.

**Mechanisms for Psychological Distress in MCI**

Understanding mechanisms that could be associated with or contribute to psychological distress in MCI is important for providing intervention and supportive services tailored to the needs of individuals with MCI. There is limited evidence suggesting the possible efficacy of behavioral interventions for alleviating psychological distress in persons with MCI (Hahn & Andel, 2011), and additional research examining the prevalence and mechanisms associated with psychological distress may further inform and improve interventions. In addition to the evidence supporting psychological distress (i.e., depressive symptoms) as part of the underlying disease pathology and a precursor to cognitive decline (Bielak, Gerstorf, Kiely, Anstey, & Luszcz, 2011), there may be aspects of daily
life in persons with MCI that could subsequently increase risk of experiencing distress. After initial symptoms of cognitive decline begin to occur, depressive symptoms or psychological distress may be a reaction to the label of MCI or slight changes to daily life. There is limited or no studies that have examined the daily experiences of persons with MCI in relation to their stress, memory, and affect processes.

Deficits in everyday functioning, daily life stressors, and memory-related changes in MCI may be a source of distress for individuals. While Petersen criteria include “intact” daily functioning as a criterion for MCI (Petersen, 2004), researchers have identified some mild deficits in more complex everyday functioning tasks in MCI that were recognized in a more recent revision of MCI criteria (Artero, Petersen, Touchon, & Ritchie, 2006). Research suggests that persons with MCI perform significantly worse compared to cognitively healthy controls on all domains of everyday functioning tasks (memory, language, visual spatial abilities, planning, organization, and divided attention), and persons with MCI showed the greatest deficits in everyday memory tasks (Farias et al., 2006). Other daily tasks that persons with MCI may have difficulties with include transportation (Peres et al., 2006) and financial tasks (Marson et al., 2003). These studies suggest that persons with MCI may experience difficulties in everyday functioning greater than that experienced in normal cognitive aging (Farias et al., 2006; Kazui et al., 2005) which may be an area of potential focus for examining mechanisms contributing to distress in everyday life; however, research has yet to examine this relationship in persons with MCI. While
stressors in daily life do not equate to psychological distress, per se, the investigation of potential associations between daily life changes, stress, and psychological well-being is warranted as a way to better understand the mechanisms contributing to psychological distress in MCI.

Some research has begun to examine in detail the processes of psychological distress in MCI. In the context of the “ambiguous loss” theory (Boss, 1999), Blieszner and colleagues’ qualitative study examined how the cognitive and behavioral deficits in MCI are associated with changes in daily life. The daily life changes may result in distress both individually for the person with MCI and also within the context of a marital relationship where one partner has MCI (Blieszner, Roberto, Wilcox, Barham, & Winston, 2007). The distress in MCI may be further exacerbated by fluctuations in cognitive functioning that may vary even from one day to the next (Blieszner et al., 2007). Persons with MCI and their care partners expressed that they had developed effective ways to cope with MCI (such as calendars and reminders), that they were open to changing roles and responsibilities within the couple, that they were flexible with daily routines, and that they (the spouse) wanted to preserve the emotional well-being of their partner with MCI (Blieszner et al., 2007). In another qualitative study, in which persons with MCI were the main reporters of the changes they experienced, some participants expressed feeling “relieved” at a diagnosis of MCI while others were either negative or more neutral in their emotional responses to having MCI (Joosten-Weyn Banningh, Vernooij-Dassen, Olde Rikkert, & Teunisse, 2008). Individuals with a-MCI reported experiencing
changes in cognition, but they also reported (and were therefore aware of) changes in motor behavior, mood, energy, and somatic symptoms (Joosten-Weyn Banningh et al., 2008). Participants also reported being upset or irritated with others for either helping them too much or being too concerned for them (Joosten-Weyn Banningh et al., 2008). Research is needed to better understand how experiences in daily life and coping processes may be associated with psychological outcomes in MCI.

An important issue concerning the mechanisms explaining distress in people with MCI is whether the daily stressors they face are completely related to their cognitive impairment or whether they are related to other daily stresses faced by older adults more generally. Even without MCI, older adults report both cognitive stressors (e.g. episodes of forgetfulness; Vestergren & Nilsson, 2011) and broader daily stresses (e.g. coping with health limitations or interpersonal conflict; Stawski, Almeida, Sliwinski, & Smyth, 2008). At present it is not well understood whether MCI tends to exert its effects on well-being mainly through cognitive specific stressors, or whether these may spill over to create additional stresses in daily life. Of additional concern is whether MCI might reduce general ability to manage stress, and make people with MCI less resilient to all stressors, not just those related to cognition.

Psychological outcomes within a daily context is particularly important and a lacking area of research thus far for persons with MCI. Because affect differs from emotion in that it is altered by the day-to-day occurrence of stressors, and the social, psychological, and environmental contexts within which the person
lives, affect may vary from one moment to the next (Cranford et al., 2006). Thus, the study of affect allows researchers to understand how changes in one’s daily life are associated with an aspect of their psychological well-being that also varies within a daily context (i.e., affect). The study of daily processes of affect and the daily context in which one experiences day-to-day stressors necessitates the use of daily diary measures.

**Psychological Effects of Stress**

Stress has been defined as “environmental demands that tax or exceed the adaptive capacity of an organism, resulting in psychological and biological changes that may place persons at risk for disease” (S. Cohen, Kessler, & Gordon, 1997). Lazarus and Folkman describe stressors as events that occur within the context of a person’s life that may exceed the person’s ability to cope using their available resources (Lazarus & Folkman, 1984). Stress and coping theory (Folkman, Lazarus, Pimley, & Novacek, 1987; Lazarus & Delongis, 1983; Lazarus & Folkman, 1984) may provide an appropriate theoretical framework for further research on the role of psychological distress in MCI. To examine both the mechanisms and potential outcomes of psychological distress in MCI, stress and coping theory incorporates the examination of different types of stressors, the subjective experience of how people appraise stressors as significant to their life, as well as outcomes or manifestations of potential stressors for a person’s well-being. Stress and coping theory posits that a better understanding of stress and coping methods can help to explain, understand, and intervene in aging processes.
Since the early 1980s, Lazarus, and colleagues have recommended that stress research should not only be limited to measuring life events that seldom occur within a person’s lifetime (e.g., retirement, widowhood), but that stress research should also examine more common daily events, hassles or stressors (e.g., car trouble, argument with spouse; Folkman et al., 1987; Lazarus & DeLongis, 1983). Because daily stressors are more proximal to a person’s day-to-day well-being, researchers suggest that daily hassles affect well-being in combination with or potentially independent from life event stress. Bolger and colleagues identified everyday stressors as separate and distinct sources of stress that may impact psychological well-being (Bolger, DeLongis, Kessler, & Schilling, 1989), and everyday stressors have been studied increasingly in recent years. Everyday stressors are different from life events in that they are seemingly minor (Almeida, 2005; Bolger et al., 1989). While a single daily stressor may not be associated with poor outcomes, the repeated, or chronic, experience of everyday stressors may accumulate to produce negative psychological outcomes, such as depression or difficulty coping in daily life (S. Cohen et al., 1997). Lazarus and Folkman’s stress and coping theory emphasizes the role of the perception of a stressor when examining the stress and coping process. Daily stressors and the experience of daily memory failures may be particularly stressful and therefore relevant in the MCI population because of repeated exposure and potential increased vulnerability.

The measurement of daily negative affect (NA) and positive affect (PA) is particularly relevant within the context of stress in that continually increased NA,
a common response to a stressor, may be an indicator of future psychiatric
disorder (e.g., clinical depression; S. Cohen et al., 1997). Research examining
daily stressors and their relationship with daily affect has suggested that
individuals who have higher anxiety (van Eck, Nicolson, & Berkhof, 1998), more
neuroticism (Mroczek & Almeida, 2004), or who experience greater global
perceived stress (Stawski et al., 2008) are more likely to have a strong
relationship between stress and affect. Deficits in memory during early stages of
cognitive decline may be distressing for individuals who may fear the progressive
nature of cognitive impairment. Thus, not only are daily stressors associated
with psychological well-being, but experiencing memory failures or reporting
memory complaints may be another type of stressor that is also predictive of
worse psychological well-being, or worse daily affect. However, research is
limited that examines whether persons with MCI differentially appraise daily
stressors or memory complaints in their daily lives, and whether they experience
worse psychological outcomes in relation to stressors.

**Physiological Effects of Stress**

Stress may not only be associated with worse psychological well-being,
but stress may also contribute to worsening of cognitive symptoms. The
experience of a stress initiates the body’s response to stress via the
hypothalamic-pituitary-adrenal (HPA) axis, which results in increased
glucocorticoids (e.g., cortisol; Chrousos, 2000). Continually elevated
glucocorticoids may have detrimental physical and cognitive health effects,
potentially via cardiovascular pathways, and chronic activation of the HPA axis
that may result in the inability to effectively respond to stress (McEwen, 1998). The inflammatory response and chronic increased activation of stress response systems in the body can also result in increased risk of autoimmune, infectious, or inflammatory diseases and can accelerate the body’s aging processes (Chrousos, 2000). Stressors may also illicit a response by the sympathetic-adrenal medullary system (SAM). The SAM response triggers the secretion of hormones, such as epinephrine or norepinephrine, increased blood pressure, increased heart rate, and in the long-term may lead to neurochemical imbalances and potentially damaging effects to heart or immune functioning (S. Cohen et al., 1997). While basal levels of stress hormones may stimulate brain activity, higher levels of hormones experienced during repeated stress may inhibit brain activity. The specific region of the brain thought to be most affected by stress hormones is the hippocampus (McEwen & Sapolsky, 1995), a region largely responsible for memory processes (Tulving & Markowitsch, 1998).

Chronic stressor exposure results in the body’s continued effort to maintain homeostasis, or balance, through a process of allostasis, or a process of bringing the body’s systems to normal levels (Juster, McEwen, & Lupien, 2010). The continued effort to maintain homeostasis in response to chronic exposure to stressors has been termed allostatic load, which McEwen and Stellar define as the “‘wear and tear’ the body experiences when repeated allostatic responses are activated during stressful situations” (McEwen & Stellar, 1993). For example, individuals coping with memory impairment may experience allostatic load due to the continued stressors associated with coping with
declines in cognitive functioning. Allostatic load coincides with the previously described stress and coping theory because the body’s physiological response to stress, via neuroendocrinel mechanisms, is contingent on that person’s appraisal of the stressors as threatening to their wellbeing. Increased stress and in particular, allostatic load, could be associated with outcomes such as cognitive failures or worsening memory, and in persons with MCI this may be particularly relevant.

Previous research has identified intraindividual associations between increased stress and worsening cognitive performance, particularly cognitive tasks requiring one aspect of cognition, attention (Sliwinski, Smyth, Hofer, & Stawski, 2006). In Sliwinski’s and colleagues research, individuals experiencing more stress than they usually do performed worse on lab-based cognitive tasks. When increased cognitive resources are devoted to stressors or negative thoughts, fewer resources can be used to perform cognitive tasks, such as remembering where you placed an item. Similarly, Neupert and colleagues examined the relationship between daily stressors in relation to daily memory complaints in a cognitively healthy older adult sample, and found that participants reported a higher number of memory complaints on days when they had more stressors (Neupert, Almeida, Mroczek, & Spiro, 2006). Research is needed that examines whether a greater number of daily stressors are associated with more frequent daily memory complaints in persons with MCI.

Persons with MCI may have a stronger relationship between increased stress and worse cognitive outcomes because of worry that the daily stressors
are a sign of impending dementia, greater appraisal of the stressors as threatening to well-being, and their MCI-related memory deficits. Souza-Talarico and colleagues examined the relationship between cortisol, a biomarker of stress, and memory performance in persons with MCI and cognitively healthy controls. In their study, cortisol was associated with better memory performance in controls, but cortisol was associated with worse cognitive performance in the MCI group (Souza-Talarico, Chaves, Lupien, Nitrini, & Caramelli, 2010). The authors explain this differing relationship in the MCI group as a result of the awareness of increasing memory complaints in the MCI group that may result in worsening memory and increased cortisol. In line with stress and coping theory, individuals with MCI may perceive memory complaints as a greater threat, and thus appraise them and react to them more severely.

**Gaps in Literature**

Research is needed to better understand the consequences of stress in daily life, as well as the prevalence and potential mechanisms for psychological distress in MCI. Most research to date focuses on neuropsychiatric symptoms in MCI rather than a broader approach to studying other aspects of psychological distress, such as quality of life or other emotions. Research has yet to examine the experience of daily stressors and daily memory complaints in the context of MCI, and specifically whether the frequency and/or severity of daily stressors reported differ in persons with MCI compared to cognitively healthy older adults. Research is also need to address whether stress is differentially associated with psychological distress depending on a person’s cognitive status. As illustrated in
Figure 1.1., certain “resilience or vulnerability factors” (e.g., age, MCI) may influence the stress process (Almeida, 2005).

Figure 1.1: *Daily stress process.* Adapted from previous research (Almeida, 2005)

In addition, research is needed that incorporates both positive and negative aspects of daily life, as well as the person with MCI’s perspective and appraisal of their own experience. A limited number of studies have included cognitively healthy comparison groups, and the results are limited by a lack of consistent criteria for MCI, inadequate control groups, and only a one-time retrospective account of psychological distress often from an informant. A majority of the quantitative research has examined prevalence of distress in MCI as a predictor for cognitive decline, rather than mechanisms and specific factors that may be contributing to distress for individuals with MCI. The research to date suggests that there are potential processes beyond purely cognitive or memory-related symptoms in persons with MCI, such as feelings of shame or
embarrassment, frustration, daily stressors, and uncertainty that may adversely impact the individual. Careful attention to aspects of psychological distress, including emotions, quality of life, and perception of stressful experiences, may provide substantive support for interventions and services for individuals with MCI. Furthermore, it is not clear whether stressors experienced by persons with MCI exacerbate memory deficits in daily life. Based on the gaps in the literature, a specific set of research hypotheses were proposed for the current dissertation study.

**Research Hypotheses**

**Descriptive analyses.**

1. Older adults with MCI will report a greater number of daily stressors and daily memory complaints than controls.

2. Older adults with MCI will report poorer well-being than controls, as measured by both retrospective and daily reports.

**Main analyses predicting daily affect.**

3. Daily stressors (both the total number of stressors and the appraisal of stressors) will be associated with worse daily affect (higher NA and lower PA) in MCI and control participants. The relationship between daily stressors and worse daily affect will be stronger in the MCI participants than the controls.

4. Daily memory complaints (both the total number of memory complaints and the appraisal of memory complaints) will be associated with worse daily affect (higher NA and lower PA) in MCI and control participants. The
relationship between daily memory complaints and worse daily affect will be stronger in the MCI participants than the controls.

