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Development of a Daily Diary Method for the Assessment of Everyday Cognitive Failures

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Abstract

Assessing how well an individual can meet real world cognitive demands is an important clinical outcome, particularly for older adults. Research examining real world cognitive functioning has used both lab-based tasks as well as questionnaires. However, these assessments were limited for a number of reasons. Lab-based tasks lack personal relevance which may affect the strategies and amount of effort individuals apply, reducing their ecological validity. Questionnaires are considered more ecologically valid but require individuals to recall cognitive failures over weeks and months depending on an individual's fallible cognitive ability to remember their mistakes over long periods of time. More recent research has attempted to develop methods for the daily reporting of cognitive failures but focus primarily on memory failures and ignore more general types of cognitive failures. These daily diary studies also failed to assess the impact of cognitive failures on daily functioning. The current study built on this previous research and introduced a set of assessment tools designed to capture missed activities, memory failures, and difficulties with attention and concentration that individuals experience on a daily basis as well as the impact of these events on daily functioning. One hundred thirty-one participants, 20 to 80 years old completed these assessments once each day for a period of seven