**Main analyses predicting daily memory complaints.**

5. Daily stressors (both the total number of stressors and the appraisal of stressors) will be associated with a greater number of daily memory complaints in both groups. The relationship between daily stressors and daily memory complaints will be greater in the MCI participants than the controls.
Chapter Two: Methods

Sample and Recruitment

The study included 15 persons with MCI and 25 cognitively healthy controls recruited from the Alzheimer’s Disease Research Center (ADRC) database at the Byrd Alzheimer’s Institute. All study participants met the following inclusion criteria: 1) willing to complete 1 hour baseline interview or mail in questionnaire; 2) willing to complete 8 consecutive days of 10-minute phone interviews; 3) willing and able to give written informed consent; and 4) have scored at least 25 on a Mini-Mental State Examination (MMSE) or an equivalent score of 20 on the Telephone Interview for Cognitive Impairment (TICS). This latter criterion was included in order to comply with Internal Review Board procedures, to help ensure cognitive ability to provide informed consent, and to eliminate participants who may have developed dementia since their previous cognitive evaluation. Detailed description on the MMSE and TICS are described below in the Measures section. Participants with MCI also had to meet the following criteria: 1) "mild cognitive impairment" diagnosis as determined by the ADRC diagnostic process; and 2) been seen by clinicians at the Byrd Alzheimer’s Center within the current or past year of recruitment (ADRC assessments are conducted annually). Participants who were cognitively healthy were required to meet the above study criteria in addition to having completed a neuropsychiatric evaluation at the Byrd Alzheimer’s Center to determine normal cognitive
functioning within current or past year. For all study participants, exclusion criteria included the inability to speak and write in English language. Compensation included the opportunity to win one of two $25 gift cards by lottery.

The Florida ADRC, funded by an Alzheimer’s Disease Center grant (Potter, 2004), includes individuals who received extensive medical and neuropsychological evaluations. The database included approximately 110 cognitively healthy older adults and 60 persons with MCI. Of these, 99 of whom who were identified by Byrd Institute Staff as either MCI or controls and who participated in extensive neuropsychological testing during the current or previous year of the study were considered eligible for recruitment. Figure 2.1 describes the study recruitment process. During Phase 1 of the recruitment, Byrd Institute staff contacted the 99 individuals over the course of two weeks to obtain permission for their contact information to be given to the current dissertation study. Once permission was obtained, their contact info and testing information was given to Elizabeth Hahn, who then proceeded with Phase 2 of recruitment. A total of 60 individuals agreed to be included in Phase 2 of recruitment, and of those 34 were cognitively healthy controls and 26 were persons with MCI. Of those 60 individuals, 40 agreed to participation and completed study protocol (25 control participants and 15 MCI participants). Chi-square analyses suggested that the MCI and control groups did not significantly differ in their agreement to enroll in the study in Phase 2 (p=0.271).
Figure 2.1. *Recruitment and study sample*

*a* Study protocol is defined as baseline interview and at least one daily interview.

*b* Passive refusal is defined as no response after five attempts.

Given the objectives of the proposed study and the nature of the recruitment procedures with respect to patient privacy laws, the sample size was limited to the number of willing and able patients at the Byrd Alzheimer’s Institute who recently underwent the extensive neuropsychological testing as part of the ADRC study. Additional efforts were made to recruit individuals who were seen
at the Byrd Alzheimer’s Institute Memory Disorders Clinic, including posting signs in the clinic, and handouts that clinicians could give to potential participants. No additional participants were referred to the study with this method.

To ensure proper attention was given to the informed consent procedure, participants with MCI were identified as “vulnerable populations” during the Internal Review Board process (Karlawish, 2003). To promote the participants’ understanding during the informed consent process, the person obtaining informed consent first explained the research verbally and also gave the participant a written copy to take home. In addition, participants were only included in the proposed study if they meet cognitive screening criterion as described in the Baseline Interview Measures section. Given the short nature of the study, subsequent assessments of consenting ability were not deemed necessary. Any indication of unwillingness to participate was observed and respected.

**Study Design**

Upon the participant’s approval, Elizabeth Hahn (EH) then contacted the participants via telephone, explained the study, and set up a time and location. Data collection was completed by both EH and a trained undergraduate assistant. Locations for the informed consent and baseline interview included the participant’s home, the School of Aging Studies at the University of South Florida, or another location conducive to a private interview (e.g., church). If the participant lived more than an hour from Tampa or was otherwise unable to
participate in an in-person baseline interview, the participant was asked if they would prefer to complete the baseline survey by mail.

Following the baseline interview, the participant completed up to eight consecutive days of interview following a daily diary study design. Diary studies use self-reported measurements that participants complete multiple times over a short-period of time, such as multiple times within a day, every day, or multiple times per week (Bolger et al., 1989). Events and experiences that “meaningfully” vary over a short period of time are intended for use in diary designs because in these cases there is variability to be measured and explained via daily reports (Affleck, Zautra, Tennen, & Armeli, 1999; Bolger, Davis, & Rafaeli, 2003). The daily interviews began within approximately two weeks of the baseline interview at a time convenient for the participant and lasted approximately ten minutes per phone call. The study included telephone interviews rather than paper-and-pencil survey methods with the goal of reducing the tendency for missing data. While a potential challenge to daily diary research is the burden associated with participation in multiple days of survey, the daily phone calls were brief and reduced the need for participant travel. Persons with MCI completed between 4-5 interviews, on average, (M=4.67, SD= 2.53) and control participants completed, on average, between 5-6 daily interviews (M=5.60, SD=1.38). Independent samples t-tests revealed no significant differences between the average number of interviews completed in the MCI vs. control participants (p=.127). Table 2.1 illustrates the percentage of participants by cognitive status that completed 1 daily interview, 2 daily interviews, and so on. Consistent with previous
recommendations (Bryk & Raudenbush, 2002), participants were included if they participated in the baseline interview and at least one daily interview. The current study used individuals with at least one day of daily diaries completed because each day of daily interviews is incorporated into the main analyses regardless of the number of total interviews per person and the statistical techniques used in the current study does not necessitate a minimum number of interviews.

Table 2.1
Completion of daily diary interviews by cognitive status

<table>
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<tr>
<th>Number of completed daily interviews, %</th>
<th>MCI n=15</th>
<th>Controls n=25</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
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<tr>
<td>8</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

**Determination of MCI**

A description of the criteria for MCI and the consensus conference for determination of MCI has been described in more detail elsewhere (Duara et al., 2010; Schinka et al., 2010). In the ADRC study, participants and an informant
were interviewed for their clinical history. Participants also underwent clinical and neuropsychological evaluation. MCI was determined through consensus conference with trained geriatricians, neuropsychologists, and neurologists, and followed previous research defining MCI as a state between normal cognitive aging and dementia (Petersen, 1999, 2003). Participants with MCI were identified as scoring 1.5 standard deviations below the mean on at least one cognitive domain for their age and education levels. Following Petersen criteria, they also met MCI criteria only if they showed no significant deficits in functional activities. Participants in the ADRC study were further classified into amnestic (memory domain affect) or non-amnestic (memory domain not affect), and single domain (only one domain affect) or multiple domain (more than one domain affected). For the purposes of the current study and because of the small number of recently tested participants within each of the subtypes of MCI, the MCI subtypes are considered together as one group of MCI participants.

**Baseline Interview Measures**

**Basic demographic information.** During the baseline interview (see Appendix A), demographic information, social factors, and health information were assessed. Demographic information included age, gender, education (highest level completed), race/ethnicity, and marital status. Additional information pertaining to social factors, such as current living arrangement, number of children, and frequency with which participant sees their children, was also assessed. During the baseline interview, participants were asked if a doctor had ever told them if they had any of five medical conditions (high blood
pressure, cancer, heart problems, diabetes, and arthritis). Health problems were considered separately as dichotomous variables [(1) yes or (0) no] for descriptive purposes, but were also considered as a single sum score of health problems, ranging from 0-5. Participants were asked about their perceived risk of AD. Specifically, they were asked, “On a scale from 0-100, how likely do you think it is that you will get Alzheimer’s disease in the next 5 years?” Scores ranged from 0 (no chance at all) to 100 (certain of diagnosis).

Global cognitive status. The MMSE (Folstein, Folstein, & McHugh, 1975) was conducted during in-person baseline interviews. The MMSE covers multiple cognitive domains, and scores range from 0-30 with 30 being the best possible score. A widely utilized cutoff score of 25 (Borson, Scanlan, Chen, & Ganguli, 2003; Kim & Caine, 2002) was used as a screening criterion to help ensure consenting capacity, and was scored as in previous research (Fillenbaum, Hughes, Heyman, George, & Blazer, 1988). When the MMSE was not available from records or the participant was not able to be completed in the in-person baseline interview, then the Telephone Interview of Cognitive Status (TICS; Welsh, Breitner, & Magruderhabib, 1993) was conducted over the phone. The TICS-30 is an 11-item survey with scores ranging from 0-30, with higher scores indicating worse cognitive performance. The TICS-30, which has been adapted from the TICS in previous research, (Langa et al., 2005) is a global cognitive status instrument that has been found to be highly correlated with MMSE (Desmond, Tatemichi, & Hanzawa, 1994). In the current study, a score of 20 on the TICS-30 was used as a cut-off, as it has been determined to be
equivalent with an MMSE score of 25 (Fong et al., 2009). For the purpose of analyses, the TICS-30 scores were converted to MMSE based on previous research (Fong et al., 2009).

**Depressive symptoms.** Participants completed the 20-item Center for Epidemiological Studies-Depression (CES-D) Scale to assess depressive symptomology during the prior week (Radloff, 1977). Items were scored (0) rarely or none of the time, (1) some or a little of the time, (2) occasionally or a moderate amount of the time, and (3) most or all of the time. Positive items were reverse-scored. Scores on the CES-D range from 0 to 60, with higher scores indicating greater depressive symptomology. Depressive symptoms were examined dichotomously, with scores of 16 or higher considered elevated depressive symptoms, consistent with previous research (Lewinsohn, Seeley, Roberts, & Allen, 1997).

**Perceived Stress Scale (PSS).** The 10-item perceived stress scale (PSS; S. Cohen, Kamarck, & Merkelstein, 1983) measures self-reported feelings and thoughts of stress in a person’s life over the past month. Example items include, “In the last month, how often have you been upset because of something that happened unexpectedly?” and “In the last month, how often have you felt confident about your ability to handle your personal problems?” Participants report how often they felt that way, on a scale ranging from (0) never, (1), almost never, (2) sometimes, (3) fairly often, and (4) very often. Positive items were reverse scored. Items were summed, and scores for the PSS ranged from 0-40 with higher scores indicating greater perceived stress.
Life satisfaction (LSI-Z). The Life Satisfaction Index Z was used to assess life satisfaction via self-report on a 13-item scale (Wood, Wylie, & Sheafor, 1969). Participants reported either “agree”, “not sure”, or “disagree” to items such as “As I grow older, things seem better than I thought they would be.” Items were scored as (2) agree, (1) not sure, and (0) disagree for positive items, and the negative items were reverse-scored. Scores range from 0-26 with higher scores indicating greater life satisfaction.

Quality of life. The 12-item Short-Form (SF-12) Health Survey was used to assess both physical health (PCS) and mental health (MCS; Ware, Kosinski, & Keller, 1996). The SF-12 includes six PCS items in four domains (physical functioning, role-physical, bodily pain, and general health) and six MCS items in four domains (vitality, social functioning, role-emotional, and mental health). As part of the SF-12, the participant was asked questions such as “In general, would you say your health is excellent, very good, good, fair, or poor.” Other questions pertain to limitation of activities or problems with daily activities as a result of emotional or physical health problems. The SF-12 was scored using a norm-based method based on previous research (Ware, Kosinski, & Keller, 1995).

Retrospective memory complaints. Self-reported memory complaints during the last month were assessed retrospectively at baseline using the full 35-item version of the self-report memory complaints scale (Sunderland, Harris, & Baddeley, 1983) which has previously been used in adults with severe brain injury. This survey includes questions in five different areas where memory-related problems may occur: speech, reading and writing, faces and places,
actions, and learning new things. Participants self-reported experiencing items either “(4) very often,” “(3) fairly often,” (2) sometimes,” “(1) almost never,” or “(0) never.” All items were summed, and scores ranged from 0-140 with higher scores indicating worse memory complaints.

**Daily Interview Measures**

**Daily affect.** All daily measures are listed in Appendix B. Daily affect was assessed using the Positive and Negative Affect Scale (PANAS; Watson, Clark, & Tellegen, 1988), which includes 6 PA items (e.g., cheerful, calm and peaceful) and 6 NA items (e.g., so sad nothing could cheer you up, hopeless). As part of the PANAS, participants were asked to report how much of the time during the past 24 hours they felt each of the items on a five-point scale, ranging from (0) “none of the time”, (1) “a little of the time,” (2) “some of the time,” (3) “most of the time,” to (4) “all of the time.” The scores for each scale, PA and NA, ranged from 0-24, with higher scores indicating higher PA or NA. For the main analyses in research hypotheses three and four, PA and NA were considered as separate dependent variables for two sets of models.

**Daily stressors and positive events.** Participants were asked to report yes/no to whether they experienced any of 12 negative and 4 positive events within the past 24 hours, a scale adapted from previous research (Bolger et al., 1989; L. H. Cohen et al., 2008). Initially, the participant was asked an open-ended question, “Did anything particularly stressful happen during the past 24 hours?” Specific daily stressor questions followed the open-ended question and included stress related to work, family demands, family member sick or injured,
transportation, finances, spousal conflict, spouse ignoring you, conflict with other family members or friends, or avoiding activities because of health. The scale also incorporated two new stressor questions, “Did someone do too much to help you with something?” and “Did someone not do enough to help you with something?” which were hypothesized to be potentially relevant in a memory-impaired population. Consistent with previous daily diary research (Sliwinski, Almeida, Smyth, & Stawski, 2009), scores for total number of stressors (0-13) and were summed for each day. The initial open-ended question was only included in the measure for total number of daily stressors if it was not included as a specific daily stressor in the follow-up questions in order to avoid repetition in counting events.

In the assessment of positive events, the participant was first asked an open-ended question, “Did anything particularly positive happen to you during the past 24 hours?” Specific positive event questions followed the open-ended question, and consisted of positive experiences while doing work, school, or volunteering events, positive leisure or recreational events, positive interactions with spouse, and positive interactions with other family/friends/others. Positive events were summed for each day, and ranged from 0-5. Similar to daily stressors, the initial open-ended question was only included in the total of daily positive events if it was not included in the specific positive event questions.

If the participant answered yes to experiencing a daily stressor or positive event, the participant was then asked to appraise the event (i.e., how “stressful” or “positive” was the event for them) with the option of answering either (0) “not
at all,” (1) “only a little,” or (2) “a great deal.” Consistent with previous daily diary research (Sliwinski et al., 2009), scores for the appraisal of events were summed for each day. For descriptive purposes in research hypothesis one, the average daily appraisal was calculated by dividing the total appraisal scores by the number of possible stressors or positive events. For multi-level analyses in research hypothesis three and five, z-scores were calculated from the total appraisal scores using PROC STANDARD in SAS Version 9.2.

**Coping.** Participants were also asked whether they used any strategies to “cope” with stress they experienced, and whether or not the coping strategies were “helpful” in lowering their stress. Scores for coping methods were coded as 1 (coping method used) or 0 (coping method not used). Coping methods were additionally scored dichotomously for whether or not they were considered “helpful.”

**Daily memory complaints.** Participants were asked seven questions pertaining to daily memory complaints, a shortened version of the retrospective memory complaints questionnaire used in the baseline interview (Sunderland et al., 1983). The shortened format is similar to measures used in previous daily diary research in older adult populations (Neupert et al., 2006). The seven questions, taken from the full questionnaire (Sunderland et al., 1983) included “In the past 24 hours, 1) Did you go back to check whether you had done something that you meant to do?; 2) Did you find that a word was ‘on the tip of your tongue,’ you knew what it was but could not quite find it?; 3) Did you forget the names of friends or relatives or call them by the wrong names?; 4) Did you forget
something you had just said-maybe say, “What was I talking about?”; 5) While reading, did you forget what the sentence is you have just read and have to re-read it?; 6) Did you forget where you had put something or lose something around the house?; and 7) Did you start to do something, then forget what it was you wanted to do-maybe saying, “What am I doing?” Scores for memory complaints were summed for each day, and ranged from 0-7. Items were chosen based on consultation with several experts on MCI, consensus, face validity and examination of previously collected pilot data.

If the participant answered yes to experiencing a memory complaint, then they were also asked a follow-up question for assessing appraisal, “How stressful was that for you?” Similar to stressor appraisal, answer choices for the follow-up question were (0) “not at all,” (1) “only a little,” or (2) “a great deal.” The total number of memory complaints, ranging from 0-7, and the appraisal of the memory complaints were summed for each day. For descriptive purposes in research hypothesis one, the average appraisal was calculated by dividing the total daily appraisal by the total number of memory complaints (seven). For multi-level analyses in research hypothesis four, the total appraisal scores were converted to z-scores using PROC STANDARD in SAS Version 9.2.

**Statistical Approach**

**Descriptive analyses.** For the first and second research hypotheses in the current study, descriptive statistics were used. Daily stressors, daily memory complaints, and retrospective and daily psychological well-being were statistically compared between the two groups, persons with MCI and controls, using
independent samples t-tests and chi-square analyses (software: SAS Version 9.2). Daily reports of stress, affect, and daily memory complaints were reported for each day, while retrospective measures were reported for each person. To better understand the data, correlations were run for all baseline variables separately by cognitive status.

**Main analyses.** For research hypotheses three, four, and five, a series of multi-level models (MLM) were conducted using PROC MIXED in SAS Version 9.2. MLM has some specific advantages, including the ability to estimate variability within and between persons (Affleck et al., 1999) by taking into account intraindividual (within-person) and interindividual (between-person) processes that may vary with data that is hierarchical in nature, such as repeated measures within a person. MLM also allows for the examination of fixed effects at either the within- or between-person level that may help to explain variance in an outcome variable (Bryk & Raudenbush, 2002). Additionally, MLM allows researchers to examine data from a sample of participants who do not all have the same number or spacing in times of measurement (Bryk & Raudenbush, 2002). The use of empirical Bayes estimates of coefficients (vs. OLS regression estimates) in MLM improves accuracy when there is missing data (Tennen, Affleck, & Armeli, 2005). Because diary studies can be time intensive for participants, the ability to measure a varying amount of data from participants can improve the power and feasibility of using diary data.

In the current study, multi-level analyses examining both within-person (WP) and between-person (BP) processes were conducted. In other words,
analyses were conducted that examined how individuals compare to themselves (WP) and how they compared to others (BP). To perform these analyses, the total scores for daily stressors and daily memory complaints were first summed for each day for each participant (n=207 total days). For WP analyses the total daily score was centered at the mean and this WP variable was used as a predictor. For BP analyses, the person-mean was calculated by averaging each person’s total scores across up to 8 days of daily interviews, and this BP variable was used as a predictor. The same calculations were performed for WP and BP variables for the measures of daily stress appraisal and memory complaint appraisal, except that the total appraisal score was instead a z-score conversion of the total score. Therefore the intraindividual MLM analyses allow the examination of whether an outcome (e.g., NA), is significantly associated with increased stress compared to that person’s typical level of stress, which is henceforth referred to as higher WP stress. In the interindividual analyses, MLM allows the examination of whether individuals who experience more stress, on average, have higher NA, which is referred to as higher BP stress.

Model specifications for all multi-level analyses included maximum likelihood (ML) estimation, an unstructured covariance matrix, and both intercept and time were considered random effects. ML estimation allows the comparison of model fit for nested models, or a sequence of models building upon one another. The -2LL statistic was used to compare model fit, and lower scores indicated better fit. Estimating intercept and time as random effects allows individuals to deviate from the mean intercept, and allows slopes to significantly
vary from the mean slope over time. Unstructured covariance matrices applied to the data do not impose structure on the data. A p-value less than .05 was considered significant for MLM.

**Daily stressors as a predictor of affect.** For research question 3, a series of MLM models estimated the WP fixed effects (number of daily stressors per day) and BP fixed effects (average number of daily stressors per person). Equation 1 below denotes the level-1 equation for the multi-level analyses.

$$Y_{ij} = \pi_{0i} + \pi_{1i} \text{(STRESSORS)} + e_{ij}, \quad (1)$$

Equation 1 estimated whether daily stressors are a significant predictor of daily affect (outcome, $Y_{ij}$). $Y_{ij}$ is the individual level of the outcome variable, daily affect. The intercept, $\pi_{0i}$, is the daily affect for person $i$ at baseline or time 0, and the slope, $\pi_{1i}$, is the daily affect for person $i$ on day $j$ as a function of the number of daily stressors. The error term is denoted as $e_{ij}$. It was hypothesized that daily stressors, would be a significant predictor of both the outcomes of PA and NA. The association of daily stressors and PA was expected to be a negative estimate (greater stress associated with lower PA), and the effect of daily stress and NA was expected to be a positive estimate (greater stressors associated with higher NA). This relationship was hypothesized for both higher WP daily stress and higher BP daily stress; persons who experience more stress than they usually do will have worse daily affect, and persons who experience more stress, on average, will have worse affect. A series of models were also run with daily stress appraisal as a predictor of affect rather than the total number of daily stressors, and similar results were hypothesized.
To estimate the moderating effect of MCI on the relationship between stress and affect, the level 2 equations estimated the interaction term of MCI and stress. The level 2 equations estimated whether having MCI was predictive of a significant difference between groups in the relationship between stress and affect. In the interaction between MCI and daily stressors, it was hypothesized that people with MCI would have a higher estimate, or a stronger relationship between greater stress and worse affect.

**Memory complaints as a predictor of affect.** The analysis of research question 4 was similar to question 3, except that the fixed effect predictor was daily memory complaints, as illustrated in Equation 2.

\[
Y_{ij} = \pi_{0i} + \pi_{1i} (\text{MEMORY COMPLAINTS}) + e_{ij},
\]

Equation 2 estimated whether daily memory complaints were a significant predictor of daily affect (outcome, \(Y_{ij}\)). Similar to Equation 1, \(\pi_{0i}\) is the intercept level of the outcome variable, affect, and \(\pi_{1i}\) is the daily affect for person \(i\) on day \(j\), as a function of daily memory complaints. It was hypothesized that daily memory complaints would be a significant predictor of both the outcomes of PA and NA. The error term is denoted as \(e_{ij}\). Similar to question 3, the effect of daily memory complaints and PA was expected to be a negative estimate (greater memory complaints associated with lower PA), and the effect of daily memory complaints and NA was expected to be a positive estimate (greater memory complaints associated with higher NA). This relationship was hypothesized for both higher WP and BP daily memory complaints; persons who experience more complaints than they usually do will have worse daily affect, and persons who
experienced more memory complaints, on average, would have worse daily affect. A series of models were also run with the appraisal of memory complaints as a predictor rather than the total number of memory complaints, and similar results were expected.

To estimate the moderating effect of MCI on the relationship between memory complaints and affect, the interaction term of MCI and memory complaints was entered into the equation. The level 2 equations estimated whether having MCI was predictive of a significant difference in the association between groups. It was expected that the interaction term of MCI and memory complaints would be a significant predictor of daily affect. Specifically, it was hypothesized that the estimate of the relationship between daily memory complaints and worse daily affect would be greater in the MCI population than the controls.

**Stressors as a predictor of memory complaints.** For research question five, daily stressors were the predictor of the outcome variable (daily memory complaints). Equation 3 below denotes that

\[
Y_{ij} = \pi_{0i} + \pi_{ji} \text{(STRESSORS)} + e_{ij}. \tag{3}
\]

In Equation 3, the outcome variable \(Y_{ij}\), is the number of daily memory complaints for person \(i\) on day \(j\), the intercept \(\pi_{0i}\) is the number of daily memory complaints for person \(i\) at time 0, and the slope \(\pi_{ji}\), is the number of daily memory complaints for person \(i\) on day \(j\), as a function of daily stressors. Similar to Equation 1 and Equation 2, \(e_{ij}\) is the error term. It was hypothesized that the estimate for the association between daily stressors and daily memory
complaints would be positive; increased daily stressors would be associated with increased daily memory complaints. This relationship was hypothesized for both higher WP and BP stress; persons who experience more stress than usual would have a greater number of memory complaints, and persons who experienced more stress, on average, would have a greater number of memory complaints. A series of models were also run with the appraisal of memory complaints as a predictor rather than the total number of memory complaints, and similar results were expected.

To estimate the moderating effect of MCI on the relationship between stress and memory, the interaction term of MCI and stress was entered into the equation. The level 2 equations estimated whether having MCI was predictive of a significant difference between groups. It was expected that the interaction of MCI and stress would be a significant moderator of the relationship between daily stressors and daily memory complaints. Specifically, it was hypothesized that the estimate of the relationship between daily stress and greater daily memory complaints would be greater in the MCI population than the controls.

**Power analyses.** Power analyses were conducted for the sample size (n=40) with two groups, (15 MCI participants and 25 control participants) for research hypotheses 1 and 2 in the current study that included either daily estimates or baseline retrospective data. Post hoc power analyses estimated a power of .71 with a sample of 40 participants, a medium effect size (.36), and a p-value of .05. Because the current study also estimated regression coefficients using MLM primarily at level-1 (daily stressors and daily memory complaints) and
also at level-2, an effective sample size that considers the nature of hierarchical data was calculated based on previous research (Savla, Roberto, Blieszner, Cox, & Gwazdauskas, 2011). For these analyses, we used the 207 total days of analyses and an intraclass correlation coefficient of .60 to calculate an approximate effective sample size of 45 level-2 units, consistent with previous research (Snijders, 2005), which yields a statistical power of .74.
Chapter Three: Results

Descriptive information for the 15 MCI and 25 control participants who completed one baseline and up to eight daily interviews is presented in Table 3.1. On average, participants were 74 years old, mostly female, married, 75% were White, and most participants achieved more than a high school education. Most participants reported living with their spouse, almost all participants had children, and half of participants reported seeing their children weekly or daily. Most participants reported having high blood pressure, a quarter of participants reported either cancer, heart problems, or diabetes, and a little over half of participants reported having arthritis. Participants reported, on average, two out of five health problems and they reported a 36% perceived risk of AD in the next five years. MCI participants were significantly more likely than controls to have more total health problems, to report having diabetes, to report more retrospective memory complaints, and to score lower on the MMSE. The two groups did not differ significantly on the other descriptive variables. Surprisingly, MCI and control participants did not differ significantly on their perceived likelihood of developing AD in the next 5 years.
<table>
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<th>Variable, M±SE or %</th>
<th>All (n=40)</th>
<th>MCI (n=15)</th>
<th>Controls (n=25)</th>
<th>p-value</th>
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<td>Female (%)</td>
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<td>20</td>
<td>20</td>
<td>20</td>
<td>1.000</td>
</tr>
<tr>
<td>Heart problems (%)</td>
<td>27.5</td>
<td>40</td>
<td>20</td>
<td>0.170</td>
</tr>
<tr>
<td>Diabetes (%)</td>
<td>27.5</td>
<td>46.7</td>
<td>16</td>
<td>0.035</td>
</tr>
<tr>
<td>Arthritis (%)</td>
<td>57.5</td>
<td>46.7</td>
<td>64</td>
<td>0.283</td>
</tr>
<tr>
<td>Percent risk of AD diagnosis in next 5 years</td>
<td>35.77±32.97</td>
<td>39.64±34.20</td>
<td>33.60±32.77</td>
<td>0.590</td>
</tr>
<tr>
<td>Retrospective memory complaints</td>
<td>45.60±21.64</td>
<td>56.87±25.21</td>
<td>38.84±16.22</td>
<td>0.022</td>
</tr>
<tr>
<td>MMSE(^3)</td>
<td>27.93±1.53</td>
<td>26.93±1.44</td>
<td>26.52±1.26</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Note. AD: Alzheimer’s disease; M: mean; MCI: MId cognitive impairment; MMSE: Mini-Mental State Exam; SD: standard deviation. \(^3\)For 2 participants, the Telephone Interview for Cognitive Status (TICS) was administered over the phone rather than MMSE, and TICS scores were converted to an MMSE score according to previous research (Fong et al., 2009).
Correlations for all baseline study variables are presented in Table 3.2 by cognitive status. Significant correlates of participant well-being were of particular interest in these analyses. For both persons with MCI and controls, having lower life satisfaction was associated with more retrospective memory complaints. For MCI participants only, a greater number of retrospective memory complaints was also significantly associated with higher perceived stress, a greater number of depressive symptoms, and lower mental health quality of life.

**Research Hypothesis 1: Daily Measures of Stressors, Positive Events, and Memory Complaints**

The daily measures of stressors, positive events, and memory complaints are reported in Table 3.3. Participants reported, on average, between one and two stressors each day, and they reported at least one stressor on approximately 74% of days. Participants reported approximately two positive events per day, and they reported at least one positive event on about 86% of days. Participants reported between one and two memory complaints per day, and they reported a memory complaint on approximately 73% of days. Independent samples t-tests revealed no significant differences between MCI and control participants for the total number of stressors or positive events per day, and chi-square analyses revealed no significant differences for the percentage of days reporting at least one stressor or at least one positive event. There were also no significant differences in the appraisal of daily stressors and daily positive events in MCI and control participants. However, MCI participants reported a significantly greater number of memory complaints each day, and the percentage of days that
MCI participants reported at least one memory complaint was significantly greater than the percentage of days for controls. MCI participants also appraised the memory complaints as significantly more stressful than control participants.

Although there were no significant differences by group in daily stressors or positive events, item analyses were conducted by cognitive status to provide descriptive information that could be of interest in understanding the results. These item level results, displayed in Figure 3.1, must be interpreted cautiously since some of the events did not happen frequently whereas the previous total stressor comparison incorporates all 13 items for 207 days of daily interviews. Only items that were reported by either MCI or controls on at least 10% of days are shown in Figure 3.1. Chi-square analyses for these items revealed that persons with MCI reported significantly fewer “other” stressors, and a significantly greater number of stressors associated with “someone not doing enough to help” and a “spouse ignoring you.” Figure 3.2 displays the specific types of positive events by cognitive status, and reveals that persons with MCI reported significantly fewer positive experiences doing “work or volunteering” and significantly fewer “other positive events.” There were no other significant differences in the item level-comparison for stressors and positive events. In Figure 3.3, individual items for memory complaints are displayed, and chi-square analyses revealed that MCI participants reported significantly more memory complaints for all seven items.
Table 3.2

Summary of intercorrelations for all study variables by cognitive status

<table>
<thead>
<tr>
<th>Measure</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Age</td>
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<tr>
<td>2. Female</td>
<td>-0.249</td>
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<tr>
<td>3. Education</td>
<td>0.203</td>
<td>-0.218</td>
<td></td>
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</tr>
<tr>
<td>4. Race</td>
<td>0.615*</td>
<td>-0.245</td>
<td>0.187</td>
<td></td>
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</tr>
<tr>
<td>5. Married</td>
<td>0.188</td>
<td>-0.387</td>
<td>-0.040</td>
<td>0.257</td>
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<tr>
<td>6. Living alone</td>
<td>0.158</td>
<td>0.327</td>
<td>-0.042</td>
<td>0.031</td>
<td>-0.048*</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>7. Health problems</td>
<td>0.153</td>
<td>-0.076</td>
<td>0.364</td>
<td>-0.315</td>
<td>-0.344</td>
<td>0.328</td>
<td></td>
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</tr>
<tr>
<td>8. Perceived AD risk</td>
<td>-0.258</td>
<td>0.100</td>
<td>-0.037</td>
<td>-0.404*</td>
<td>-0.390</td>
<td>0.396</td>
<td>0.325</td>
<td></td>
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</tr>
<tr>
<td>9. PSS</td>
<td>0.144</td>
<td>0.057</td>
<td>-0.118</td>
<td>0.149</td>
<td>-0.443*</td>
<td>0.442*</td>
<td></td>
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</tr>
<tr>
<td>10. CES-D</td>
<td>-0.163</td>
<td>-0.027</td>
<td>-0.194</td>
<td>-0.107</td>
<td>-0.450*</td>
<td>0.345</td>
<td>0.109</td>
<td>0.338</td>
<td>0.685*</td>
<td>-0.687*</td>
<td>0.206</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. LSI-Z</td>
<td>0.079</td>
<td>0.033</td>
<td>0.346</td>
<td>0.030</td>
<td>0.262</td>
<td>-0.312</td>
<td>-0.164</td>
<td>0.209</td>
<td>0.257</td>
<td>-0.371</td>
<td></td>
<td>0.187</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. SF-12-PCS</td>
<td>0.124</td>
<td>0.072</td>
<td>-0.007</td>
<td>0.049</td>
<td>-0.020</td>
<td>0.042</td>
<td>-0.122</td>
<td>-0.372</td>
<td>0.117</td>
<td>-0.289</td>
<td>0.319</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. SF-12-MCS</td>
<td>0.022</td>
<td>-0.139</td>
<td>0.201</td>
<td>-0.199</td>
<td>0.376</td>
<td>-0.333</td>
<td>-0.123</td>
<td>0.062</td>
<td>-0.469*</td>
<td>-0.279</td>
<td>-0.736*</td>
<td>-0.067</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Retrospective memory complaints</td>
<td>0.087</td>
<td>-0.087</td>
<td>-0.074</td>
<td>-0.141</td>
<td>-0.055</td>
<td>0.081</td>
<td>0.121</td>
<td>0.281</td>
<td>0.122</td>
<td>0.189</td>
<td>-0.429*</td>
<td>-0.297</td>
<td>-0.284</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. MMSE</td>
<td>0.116</td>
<td>0.007</td>
<td>0.129</td>
<td>0.312</td>
<td>-0.112</td>
<td>-0.046</td>
<td>0.328</td>
<td>-0.309</td>
<td>0.184</td>
<td>-0.015</td>
<td>0.33</td>
<td>0.220</td>
<td>0.175</td>
<td>0.498*</td>
<td></td>
</tr>
</tbody>
</table>

Note. *p < 0.05. Correlations for MCI participants (n=15) are presented above the diagonal and correlations for control participants are presented below the diagonal (n=25).
Table 3.3
Daily measures of stressors, positive events, and memory complaints by cognitive status for up to 8 days

<table>
<thead>
<tr>
<th>Variable&lt;sup&gt;a&lt;/sup&gt;, M ± SD or %</th>
<th>All&lt;sup&gt;r=207 days&lt;/sup&gt;</th>
<th>MCI&lt;sup&gt;n=67 days&lt;/sup&gt;</th>
<th>Controls&lt;sup&gt;n=140 days&lt;/sup&gt;</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Daily stressors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of daily stressors</td>
<td>1.29 ± 1.12</td>
<td>1.39 ± 1.36</td>
<td>1.24 ± 0.99</td>
<td>0.369</td>
</tr>
<tr>
<td>Percent cays reported 1+ stressors</td>
<td>74</td>
<td>73</td>
<td>74</td>
<td>0.860</td>
</tr>
<tr>
<td>Average apprais&lt;sup&gt;a&lt;/sup&gt; of daily stressors</td>
<td>0.06 ± 0.11</td>
<td>0.07 ± 0.12</td>
<td>0.06 ± 0.10</td>
<td>0.877</td>
</tr>
<tr>
<td><strong>Daily positive events</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of daily positive events</td>
<td>2.07 ± 1.32</td>
<td>1.89 ± 1.33</td>
<td>2.16 ± 1.31</td>
<td>0.181</td>
</tr>
<tr>
<td>Percent cays reported 1+ positive events</td>
<td>86</td>
<td>82</td>
<td>88</td>
<td>0.263</td>
</tr>
<tr>
<td>Average apprais&lt;sup&gt;a&lt;/sup&gt; of positive events</td>
<td>0.72 ± 0.57</td>
<td>0.70 ± 0.60</td>
<td>0.73 ± 0.65</td>
<td>0.711</td>
</tr>
<tr>
<td><strong>Daily memory complaints</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of memory complaints</td>
<td>1.64 ± 1.54</td>
<td>2.59 ± 1.61</td>
<td>1.19 ± 0.28</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Percent cays reported 1+ memory complaints</td>
<td>73</td>
<td>91</td>
<td>65</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Average apprais&lt;sup&gt;a&lt;/sup&gt; of memory complaints</td>
<td>0.14 ± 0.20</td>
<td>0.26 ± 0.24</td>
<td>0.08 ± 0.16</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Note. MCI: mild cognitive impairment. <sup>a</sup>Average appraisal is defined as the mean of the individual items for appraisal of either daily stressors (12 items), positive events (4 items), or memory complaints (7 items).
Figure 3.1. Daily stressors by type and cognitive status

*Note.* MCI: mild cognitive impairment. Chi-square analyses revealed significant differences by cognitive status at significance level of \( **p<.01 \).
Figure 3.2. Daily positive events by type and cognitive status

Note. MCI: mild cognitive impairment. Chi-square analyses revealed significant differences by cognitive status at significance level of *p<.05.
Figure 3.3. Daily memory complaints by type and cognitive status

Note. MCI: mild cognitive impairment. Chi-square analyses revealed significant differences by cognitive status at significance levels of *p<.05 and **p<.01.
Research hypothesis 2: Retrospective and daily psychological well-being

Table 3.4 illustrates both retrospective and daily reports of psychological well-being for all participants separately by cognitive status. For the retrospective measures of well-being, independent samples t-tests revealed that persons with MCI had significantly higher perceived stress and lower life satisfaction. There was a trend for MCI participants to have higher depressive symptoms (p=0.064) and lower physical health quality of life (p=0.077). Persons with MCI did not differ from controls on mental health quality of life. For the daily measures of well-being, participants with MCI reported significantly lower daily PA and significantly higher daily NA.

Covariates in main analyses

The demographic and descriptive variables (age, gender, education, race, marital status, health problems, and perceived AD risk) were entered into three separate models predicting the three outcome variables (NA, PA, and memory complaints) for research hypotheses 3, 4, and 5 in order to help provide statistical determination of relevant covariates in main analyses in research hypotheses three, four, and five. These results are presented in Table 3.5. In analyses predicting NA, younger age and being White was predictive of higher NA; thus, for all subsequent adjusted models predicting NA, age and race were added as covariates. Table 3.5 shows that younger age, having higher education, being married, and lower perceived AD risk were significantly related to higher PA; therefore, these significant predictors were then added as covariates in subsequent adjusted models predicting PA. The demographic and
descriptive variables were not significant predictors of memory complaints; however, age and education were added as covariates in subsequent analyses predicting memory complaints because of their likely conceptual association with memory. Time was not included as a predictor in any of the analyses because it was not significantly correlated with any of the outcome measures and it was not a variable of conceptual interest in the study. In other words, the current study was not interested in whether participants experience a significant change over time in NA or PA across the 8 days of daily diaries.

**Research hypothesis 3: Daily stressors predicting affect**

A series of unadjusted and adjusted MLMs of daily stressors (both total number of daily stressors and daily stressor appraisal) predicting daily NA are presented in Table 3.6. Results suggest that higher WP daily stress (i.e., days when a person experienced more daily stressors than they usually do), was associated with significantly higher NA. Higher levels of BP stress (individuals who, on average, experienced more daily stressors compared to others) were not associated with significantly higher NA. When the moderating effect of cognitive status with daily stress was added to this model, WP stress was no longer significant but the interaction of MCI and WP daily stress was significant. These results remained after adjusting for age and race. The moderating effect of cognitive status on the relationship between daily stressors and NA is illustrated in Figure 3.4. These results suggest that the relationship between number of daily stressors and higher NA was significantly higher in the MCI group than in
Table 3.4

Retrospective and daily reports of psychological well-being by cognitive status

<table>
<thead>
<tr>
<th>Variable†, M ± SD or %</th>
<th>All</th>
<th>MCI</th>
<th>Controls</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Retrospective psychological well-being</strong></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>n=40 persons</td>
<td>n=15 persons</td>
<td>n=25 persons</td>
<td></td>
</tr>
<tr>
<td>PSS</td>
<td>12.80±6.83</td>
<td>16.13±7.25</td>
<td>10.48±5.71</td>
<td>0.009</td>
</tr>
<tr>
<td>CES-D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Score</td>
<td>16.23±9.52</td>
<td>20.27±11.47</td>
<td>13.80±7.35</td>
<td>0.0064</td>
</tr>
<tr>
<td>Elevated depressive symptoms (% ≥16)</td>
<td>36</td>
<td>53</td>
<td>28</td>
<td>0.109</td>
</tr>
<tr>
<td>LSI-Z</td>
<td>19.33±5.17</td>
<td>16.48±5.65</td>
<td>21.04±3.91</td>
<td>0.014</td>
</tr>
<tr>
<td>SF-12-Mental health</td>
<td>54.24±9.32</td>
<td>52.50±12.25</td>
<td>55.22±7.30</td>
<td>0.458</td>
</tr>
<tr>
<td>SF-12 Physical health</td>
<td>40.79±11.37</td>
<td>36.51±10.34</td>
<td>43.36±12.18</td>
<td>0.077</td>
</tr>
<tr>
<td><strong>Daily psychological well-being</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>n=207 days</td>
<td>n=67 days</td>
<td>n=140 days</td>
<td></td>
</tr>
<tr>
<td>Total daily PA</td>
<td>15.16±5.49</td>
<td>13.10±6.03</td>
<td>16.15±4.94</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Average daily PA</td>
<td>2.52±0.92</td>
<td>2.13±1.01</td>
<td>2.69±0.82</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total daily NA</td>
<td>2.25±4.01</td>
<td>4.00±5.03</td>
<td>1.41±2.09</td>
<td>0.001</td>
</tr>
<tr>
<td>Average daily NA</td>
<td>0.37±0.67</td>
<td>0.66±1.00</td>
<td>0.23±0.35</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Note. CES-D: Center for Epidemiologic Studies-depression scale; LSI-Z: Life satisfaction Index-Z; M: mean; MCI: mild cognitive impairment; NA: negative affect; PA: positive affect; PSS: Perceived stress scale; SD: standard deviations; SF-12: Short form health survey-12 items. †Total PA and NA daily affect are the sums of all 6 PA and 6 NA items for each day, and average daily PA and NA are defined as the mean of the 6 PA and 6 NA items for each day.
the control group. Having a higher intercept, or initial day of reporting NA, was also associated with higher NA.

Table 3.5

*Fixed effects estimates for models of demographic and descriptive information predicting outcome variables (negative affect, positive affect, memory complaints)*

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Negative affect</th>
<th>Positive affect</th>
<th>Memory complaints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>3.39 (1.18)**</td>
<td>4.36 (1.39)**</td>
<td>2.42 (2.55)</td>
</tr>
<tr>
<td>Age</td>
<td>-0.04 (0.02)**</td>
<td>-0.04 (0.02)*</td>
<td>-0.02 (0.04)</td>
</tr>
<tr>
<td>Gender</td>
<td>-0.15 (0.21)</td>
<td>0.43 (0.25)†</td>
<td>0.04 (0.49)</td>
</tr>
<tr>
<td>Education</td>
<td>-0.33 (0.21)</td>
<td>0.58 (0.25)*</td>
<td>-0.55 (0.50)</td>
</tr>
<tr>
<td>Race</td>
<td>0.50 (0.22)*</td>
<td>-0.23 (0.26)</td>
<td>0.36 (0.51)</td>
</tr>
<tr>
<td>Marital status</td>
<td>-0.04 (0.18)</td>
<td>0.58 (0.21)**</td>
<td>-0.16 (0.21)</td>
</tr>
<tr>
<td>Health problems</td>
<td>0.19 (0.09)†</td>
<td>0.07 (0.11)</td>
<td>0.19 (0.22)</td>
</tr>
<tr>
<td>Self-reported % risk of AD</td>
<td>0.00 (0.00)</td>
<td>-0.01 (0.00)*</td>
<td>0.01 (0.01)†</td>
</tr>
</tbody>
</table>

*Note.* **p<.01, *p < 0.05, †p<.0, SE: standard error.

In a series of MLMs of daily stressor appraisal as a predictor of NA, a higher intercept, having MCI, higher WP daily stress appraisal, and higher BP daily stressor appraisal were significantly predictive of increased NA. After adjusting for age and race and adding the moderating effect of cognitive status, results suggest that a higher intercept, having MCI, and the interaction of WP daily stressor appraisal and MCI were significantly predictive of higher NA. The interaction effect of MCI and daily stress appraisal in association with NA is illustrated in Figure 3.5, and suggests that on days when a person with MCI reports higher stress appraisal than they usually do, they have significantly
higher NA as compared to on a day when a control participant reports higher stress appraisal than they normally do.

A series of MLM were run to examine the association of total daily stressors and daily PA (Table 3.7). These results suggest that a higher intercept and lower WP stress (i.e., days when a person experienced a less stress than they usually do) were associated with significantly higher PA. When the interaction effect of cognitive status and daily stressors and relevant covariates were added to the model, only the intercept level of PA remained a significant predictor of PA.

Similar results were found for daily stressor appraisal and PA. Higher intercept and lower WP daily stressor appraisal were predictive of higher PA. After adding the moderating effect of cognitive status and daily stressor appraisal and relevant covariates, only having a higher intercept level of PA was significantly associated with higher PA. There were no moderating effect of MCI in the relationship between daily stressor appraisal and PA.

**Research hypothesis 4: Memory complaints predicting affect**

A series of MLM of daily memory complaints predicting daily NA are presented in Table 3.8. Results suggest that higher BP daily memory complaints are associated with higher NA (i.e., participants who report more memory complaints, in general, have increased NA). These results were no longer significant after adding the interaction effect of cognitive status and memory complaints and controlling for age and race. In analyses examining the appraisal of memory complaints as a predictor of daily memory complaints, only a higher intercept level of NA was significantly associated with higher NA.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unadjusted Model 1</th>
<th>Unadjusted Model 2</th>
<th>Adjusted Model 3</th>
<th>Adjusted Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total number of daily stressors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-0.01 (0.19)</td>
<td>0.09 (0.24)</td>
<td>2.21 (0.92) *</td>
<td>2.99 (0.98) **</td>
</tr>
<tr>
<td>MCI</td>
<td>0.30 (0.17) *</td>
<td>0.08 (0.37)</td>
<td>0.31 (0.37)</td>
<td>0.34 (0.35)</td>
</tr>
<tr>
<td>Within-person stress</td>
<td><strong>0.04 (0.02)</strong> *</td>
<td>0.00 (0.03)</td>
<td>0.00 (0.03)</td>
<td>0.00 (0.03)</td>
</tr>
<tr>
<td>Between-person stress</td>
<td>0.21 (0.13)</td>
<td>0.21 (0.13)</td>
<td>0.21 (0.17)</td>
<td>0.23 (0.16)</td>
</tr>
<tr>
<td>Within-person stress*MCI</td>
<td>0.08 (0.04) *</td>
<td>0.08 (0.04) *</td>
<td>0.09 (0.04) *</td>
<td></td>
</tr>
<tr>
<td>Between-person stress*MCI</td>
<td>0.06 (0.54)</td>
<td>0.00 (0.25)</td>
<td>0.00 (0.25)</td>
<td></td>
</tr>
<tr>
<td>-2 log likelihood</td>
<td>132.5</td>
<td>127.5</td>
<td>122.3</td>
<td>119.2</td>
</tr>
<tr>
<td><strong>Appraisal of daily stressors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>0.25 (0.09) **</td>
<td>0.25 (0.08) **</td>
<td>1.40 (0.8) *</td>
<td>1.94 (0.9) *</td>
</tr>
<tr>
<td>MCI</td>
<td>0.31 (0.15) *</td>
<td>0.29 (0.14) *</td>
<td>0.31 (0.14) *</td>
<td>0.33 (0.13) *</td>
</tr>
<tr>
<td>Within-person stress</td>
<td>0.05 (0.02) **</td>
<td>0.02 (0.02)</td>
<td>0.02 (0.02)</td>
<td>0.02 (0.02)</td>
</tr>
<tr>
<td>Between-person stress</td>
<td>0.54 (0.15) **</td>
<td>0.28 (0.19)</td>
<td>0.23 (0.13)</td>
<td>0.25 (0.19)</td>
</tr>
<tr>
<td>Within-person stress*MCI</td>
<td>0.07 (0.03) *</td>
<td>0.07 (0.03) *</td>
<td>0.07 (0.03) *</td>
<td></td>
</tr>
<tr>
<td>Between-person stress*MCI</td>
<td>0.54 (0.26) *</td>
<td>0.52 (0.27)</td>
<td>0.44 (0.27)</td>
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</tr>
<tr>
<td>-2 log likelihood</td>
<td>121.4</td>
<td>114.5</td>
<td>112.6</td>
<td>111.0</td>
</tr>
</tbody>
</table>

Note: **p < .01, *p < .05; †p < .10; MCI: mild cognitive impairment; NA: negative affect; SE: standard error. **Within-person stress is the individual reports of daily stressors for each day, and between-person stress is the person-level mean over up to 8 days of daily interviews. †Model 3 is adjusted for age. †Model 4 is adjusted for age and race.
Figure 3.4. Interaction of the moderating effect of cognitive status on the relationship between within-person daily stress\(^a\) and NA. MCI: mild cognitive impairment, NA: negative affect, SD: standard deviation; \(^a\)Within-person stress was defined as the total daily number of stressors dichotomized as 1 SD above and below the mean for the purposes of illustrating interaction effects.

Figure 3.5. Interaction of the moderating effect of cognitive status on the relationship between within-person daily stress appraisal\(^a\) and NA. MCI: mild cognitive impairment, NA: negative affect, SD: standard deviation; \(^a\)Within-person daily stress appraisal was defined as total daily daily stress appraisal dichotomized as 1 SD above and below the mean for the purposes of illustrating interaction effects.
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unadjusted Model 1</th>
<th>Unadjusted Model 2</th>
<th>Adjusted Model 3</th>
<th>Adjusted Model 4</th>
<th>Adjusted Model 5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Est (SE)</td>
<td>Est (SE)</td>
<td>Est (SE)</td>
<td>Est (SE)</td>
<td>Est (SE)</td>
</tr>
<tr>
<td>Total number of daily stressors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercep:</td>
<td>2.85 (0.26)**</td>
<td>3.02 (0.33)**</td>
<td>5.15 (1.27)**</td>
<td>4.98 (1.38)**</td>
<td>5.13 (1.22)**</td>
</tr>
<tr>
<td>MCI</td>
<td>-0.31 (0.23)</td>
<td>-0.70 (0.50)</td>
<td>-0.45 (0.51)</td>
<td>-0.55 (0.50)</td>
<td>-0.76 (0.46)</td>
</tr>
<tr>
<td>Within-person stress</td>
<td>-0.09 (0.03)**</td>
<td>-0.06 (0.04)</td>
<td>-0.06 (0.04)</td>
<td>-0.06 (0.04)</td>
<td>-0.06 (0.04)</td>
</tr>
<tr>
<td>Between-person stress</td>
<td>-0.16 (0.18)</td>
<td>-0.30 (0.24)</td>
<td>-0.23 (0.24)</td>
<td>-0.21 (0.23)</td>
<td>-0.15 (0.21)</td>
</tr>
<tr>
<td>Within-person stress*MCI</td>
<td>-0.07 (0.06)</td>
<td>-0.06 (0.06)</td>
<td>-0.06 (0.06)</td>
<td>-0.05 (0.06)</td>
<td>-0.06 (0.06)</td>
</tr>
<tr>
<td>Between-person stress*MCI</td>
<td>0.31 (0.36)</td>
<td>0.15 (0.36)</td>
<td>0.25 (0.36)</td>
<td>0.35 (0.32)</td>
<td></td>
</tr>
<tr>
<td>-2 log likelihood</td>
<td>334.6</td>
<td>332.8</td>
<td>329.9</td>
<td>328.1</td>
<td>315.5</td>
</tr>
<tr>
<td>Appraisal of daily stressors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercep:</td>
<td>2.56 (0.13)**</td>
<td>2.66 (0.13)**</td>
<td>6.31 (1.19)**</td>
<td>6.36 (1.33)**</td>
<td>6.13 (1.25)**</td>
</tr>
<tr>
<td>MCI</td>
<td>-0.32 (0.22)</td>
<td>-0.31 (0.22)</td>
<td>-0.25 (0.20)</td>
<td>-0.24 (0.20)</td>
<td>-0.28 (0.19)</td>
</tr>
<tr>
<td>Within-person stress</td>
<td>-0.08 (0.03)**</td>
<td>-0.09 (0.04)</td>
<td>-0.07 (0.04)</td>
<td>-0.07 (0.04)</td>
<td>-0.07 (0.04)</td>
</tr>
<tr>
<td>Between-person stress</td>
<td>-0.42 (0.22)</td>
<td>-0.33 (0.31)</td>
<td>-0.40 (0.29)</td>
<td>-0.51 (0.28)</td>
<td>-0.30 (0.28)</td>
</tr>
<tr>
<td>Within-person stress*MCI</td>
<td>-0.04 (0.06)</td>
<td>-0.03 (0.06)</td>
<td>-0.03 (0.06)</td>
<td>-0.02 (0.06)</td>
<td>-0.02 (0.06)</td>
</tr>
<tr>
<td>Between-person stress*MCI</td>
<td>0.12 (0.44)</td>
<td>0.22 (0.40)</td>
<td>-0.18 (0.41)</td>
<td>-0.15 (0.40)</td>
<td></td>
</tr>
<tr>
<td>-2 log likelihood</td>
<td>333.3</td>
<td>332.5</td>
<td>324.2</td>
<td>322.9</td>
<td>315.0</td>
</tr>
</tbody>
</table>

Note. **p<.01, *p<.10; MCI: mild cognitive impairment; PA: positive affect; SE: standard error. *Within-person stress is the individual reports of daily stressors for each day, and between-person stress is the person-level mean over up to 8 days of daily interviews. **Model 3 is adjusted for age. *Model 4 is adjusted for age, race, and education. *Model 5 is adjusted for age, race, education, and perceived AD risk.
Table 3.9 shows the results of MLM of daily memory complaints predicting daily PA, and these results suggest that the initial day of diary reporting, or intercept, was the only significant predictor of daily PA. Similarly, in analyses of the appraisal of memory complaints as a predictor, only the intercept level of PA was a significant predictor of PA.

**Research hypothesis 5: Daily stress predicting daily memory complaints**

Results of a series of MLM of daily stressors predicting daily memory complaints are presented in Table 3.10. Having MCI, higher WP daily stress, and higher BP daily stress were significantly associated with a greater number of daily memory complaints. These results suggest that on days when a person experienced more stress than they usually do, they reported a greater number of memory complaints. Also, individuals who in general report more stress, report a greater number of memory complaints. After adding the interaction effect of cognitive status and daily stressors and controlling for age and education, having MCI and higher BP daily stress both remained significant predictors of increased memory complaints. There were no interaction effects where MCI moderated the relationship between daily stressors and daily memory complaints. In analyses of the appraisal of daily stressors as a predictor of memory complaints, having a higher intercept level of memory complaints, having MCI and reporting higher BP daily stress was associated with greater memory complaints.
### Table 3.8

**Fixed effects estimates for models of within-person and between-person daily memory complaints predicting daily NA, Est. (SE)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unadjusted Model 1</th>
<th>Unadjusted Model 2</th>
<th>Adjusted Model 3</th>
<th>Adjusted Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total number of daily memory complaints</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>0.02 (0.13)</td>
<td>0.14 (0.17)</td>
<td>1.93 (0.93)*</td>
<td>2.61 (0.99)*</td>
</tr>
<tr>
<td>MCI</td>
<td>0.06 (0.12)</td>
<td>-0.21 (0.31)</td>
<td>-3.15 (0.30)</td>
<td>0.13 (0.29)</td>
</tr>
<tr>
<td>Within-person memory</td>
<td>0.02 (0.32)</td>
<td>0.01 (0.02)</td>
<td>0.01 (0.02)</td>
<td>0.01 (0.02)</td>
</tr>
<tr>
<td>Between-person memory</td>
<td>0.19 (0.07)*</td>
<td>0.06 (0.12)</td>
<td>0.07 (0.11)</td>
<td>0.06 (0.11)</td>
</tr>
<tr>
<td>Within-person memory*NIC</td>
<td>0.01 (0.04)</td>
<td>0.00 (0.04)</td>
<td>0.00 (0.04)</td>
<td>0.00 (0.04)</td>
</tr>
<tr>
<td>Between-person memory*NIC</td>
<td>0.17 (0.15)</td>
<td>0.17 (0.14)</td>
<td>0.18 (0.14)</td>
<td>0.18 (0.14)</td>
</tr>
<tr>
<td>-2 log likelihood</td>
<td>134.3</td>
<td>133.0</td>
<td>129.3</td>
<td>127.1</td>
</tr>
</tbody>
</table>

| **Appraisal of memory complaints** |                    |                    |                  |                  |
| Intercept                         | 0.28 (0.11)*       | 0.26 (0.11)*       | 2.11 (0.97)*     | 2.61 (1.05)*     |
| MCI                              | 0.21 (0.18)        | 0.21 (0.19)        | 0.29 (0.19)      | 0.32 (0.19)      |
| Within-person memory             | 0.03 (0.32)        | 0.03 (0.04)        | 0.03 (0.04)      | 0.03 (0.04)      |
| Between-person memory             | 0.16 (0.14)        | 0.06 (0.22)        | -2.02 (0.21)     | -0.03 (0.20)     |
| Within-person memory*NIC         | -0.01 (0.05)       | -0.01 (0.05)       | -0.01 (0.05)     | -0.01 (0.05)     |
| Between-person memory*NIC        | 0.17 (0.28)        | 0.23 (0.27)        | 0.22 (0.28)      |                |
| -2 log likelihood                | 136.3              | 136.0              | 132.5            | 130.5            |

*Note. *p < 0.05; †p < 0.10; MCI: mild cognitive impairment; NA: negative affect; SE: standard error. *Within-person stress is the individual reports of daily stressors for each day, and between-person stress is the person-level mean over up to 8 days of daily interviews. *Model 3 is adjusted for age. *Model 4 is adjusted for age and race.
Table 3.6

Fixed effects estimates for models of within-person and between-person daily memory complaints predicting daily PA, Est (SE)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unadjusted Model 1</th>
<th>Unadjusted Model 2</th>
<th>Adjusted Model 3</th>
<th>Adjusted Model 4</th>
<th>Adjusted Model 5</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total number of daily memory complaints</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>intercept</td>
<td>2.86 (0.78)**</td>
<td>2.89 (0.23)**</td>
<td>5.72 (1.23)**</td>
<td>5.70 (1.37)**</td>
<td>5.57 (1.25)**</td>
</tr>
<tr>
<td>MCI</td>
<td>-0.08 (0.26)</td>
<td>-0.11 (0.44)</td>
<td>-0.07 (0.1)</td>
<td>-0.08 (3.41)</td>
<td>-0.23 (3.38)</td>
</tr>
<tr>
<td>Within-person memory</td>
<td>0.02 (0.03)</td>
<td>0.02 (0.04)</td>
<td>0.02 (0.04)</td>
<td>0.02 (0.04)</td>
<td>0.02 (0.04)</td>
</tr>
<tr>
<td>Between-person memory</td>
<td>-0.19 (0.10)^†</td>
<td>-0.21 (0.16)</td>
<td>-0.28 (0.15)^†</td>
<td>-0.23 (1.15)</td>
<td>-0.13 (1.15)</td>
</tr>
<tr>
<td>Within-person memory*MCI</td>
<td>0.00 (0.07)</td>
<td>0.00 (0.07)</td>
<td>0.00 (0.07)</td>
<td>0.00 (0.07)</td>
<td>0.00 (0.07)</td>
</tr>
<tr>
<td>Between-person memory*MCI</td>
<td>0.04 (0.21)</td>
<td>0.05 (0.20)</td>
<td>0.05 (0.13)</td>
<td>0.03 (0.18)</td>
<td></td>
</tr>
<tr>
<td>-2 log likelihood</td>
<td>336.9</td>
<td>336.9</td>
<td>331.8</td>
<td>330.5</td>
<td>326.5</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appraisal of memory complaints</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>intercept</td>
<td>2.58 (0.4)**</td>
<td>2.58 (0.14)**</td>
<td>5.87 (1.22)**</td>
<td>5.72 (1.34)**</td>
<td>5.47 (1.24)**</td>
</tr>
<tr>
<td>MCI</td>
<td>-0.19 (0.24)</td>
<td>-0.15 (0.25)</td>
<td>-0.06 (0.24)</td>
<td>-0.08 (3.23)</td>
<td>-0.23 (3.23)</td>
</tr>
<tr>
<td>Within-person memory</td>
<td>0.05 (0.03)</td>
<td>0.06 (0.06)</td>
<td>0.05 (0.06)</td>
<td>0.06 (0.03)</td>
<td>0.05 (0.06)</td>
</tr>
<tr>
<td>Between-person memory</td>
<td>-0.33 (0.18)^†</td>
<td>-0.31 (0.28)</td>
<td>-0.52 (0.27)^†</td>
<td>-0.48 (0.27)^†</td>
<td>-0.15 (3.27)</td>
</tr>
<tr>
<td>Within-person memory*MCI</td>
<td>-0.01 (0.08)</td>
<td>0.00 (0.08)</td>
<td>-0.01 (0.08)</td>
<td>-0.01 (3.08)</td>
<td>-0.01 (3.08)</td>
</tr>
<tr>
<td>Between-person memory*MCI</td>
<td>-0.04 (0.37)</td>
<td>0.07 (0.34)</td>
<td>0.06 (0.34)</td>
<td>-0.10 (3.32)</td>
<td></td>
</tr>
<tr>
<td>-2 log likelihood</td>
<td>339.8</td>
<td>339.8</td>
<td>332.3</td>
<td>331.8</td>
<td>322.8</td>
</tr>
</tbody>
</table>

Note. "**p<.01, "p<.10, MCI: mild cognitive impairment, PA: positive affect. SE: standard error. ^Within-person stress is the individual reports of daily stressors for each day, and between-person stress is the person-level mean over up to 8 days of daily interviews. Model 3 is adjusted for age. Model 4 is adjusted for age, education, and race. Model 5 is adjusted for age, race, education, and perceived AD risk."
Table 3.10

Fixed effects estimates for models of daily stressors predicting within-person and between-person\(^\text{a}\) daily memory complaints, Est. (SE)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unadjusted Model 1</th>
<th>Unadjusted Model 2</th>
<th>Adjusted Model 3(^\text{b})</th>
<th>Adjusted Model 4(^\text{c})</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total number of daily stressors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>0.30 (0.33)</td>
<td>0.05 (0.40)</td>
<td>1.94 (1.58)</td>
<td>1.90 (0.22)</td>
</tr>
<tr>
<td>N/CI</td>
<td>1.42 (0.30)**</td>
<td>1.98 (0.65)**</td>
<td>2.22 (0.66)**</td>
<td>2.43 (0.65)**</td>
</tr>
<tr>
<td>Within-person stress</td>
<td>0.17 (0.08)*</td>
<td>0.06 (0.10)</td>
<td>0.06 (0.10)</td>
<td>0.06 (0.10)</td>
</tr>
<tr>
<td>Between-person stress</td>
<td>0.59 (0.23)*</td>
<td>0.83 (0.33)**</td>
<td>0.91 (0.30)**</td>
<td>0.88 (0.28)**</td>
</tr>
<tr>
<td>Within-person stress(^\text{d}) MCI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between-person stress(^\text{d}) MCI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-2 log likelihood</td>
<td>631.9</td>
<td>628.6</td>
<td>627.8</td>
<td>625.7</td>
</tr>
<tr>
<td><strong>Appraisal of daily stressors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>0.69 (0.22)**</td>
<td>0.65 (0.25)*</td>
<td>0.95 (1.76)</td>
<td>0.97 (1.72)</td>
</tr>
<tr>
<td>N/CI</td>
<td>1.45 (0.30)**</td>
<td>1.53 (0.42)**</td>
<td>1.59 (0.43)*</td>
<td>1.81 (0.42)</td>
</tr>
<tr>
<td>Within-person stress</td>
<td>0.08 (0.06)</td>
<td>0.01 (0.08)</td>
<td>0.01 (0.07)</td>
<td>0.01 (0.08)</td>
</tr>
<tr>
<td>Between-person stress</td>
<td>0.53 (0.29)*</td>
<td>0.72 (0.39)*</td>
<td>0.70 (0.36)(^\text{f})</td>
<td>0.63 (0.35)(^\text{f})</td>
</tr>
<tr>
<td>Within-person stress(^\text{d}) MCI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between-person stress(^\text{d}) MCI</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-2 log likelihood</td>
<td>639.8</td>
<td>637.4</td>
<td>637.3</td>
<td>635.7</td>
</tr>
</tbody>
</table>

Note. \(^*\)p < .01, \(^\dagger\)p < .05; \(^\ddagger\)p < .10; SE: standard error. \(^\text{a}\)Within-person stress is the individual reports of daily stressors for each day, and between-person stress is the person-level mean over up to 8 days of daily interviews. \(^\text{b}\)Model 3 is adjusted for age. \(^\text{c}\)Model 4 is adjusted for age and education.
After adding the interaction effect of cognitive status and daily stressors, MCI and higher BP daily stress were significantly predictive of greater memory complaints but there were no moderating effects of cognitive status in the relationship between daily stressors and memory complaints. These results suggest that MCI participants and participants who, in general, have more stress are more likely to have a greater number of memory complaints. These results were no longer significant after controlling for age and education.
Chapter Four: Discussion

Some, but not all, of the study hypotheses were supported. As predicted, persons with MCI reported a greater number of memory complaints on a retrospective measure. When using a daily diary measure, they also reported a significantly greater number of daily memory complaints, and they appraised them as significantly more stressful than controls. This finding was also reflected in item-level analyses, where persons with MCI reported significantly greater memory complaints on all seven items. The results of this study support previous research that found worse memory performance in MCI participants than control participants on memory tasks (Marson et al., 2003). Previous research has mainly examined everyday memory complaints using lab-based memory tasks, and the findings of the current study add to the literature by incorporating the measurement of self-reported experiences of memory complaints in daily life. In the current study, the significant difference between MCI and controls on reports of daily memory complaints also suggests that MCI participants are able to report their current memory problems and are potentially aware of the declines in memory. Furthermore, the difference in all types of memory complaints on individual item analyses supports the construct validity of the items included in the current study, and the overall pattern of findings for memory complaints is promising for future research including persons with MCI as participants.
MCI participants had significantly worse psychological well-being than controls on some of the retrospective measures of well-being and all of the daily reports of well-being. Specifically, persons with MCI scored significantly worse than controls on measures of perceived stress, life satisfaction, and daily measures assessed via daily diaries of PA and NA. Previous research assessing daily measures in persons with MCI is limited. In our findings, the MCI and control participants did not appear to differ on the measures of health-related quality of life, suggesting that MCI may not significantly interfere with functioning in daily life, consistent with Petersen criteria for MCI (Petersen, 2004). Daily diary measures showed some utility in possibly capturing the more subtle differences in well-being. Differences in retrospective measures of well-being, which were measured on varying time scales, including the past week or the past month, point to the possibility that MCI participants are able to report their feelings of greater psychological distress regardless of the time interval with which they are asked to recall.

The finding of worse psychological well-being on more positive aspects of well-being, such as life satisfaction, amidst no significant differences in other more negative aspects of well-being, such as depressive symptoms, illustrates the importance of conceptualizing and examining both positive and negative emotions as independent constructs and not necessarily the inverse of each other (Zautra, Potter, & Reich, 1997). In other words, when a person feels sad they may also feel happy, too, and also when a person is not happy that does not equate to feelings of sadness.
As hypothesized, both total number of daily stressors and the appraisal of daily stressors were significantly associated with worse daily affect, for both persons with MCI and controls. For the outcome of PA, this relationship remained when relevant covariates were added to the model, but the stress-PA relationship was no longer significant after adding the interaction effect. This suggests that controlling for relevant covariates there remains a significant relationship between higher daily stress and lower PA, and it also suggest that the power to detect main effects was reduced when more predictors were added to the model.

For NA, when the moderating effect of cognitive status was added to the model, this significant stress-NA relationship was limited to the MCI participants. These results suggest, as illustrated in Figures 3.4 and 3.5 that the relationship between higher daily stessor appraisal and higher NA was limited to the MCI participants rather than controls, and was limited to the analyses examining WP processes rather than BP processes. The significant WP processes, rather than BP processes, suggest that a person who, on average, has more stress (BP variability) may possibly learn to cope with the stressors and thus their well-being is potentially less associated with stress. On the other hand, when a person experiences more stress than they are usually accustomed to (WP stress variability), they may subsequently experience declines in well-being. The increased emotional variability within MCI participants from one day to the next may be clinically relevant.
Our findings of a stronger stress-NA relationship in the MCI group suggests that while persons with MCI may not experience significantly more daily stressors than controls, they may be more vulnerable to the potential psychological consequences of stress. These findings also support stress and coping theory which emphasizes both the objective occurrence and also the perception of a stressor as critical in understanding the role of a stressor in relation to a person’s well-being (Lazarus & Folkman, 1984). The appraisal, or perception, of daily stressors may be particularly relevant in the MCI population because they may perceive the daily stressors as a threat to their well-being or a distressing sign of oncoming dementia. Furthermore, persons with MCI may have diminished reserve capacity (Baltes, 1987; Staudinger, Marsiske, & Baltes, 1995). Reserve capacity is a concept which stems from life-span theory and posits that throughout life individuals are faced with “gains” and “losses” and that the accumulation of these two result in the person’s capacity to effectively cope with adversity (Baltes, 1987). Accumulated “losses,” such as the repeated experience of stress associated with early cognitive decline, may result in reduced reserve capacity, reduced ability to cope with adversity, and worse outcomes for the individual.

In contrast to MCI, the finding of no significant increase in NA in association with daily stressors in the control group was surprising. One possible explanation of this finding is that there may be a smaller effect size in the control participants as compared to the MCI participants, requiring a larger sample size to obtain adequate statistical power in determining a significant effect. A second
explanation may be that the specific types of stressors in the current study (e.g., someone not doing enough to help you with something) may not be distressing to older adults without cognitive impairment.

Not only was stress associated with daily affect, but a greater number of memory complaints were also significantly related to higher NA. This relationship remained significant in adjusted analyses, but the memory complaint-NA relationship was no longer significant after adding the interaction effect. This suggests that there existed a relationship between memory complaints and affect after adjusting for relevant covariates, but the power to detect this significant association was reduced with the addition of covariates in moderation analyses. The significant BP analysis, but not WP analysis, suggests that people who, on average, experience more memory complaints also report higher NA. This significant association may be an early indicative of a previously reported link between depression and cognitive decline (Bielak et al., 2011).

As predicted, daily stressors were associated with significantly more daily memory complaints, for both persons with MCI and controls. These findings illustrate that daily stress may not only be related to psychological well-being, but also memory in daily life. The significant BP stress-memory relationship suggests that older adults who reported more memory complaints in general have higher stress, but that there were not significant day-to-day variations within individuals on high or low stress days. The finding of no moderating effect in this relationship by cognitive status suggests that stress may be related to memory complaints regardless of whether a person has been identified as MCI or not.
Thoughts about stress may distract an individual, and reduce performance in some cognitive processes, such as attention or working memory (Klein & Boals, 2001). Our findings provide a day-to-day examination of subtle changes in memory that may be indicative of previous longitudinal research which has suggested that persons who are prone to stress, or vulnerable to stress, have an increased risk of AD and cognitive decline (Wilson et al., 2011; Wilson et al., 2003). While this research suggests that the cumulative effects of stress may affect cognitive functioning longitudinally, our finding suggests that stress may be related to cognitive performance within relatively short periods of time, as well.

Since our research is observational and thus cannot determine causal relationships, a possible alternate explanation for the association between daily stressors and daily memory complaints is that the memory-related problems may lead to increases in daily stress (e.g., forgetting to do something leading to a fight with a spouse). Research that incorporates multiple days or multiple time points within days of data collection and examines in more detail the context of the stress and memory complaints may provide more information as to the causal relationship of stress and memory complaints.

A number of the current study’s hypotheses were not supported. In analyses comparing the reported number of daily stressors and daily positive events, there were no significant differences between MCI and control participants. These analyses may suggest that MCI does not necessarily exert an overwhelming effect on every aspect of daily life. Previous research (Peres et al., 2006) suggests that MCI participants have more difficulty in daily tasks such
as transportation and financial tasks. However, our finding of no difference in a sum variable of daily stressors including these types of tasks could be a result of persons with MCI avoiding the types of transportation or financial activities which cause them distress or embarrassment from being around other people, whereas previous findings of a difference in tasks between MCI and controls were associated with lab-based procedure tasks. This finding supports the theory of selection, optimization, and compensation (Baltes, 1990), which posits that with increased age, individuals may select and reduce their activities or behaviors to adjust to changing abilities or changing skills. The concepts of optimization and compensation suggest that the person then uses the selected skills as a way to successfully adapt and account for declining abilities.

However, MCI and control participants did differ in item-level analyses of daily stressors and daily positive events. The individual item-level differences suggest that in some areas potentially relevant to MCI, they reported significantly more stressors, such as being ignored by a spouse or feeling like someone is not doing enough to help with something. This may be clinically relevant in that persons with MCI and their significant others may be able to develop effective methods of communication that may help ameliorate those specific types of stressors. These types of stressors may not have been identified through retrospective measures of perceived stress or daily stressors, which provide support for the utility of daily diary measures for developing interventions for persons with MCI. Control participants reported significantly more “other” stressors, which was an open-ended recall question that was perhaps more
difficult for the MCI participants to self-report, resulting in a lower number of stressors in this category for MCI.

In addition, item-level analyses suggested lower positive events in a couple of the items for MCI participants, whereas there were no items where MCI participants reported significantly more positive events than controls. Future research is needed that uses a larger sample size and incorporates items potentially relevant to persons with MCI in order to continue to examine the occurrence of daily stressors and daily positive events in this population as compared to healthy older adults.

In summary, the findings collectively illustrate several key points about the daily experiences of persons with MCI as compared to cognitively healthy controls. Persons with MCI reported more memory complaints, and appraise them as more stressful, but in the main analyses memory complaints were not associated with worse psychological well-being. However, persons with MCI and controls reported similar rates of daily stressors, but the daily stressors (and the appraisal of daily stressors) were associated with a stronger stress-NA relationship in the MCI group. Therefore, these findings collectively may suggest that the memory-related deficits associated with MCI may result in increased vulnerability (i.e., greater psychological distress) in relation to daily stressors experienced as part of normal aging. Perhaps daily stressors are more distressing than the memory-related complaints that people experience, or daily memory complaints may exert their effects through certain kinds of daily
stressors (e.g., a memory complaint leading to the experience of a daily stressor).

One finding worth mentioning, but not included in our initial hypotheses, was the finding of no significant difference in perceived risk of AD between persons with MCI and control participants. The finding of a 40% perceived risk of AD in the MCI group and a 33% perceived risk of AD in the control group suggests that the control participants are likely over-reporting their risk of AD rather than the MCI participants underreporting their risk of AD. The sample included control participants who sought out neuropsychiatric testing as part of an AD study, which may bias their perception and awareness of the risk of AD. It also highlights the fact that the fear of dementia and AD associated with aging may exacerbate perceived risk, and underscores the need for public health efforts to inform an aging society of the actual risks of AD with age.

There are some important limitations to this study that should be mentioned. First, the current sample is clinic-based and thus results may not be generalizable to all older adults living in the community. Participants from clinical samples generally have been reported to have higher rates of neuropsychiatric symptoms than those from population studies (Apostolova & Cummings, 2008) and the results may, therefore, not extend to participants recruited from the community with MCI or mild memory deficits. However, given the nature of MCI as a potentially ambiguous label from one setting to the next, the current study used recruitment of participants who have been identified as MCI after extensive neuropsychological testing by trained clinicians as a way to better categorize the
group for analysis. It is possible that individuals seeking clinical care for the memory problems may be less embarrassed or ashamed of their memory complaints than those not seeking care and more willing to report problems using the methods of the present study than individuals identified through population studies. Also, a common criticism of clinic-based recruitment is that they tend to have an increased likelihood that many participants are White and highly educated. However, the current ADRC sample included approximately 25% of participants who identified themselves as Black or Hispanic, due to extensive efforts that had been undertaken by the ADRC to address this issue.

Second, data on the validity of self-reported measures used in the study are limited in populations with MCI. A previous qualitative study found that persons with MCI reported and were therefore aware of cognitive changes they were experiencing (Joosten-Weyn Banningh et al., 2008). Previous research suggests that the recognition of emotions in persons with MCI was considered to be more reliable than the measurement of emotion recognition in persons with early or moderate AD (Weiss et al., 2008). Compared to cognitively healthy controls, persons with MCI with one cognitive domain deficits (e.g., memory) did not differ in ability to recognize emotion. However, there were differences in the MCI participants with multiple cognitive domains of deficits (e.g., memory and executive functioning), and they showed poorer emotion recognition as compared to controls (Weiss et al., 2008). We believe that our use of self-reports in persons with MCI was reasonable given the global cognitive status eligibility criteria, and the short duration of recall in daily diary design. Many of the results
also suggest validity of self-reports, including the finding of higher retrospective and daily memory complaints in the MCI group. In addition, the current study was more interested in how individuals perceive events as stressful or memory deficits in their daily experiences, rather than the accuracy of being able to remember every event that happened during the past 24 hours. Given the focus on perception, we believe that the use of self-report is justifiable in this population.

Third, the sample size was relatively small, diminishing the power of the study. Recruitment was limited to the number of willing and able participants who had recently undergone extensive neuropsychiatric testing as part of the ADRC study and who had been recently reassessed. Thus, the sample was smaller than anticipated, and the sample consisted of all types of MCI rather than amnestic only. Previous research identifies a-MCI as the most likely to convert to AD and the most likely to experience memory complaints (Artero et al., 2006; Ganguli et al., 2011). While our MCI sample is heterogeneous in the subtype of MCI, the sample consisted of MCI participants who reported worse memory on reports of daily memory complaints, suggesting they experienced memory-related complaints characteristics of the amnestic-form of MCI.

**Future Research**

Lessons learned from this study provide some suggestions and challenges for future research in MCI populations. As Garand and colleagues discuss in their review, the differences in conducting research in persons with MCI may differ based on the confusion surrounding the label and the uncertainty
regarding prognosis (Garand, Lingler, Conner, & Dew, 2009). Persons with MCI may decline research participation because they are possibly ashamed of a “label” or do not want to go to a “Alzheimer’s clinic” (Garand et al., 2009), which may result in a potentially biased sample. While a diagnostic label may induce stigma or embarrassment, for research purposes it provides a homogenous group with which to study for intervention, and treatment purposes (Garand et al., 2009). A greater number of missing days in the MCI group (although not statistically significant) may have also resulted from discomfort with the types of questions regarding memory complaints or difficulty in tasks in everyday life (Garand et al., 2009). However, this discomfort was not conveyed by either MCI or control participants in our study in their communication with the researchers. In addition, the daily interview questions were described in such a way that memory complaints or daily stressors are events that happen in everyday life, and they are the types of events that normally happen with aging rather than questions related to pathological cognitive impairment. Future research using diary methods to examine aspects of daily life in persons with MCI may benefit from sensitivity to the stigma or embarrassment associated with MCI label, and a study design that includes a shorter number of days of data collection to reduce participant burden (e.g. 5 or 6 days) or the option to make up days missed during the eight days of diaries.

There are other analyses that could be conducted with these data but that are beyond the scope of the current dissertation project and may necessitate further data collection for a larger sample size. For example, which types of
stressors are most strongly associated with daily affect? Also, do coping methods help individuals to deal with stress associated with MCI? Although not examined in this study, the individual ways in which people perceive stress and cope with daily hassles or stressors may influence how stress may be harmful for some but benign for others (S. Cohen et al., 1997; Folkman et al., 1987; Lazarus & Delongis, 1983). Future studies should examine in more detail coping processes in persons with MCI to better understand how stress and coping might be associated with psychological outcomes. Also, MLM analyses examining the intraindividual variability in reporting stressors, daily affect, and daily memory complaints across days could estimate whether there are differences in internal consistency for MCI vs. control participants.

Also, there is evidence that women report more anxiety about memory complaints and also that they report more memory complaints, in general (Souza-Talarico, Chaves, Nitrini, & Caramelli, 2009). The current study did not have an adequate sample to examine gender differences due to a small percentage of males, but this is a topic that should be addressed in future research. Gender, and other demographic or socioeconomic factors, should be addressed in future research as potential moderators or risk factors in the relationships between stress, emotion, and memory complaints.

The finding of differences in self-reported memory complaints between the MCI and control participants also add to previous literature examining the utility of self-reports in MCI participants. Crowe and colleagues previously found that self-reported change in memory was associated with increased cognitive decline.
and that this relationship was stronger among participants with fewer depressive symptoms (Crowe et al., 2006). Future research, with larger sample sizes, should further examine the role of depressive symptoms as a potential moderator in the processes of stress, memory complaints, and well-being in daily life. Specifically, research is needed that examines whether persons with co-occurring depression and MCI are accurate reporters of daily memory complaints and whether the self-reports of daily memory complaints and their relationship with stress or well-being are altered by the presence of depressive symptoms.

Daily diary measures do not have generally well-validated cut-points to determine clinical significance. Therefore, as the field develops, more research is needed to better understand the potential clinical implications of daily diary well-being measures. Finally, informants were not included in the current study due to the possibility that they were either biased in their perception of the person with MCI because of stress or frustration or that the full range of deficits (including subtle changes in cognition) may not be noticeable to the informant. Future research is needed to better addresses the utility of informants in studies related to MCI.

An important issue in research related to MCI, and in particular, research related to MCI and well-being, is the meaning of a label of “MCI” for research and clinical purposes. Given that some persons with MCI may have cognitive functioning that falls within the range of normal cognition, there is some confusion as to what the ethical implications are for “labeling” individuals as MCI. For some, it may unnecessarily increase stress and anxiety about impending
dementia that may never progress to that level of cognitive impairment (Werner & Korczyn, 2008; Whitehouse, 2007; Whitehouse & Juengst, 2005). How people view illness largely affects their experience, such that individuals who accept memory problems in MCI as part of normal aging likely have different outcomes than individuals who fear memory problems as the beginning of dementia.

Research is needed to further address this issue of “meaningness” of MCI. In the current study, some participants made comments which suggest that they apply meaning differently and therefore appraise memory complaints differently. For example, some participants, when asked whether a memory complaint was stressful for them, replied “I don’t let it bother me anymore” or “It used to bother me but I am used to it now.” For others, mainly the control participants, they responded “this is something I have always done” when reporting a memory complaint. Other participants expressed more frustration in their memory complaint and reported feeling “a great deal” stressed as a result. Previous qualitative research in MCI populations suggests that there are wide variations in how people perceive memory-related changes in MCI (Joosten-Weyn Banningh et al., 2008). While some individuals may fixate on memory problems over time, others may become desensitized to the memory-related complaints and adjust their lifestyle or adapt to the changes. Further research is needed that identifies why there are differences in the appraisal of memory complaints. Daily diary studies can provide an important medium with which to further examine the issue of how people apply meaning to memory changes, and how this, in turn, relates to their psychological well-being over the course of cognitive decline.
The current dissertation, and other similar research, may help to identify areas of potential concern, develop effective coping strategies in persons with MCI, and also inform interventions. Specifically, the results of this study can help identify what aspects of MCI may be stressful and how these everyday stressors may worsen psychological well-being in everyday life. Our finding of within-person differences in the association between stress and affect is relevant in a clinical context because individuals who are assessed only one time for psychological distress, on a day when they have lower stress, may appear to be doing better than they do on other days when they experience more stress. Retrospective measures may not capture the subtle daily variations in emotion, stress, and memory complaints. Furthermore, the finding of increased within-person variation in the MCI participants in association with daily stressors may be particularly taxing over time for the individual’s overall well-being and may be indicative of future psychiatric disorders.

This research is intended to inform relatives and caregivers of loved ones with MCI, clinicians who give diagnoses of MCI to their patients, and individuals providing community support for persons with MCI. The identification of potentially stressful aspects of daily life for persons with MCI may help inform interventions that can specifically target how individuals appraise stress in their life, through cognitive behavioral therapy or other types of supportive services. Interventions targeting psychological well-being, such as purpose in life, self-esteem, acceptance, and sense of mastery within an environment, are recommended to lower stress and to prevent the potentially negative effects of
stress on physical, mental, and emotional health (Juster et al., 2010). Development of these interventions requires a thorough understanding of the daily consequences of memory impairment so that the intervening activities may meet the specific needs of this growing population.

In particular, the use of daily diary methods to examine the daily experiences of persons with MCI may further inform researchers and clinicians of the subtle changes in daily psychological well-being, daily memory complaints, or daily appraisal of stress in a person’s life that may accumulate over time and result in potentially negative outcomes. Research examining psychological distress in MCI and the potential mechanisms associated with increased distress can begin to meet the needs of a growing population of older adults that may differ in many ways from both persons with dementia and also cognitively healthy older adults. Supportive services, informed by future research that continues to examine in detail the daily experiences of persons with MCI, can be tailored to persons with MCI in order to reduce psychological distress and increase quality of life during early stages of cognitive decline.
References


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Appendices

Appendix A: Baseline Interview Measure

*Script:* Hello! Thank you for agreeing to participate in this interview. Before we can begin, I have some background questions.

**Section A: Participant Information**

Name____________________________________________
Address____________________________________________
________________________________________________________________________
City_____________________________________State_____ ____ Zip_____________________
Phone______________________________________________
________________________________________________________________________
What’s the best time of day to call?_________________________________________

**Section B: Global Cognitive Status (survey)**

**Mini-Mental State Exam**

*Script:* The next series of questions are designed to measure your mental abilities related to memory and arithmetic. Some of the questions may seem easy, some may seem hard. Just do the best you can.

C1.   a. What year is it?

     b. What season is it?

     c. What is today’s date?

     d. What day of the week is it?
e. What month is it?

C2.  
   a. What state are we in?
   b. What county are we in?
   c. What town (city) are we in?
   d. What building or place are we in?
   e. What floor are we on?

C3. Now I am going to name three objects. When I finish I would like you to repeat them back to me. Ready? The objects are orange, airplane, and tobacco. (PAUSE) Now repeat them back to me.

   ORANGE     AIRPLANE     TOBACCO

Thank you. Now try to remember these objects because I will ask you to repeat them again later.

Now I will ask you to complete a counting exercise. Please begin counting with 100 and count backwards by 7s. Keep going until I ask you to stop.

C4a.  
   93, 86, 79, 72, 65    ____    ____    ____    ____    ____

C4b. Please spell the word WORLD backwards.

   ____    ____    ____    ____    ____    __________

   D     L     R     O     W

C5. Remember the 3 objects I asked you to repeat back to me earlier? Please repeat them back to me now.

   ORANGE     AIRPLANE     TOBACCO

C7. I am going to show you a card with some instructions on it. Read the instructions and do what they say.

   CLOSE YOUR EYES
Section C: Demographic and social information (survey)

Gender (circle one)  1. MALE  2. FEMALE

Date of birth ______/_______/_______

What race/ethnicity do you consider yourself to be?
   1. WHITE NON-HISPANIC
   2. AFRICAN-AMERICAN
   3. HISPANIC
   4. ASIAN-AMERICAN
   5. OTHER_________________________

Highest level of education completed
   1. LESS THAN HIGH SCHOOL
   2. HIGH SCHOOL
   3. SOME COLLEGE, NO DEGREE
   4. 2 or 4-YEAR DEGREE
   5. SOME GRADUATE SCHOOL, OR GRADUATE DEGREE

Marital Status
   1. MARRIED
   2. DIVORCED/SEPARATED
   3. WIDOWED
   4. SINGLE

Living with anyone?  1. YES  2. NO  If yes, who do you live with?_________________________

Any children?  1. YES  2. NO  If yes, how many? __________

How often do you see your children?
   1. A FEW TIMES A YEAR
   2. MONTHLY OR EVERY OTHER MONTH
   3. WEEKLY OR DAILY
   4. N/A (no children)
Section D: Health information (survey)

Script: This next section asks some general questions about your health and how you usually feel.

Has a doctor ever told you have high blood pressure? 1. YES 2. NO
Cancer? 1. YES 2. NO
Heart problems? 1. YES 2. NO
Diabetes? 1. YES 2. NO
Arthritis? 1. YES 2. NO

On a scale from 0% to 100%, how likely do you think it is that you will get Alzheimer’s disease over the next 5 years (0% means no chance at all, and 100% means I am totally certain that I will get Alzheimer’s disease) ________________________%

Section E: CES-D Scale (self-report)

Instructions for Questions: Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week.

| Rarely or none of the time (Less than 1 day) | 1 |
| Some or a little of the time (1-2 days) | 2 |
| Occasionally or a moderate amount of the time (3-4 days) | 3 |
| Most or all of the time (5-7 days) | 4 |

During the past week:

1. I was bothered by things that usually don’t bother me.
   0 1 2 3

2. I did not feel like eating; my appetite was poor.
   0 1 2 3

3. I felt that I could not shake off the blues even with help from my family or friends.
   0 1 2 3
4. I felt that I was just as good as other people.
   0 1 2 3

5. I had trouble keeping my mind on what I was doing.
   0 1 2 3

6. I felt depressed.
   0 1 2 3

7. I felt that everything I did was an effort.
   0 1 2 3

8. I felt hopeful about the future.
   0 1 2 3

9. I thought my life had been a failure.
   0 1 2 3

10. I felt fearful.
    0 1 2 3

11. My sleep was restless.
    0 1 2 3

12. I was happy.
    0 1 2 3

13. I talked less than usual.
    0 1 2 3

    0 1 2 3

15. People were unfriendly.
    0 1 2 3

16. I enjoyed life.
    0 1 2 3

17. I had crying spells.
    0 1 2 3
18. I felt sad.

0 1 2 3

19. I felt that people dislike me.

0 1 2 3

20. I could not get “going.”

0 1 2 3

21. | Section F: Perceived Stress Scale (survey)

**Script:** The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate how often you felt or thought a certain way.

<table>
<thead>
<tr>
<th>NEVER</th>
<th>0</th>
<th>FAIRLY OFTEN</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALMOST NEVER</td>
<td>1</td>
<td>VERY OFTEN</td>
<td>4</td>
</tr>
<tr>
<td>SOMETIMES</td>
<td>2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. In the last month, how often have you been upset because of something that happened unexpectedly?

0 1 2 3 4

2. In the last month, how often have you felt that you were unable to control the important things in your life?

0 1 2 3 4

3. In the last month, how often have you felt nervous and “stressed”?

0 1 2 3 4

4. In the last month, how often have you felt confident about your ability to handle your personal problems?

0 1 2 3 4

5. In the last month, how often have you felt that things were going your way?

0 1 2 3 4

6. In the last month, how often have you found that you could not cope with all the things that you had to do?

0 1 2 3 4

7. In the last month, how often have you been able to control irritations in your life?

0 1 2 3 4

8. In the last month, how often have you felt that you were on top of things?

0 1 2 3 4

9. In the last month, how often have you been angered because of things that were outside of
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

Section G: Everyday memory (self-report)

Instructions for Questions: The next questions are related to problems anyone might experience with forgetting everyday things. Please answer these questions based your experiences over the past month.

<table>
<thead>
<tr>
<th>NEVER</th>
<th>0</th>
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<tbody>
<tr>
<td>ALMOST NEVER</td>
<td>1</td>
</tr>
<tr>
<td>SOMETIMES</td>
<td>2</td>
</tr>
<tr>
<td>FAIRLY OFTEN</td>
<td>3</td>
</tr>
<tr>
<td>VERY OFTEN</td>
<td>4</td>
</tr>
</tbody>
</table>

1. Forgetting the names of friends or relatives or calling them by the wrong names.
   0 1 2 3 4

2. Forgetting the names of common things or using the wrong names.
   0 1 2 3 4

3. Finding that a word is "on the tip of your tongue." You know what it is but can't quite find it.
   0 1 2

4. Forgetting something you were told a few minutes ago. Perhaps something your partner or friend has just said.
   0 1 2 3 4

5. Forgetting something you were told yesterday or a few days ago.
   0 1 2 3 4

6. Repeating something you have just said or asking the same question several times.
   0 1 2 3 4

7. Forgetting what you have just said. Maybe saying "What was I talking about?"
   0 1 2 3 4

8. Losing track of what someone is trying to tell you. Unable to follow the thread of their conversation.
   0 1 2 3 4

9. Starting to say something, then forgetting what it was that you wanted to speak about.
   0 1 2 3 4

10. Letting yourself ramble on to speak about unimportant or irrelevant things.
11. Forgetting to tell somebody something important. Perhaps forgetting to pass on a message or remind someone of something.

12. Getting the details of what someone has told you mixed up and confused.

13. Repeating a story or joke you have already told.

14. Forgetting the meanings of unusual words.

15. Forgetting what the sentence you have just read was about and having to re-read it.

16. Unable to follow the thread of a story. Lose track of what it is about.

17. Forgetting how to spell words.

18. Forgetting where you have put something. Losing things around the house.

19. Failing to recognize friends or relatives by sight.

20. Failing to recognize television characters or other famous people by sight.

21. Getting lost or turning in the wrong direction on a journey or walk you have often been on.

22. Failing to recognize places you are told you've often been to before.

23. Finding television stories difficult to follow.

24. Forgetting to do some routine thing that you would normally do once or twice in a day.

25. Discovering that you have done some routine thing twice by mistake.

26. Having to go around checking whether you have done everything you meant to do.

27. Forgetting what you did yesterday or getting the details of what happened mixed up and confused.
28. Starting to do something, then forgetting what it was you wanted to do. Maybe saying "What am I doing?"
   0 1 2 3 4
29. Being absent minded. Doing something that you didn't really intend to do.
   0 1 2 3 4
30. Unable to remember the name of someone you met for the first time recently.
   0 1 2 3 4
31. Failing to recognize someone you met for the first time recently.
   0 1 2 3 4
32. Getting lost on a journey or walk that you've only been on once or twice before.
   0 1 2 3 4
33. Unable to pick up a new skill such as a game or working some new gadget after you have practiced once or twice.
   0 1 2 3 4
34. Unable to cope with a change in your daily routine. Following your old routine by mistake.
   0 1 2 3 4
35. Forgetting to keep an appointment.
   0 1 2 3 4

Section H: Short-form health survey (survey)

Survey: This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

Please answer every question by marking one box. If you are unsure about an answer, please give the best answer you can.

1. In general, would you say your health is:

   Excellent  Very good  Good  Fair  Poor

2. The following items are about activities you might do during your typical day. Does your health now limit you in these activities? If so, how much?

   a. Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf
      1. Yes, limited a lot
      2. Yes limited a little
      3. No, not limited at all

   b. Climbing several flights of stairs
      1. Yes, limited a lot
      2. Yes limited a little
3. During the past 4 weeks have you had any of the following problems with your work or other regular daily activities as a result of your physical health?
   a. Accomplished less than you would like
      1. Yes
      2. No
   b. Were limited in the kind of work or other activities
      1. Yes
      2. No

4. During the past 4 weeks have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?
   a. Accomplished less than you would like
      1. Yes
      2. No
   b. Didn’t do work or other activities as carefully as usual
      1. Yes
      2. No

5. During the past 4 weeks how much did pain interfere with your normal work (including both work outside the home and housework)?
   1. Not at all
   2. A little bit
   3. Moderately
   4. Quite a bit
   5. Extremely

6. These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give one answer that comes closest to the way that you have been feeling.

   How much of the time during the past 4 weeks
   a. Have you felt calm and peaceful?
      1. All of the time
      2. Most of the time
      3. A good bit of the time
      4. Some of the time
      5. A little of the time
b. Did you have a lot of energy?
   1. All of the time
   2. Most of the time
   3. A good bit of the time
   4. Some of the time
   5. A little of the time
   6. None of the time

c. Have you felt downhearted and blue?
   1. All of the time
   2. Most of the time
   3. A good bit of the time
   4. Some of the time
   5. A little of the time
   6. None of the time

7. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?
   1. All of the time
   2. Most of the time
   3. A good bit of the time
   4. Some of the time
   5. A little of the time
   6. None of the time

Section I: Life Satisfaction Index Z (self-report)

Instructions for Questions: Here are some statements about life in general that people feel differently about. Would you read each statement on the list, and if you agree with it, circle "AGREE." If you do not agree with a statement, circle "DISAGREE." If you are not sure one way or the other, circle "?." Please be sure to answer every question on the list.

1. As I grow older, things seem better than I thought they would be.
   
   AGREE   DISAGREE   ?

2. I have gotten more of the breaks in life than most of the people I know.
AGREE       DISAGREE       ?
3. This is the dreariest time of my life.
   AGREE       DISAGREE       ?
4. I am just as happy as when I was younger.
   AGREE       DISAGREE       ?
5. These are the best years of my life.
   AGREE       DISAGREE       ?
6. Most of the things I do are boring or monotonous.
   AGREE       DISAGREE       ?
7. The things I do are as interesting to me as they ever were.
   AGREE       DISAGREE       ?
8. As I look back on my life, I am fairly well satisfied.
   AGREE       DISAGREE       ?
9. I have made plans for things I'll be doing a month or a year from now.
   AGREE       DISAGREE       ?
10. When I think back over my life, I didn't get most of the important things I wanted.
   AGREE       DISAGREE       ?
11. Compared to other people, I get down in the dumps too often.
   AGREE       DISAGREE       ?
12. I've gotten pretty much what I expected out of life.
   AGREE       DISAGREE       ?
13. In spite of what people say, the lot of the average man is getting worse, not better.
   AGREE       DISAGREE       ?

Appendix B: Daily Interview Measure

DAY # (circle day)  1  2  3  4  5  6  7  8

START TIME ___________________ ( AM / PM )  END TIME ___________________ (AM / PM)

TOTAL MINUTES ___________________

WEEKDAY
   Today is...
1. MONDAY
2. TUESDAY
3. WEDNESDAY
4. THURSDAY
5. FRIDAY
6. SATURDAY
7. SUNDAY
Script on first day:

Hi, this is __________ from the School of Aging Studies at USF and I am calling to do the (first) interview for the study on health and aging. Again, I will be asking you about positive and negative experiences you may have had today. This should take about 10 minutes.

Ok, great! Let’s begin.

SECTION 1: Daily Stress

Script: First, I'm going to ask you about some stressful things that sometimes happen to people. Please answer yes/no for each one that may have happened to you during the past 24 hours.

1. Did anything particularly stressful happen in the past 24 hours? 1. YES 2. NO
1a. (If yes) What was it that happened?

2. “You had a lot of work to do” 1. YES 2. NO
2a. (If yes) How stressful was that for you?
   1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL

3. “You had many family demands” 1. YES 2. NO
3a. (If yes) How stressful was that for you?
   1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL

4. “A family member became sick or injured” 1. YES 2. NO
4a. (If yes) How stressful was that for you?
   1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL

5. “Transportation problem,” 1. YES 2. NO
5a. (If yes) How stressful was that for you?
   1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL

6. “Financial problem” 1. YES 2. NO
6a. (If yes) How stressful was that for you?
   1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL

7. “Conflict with your spouse or partner” 1. YES 2. NO
7a. (If yes) How stressful was that for you?
   1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL

8. “A spouse or partner snubbed or ignored you” 1. YES 2. NO
8a. (If yes) How stressful was that for you?
   1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL
9. “Someone was doing too much to help you with something” 1. YES 2. NO
   9a. (If yes) How stressful was that for you?
       1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL
10. “Someone wasn’t doing enough to help you with something” 1. YES 2. NO
    10a. (If yes) How stressful was that for you?
        1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL
11. “Conflict with a family member” 1. YES 2. NO
    11a. (If yes) How stressful was that for you?
        1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL
12. “Conflict with friend, neighbor or someone else” 1. YES 2. NO
    12a. (If yes) How stressful was that for you?
        1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL
13. “Giving up or avoiding leisure/social activities because of health reasons” 1. YES 2. NO
    13a. (If yes) How stressful was that for you?
        1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL

Script: Now I’m going to ask you about some positive things that may have happened. Please answer yes/no for each one that may have happened to you during the past 24 hours.

1. Did anything particularly positive happen in the past 24 hours? 1. YES 2. NO
   1a. (If yes) What was it that happened?

Script: Next, I have a list of some specific events that may have happened. Please say yes if these things happened, even if you have already mentioned it in the first question.

2. “Positive event at work, school” 1. YES 2. NO
   2a. (If yes) How positive was that for you?
       1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL
3. “Positive leisure or recreational event” 1. YES 2. NO
   3a. (If yes) How positive was that for you?
       1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL
4. “Positive interaction with spouse or partner” 1. YES 2. NO
   4a. (If yes) How positive was that for you?
       1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL
5. “Positive social event with your family or friends” 1. YES 2. NO
   5a. (If yes) How positive was that for you?
       1. NOT AT ALL 2. ONLY A LITTLE 3. A GREAT DEAL
SECTION 2: Coping with Stress
1. Did you try to do anything to cope with stress you experienced today?

2. Was it helpful in lowering your stress?

SECTION 3: Everyday Memory

Script: Now I’m going to ask you a few questions about forgetfulness that people might normally experience in their everyday lives. In the past 24 hours…

1. Did you go back to check whether you had done something that you meant to do?
   1. YES  2. NO
   1a. (If yes) How stressful was that for you?
       1. NOT AT ALL  2. ONLY A LITTLE  3. A GREAT DEAL

2. Did you find that a word was on the “tip of your tongue,” you knew what it was but could not quite find it?
   1. YES  2. NO
   3a. (If yes) How stressful was that for you?
       1. NOT AT ALL  2. ONLY A LITTLE  3. A GREAT DEAL

3. Did you forget the names of friends or relatives or call them by the wrong names?
   1. YES  2. NO
   2a. (If yes) How stressful was that for you?
       1. NOT AT ALL  2. ONLY A LITTLE  3. A GREAT DEAL

4. Did you forget something you had just said—maybe say, “What was I talking about?”
   1. YES  2. NO
   4a. (If yes) How stressful was that for you?
       1. NOT AT ALL  2. ONLY A LITTLE  3. A GREAT DEAL

5. While reading, did you forget what the sentence is you have just read and have to re-read it?
   1. YES  2. NO
   5a. (If yes) How stressful was that for you?
       1. NOT AT ALL  2. ONLY A LITTLE  3. A GREAT DEAL

6. Did you forget where you had put something or lose something around the house?
   1. YES  2. NO
   7a. (If yes) How stressful was that for you?
       1. NOT AT ALL  2. ONLY A LITTLE  3. A GREAT DEAL
7. Did you start to do something, then forget what it was you wanted to do... maybe saying
   "What am I doing?"
   1. YES  2. NO

7a. (If yes) How stressful was that for you?
   1. NOT AT ALL   2. ONLY A LITTLE   3. A GREAT DEAL

SECTION 5: Daily Affect

Script: The next questions ask about feelings that you may have. Since we spoke yesterday,
how much of the time did you feel...

<table>
<thead>
<tr>
<th>Question</th>
<th>None of the time</th>
<th>A little of the time</th>
<th>Some of the time</th>
<th>Most of the time</th>
<th>All of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Cheerful?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. So sad nothing could cheer you up?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. In good spirits?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. Nervous?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. Extremely happy?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. Restless or fidgety?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. Worthless?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. Calm and peaceful?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. Hopeless?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. Satisfied?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. That everything was an effort?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. Full of life?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Script on days 1-7: Those are all the questions that I have today, and again, thank you for your
time.

Is it still okay that I call tomorrow at ___________________________?
Time for next daily interview___________________________ (AM / PM)
Thank you and I look forward to talking with you then.

Script on the day 8: Thank you so much for all of your help on this study. We greatly appreciate
your time.

When the study is over, we will send you a summary of results and we will be letting you know
soon the results of the lottery. Thank you again!
About the Author

Elizabeth Anne Hahn is a doctoral candidate in the School of Aging Studies at the University of South Florida (USF). She completed a Bachelor of Science degree in Human Development and Family Studies at The Pennsylvania State University, and minors in Gerontology and Health Policy & Administration in 2008. She began the doctoral program in 2008 at USF after receiving the Presidential Doctoral Fellowship, and during her time at USF she was also the recipient of the Dean and Provost’s Awards for Outstanding Teaching by a Graduate Teaching Assistant. Ms. Hahn has worked on numerous research projects, publications, and has presented her research at local and national conferences. She was also selected to participate in a Human Development Winter School at Heidelberg University in Germany, and studied as a visiting student at the Karolinska Institute in Stockholm Sweden. Pending the successful completion of her doctoral dissertation and defense presentation, Ms. Hahn was selected as a 2012-2014 postdoctoral research fellow in the Psychology Department at Brandeis University, where she plans to work with Dr. Margie Lachman.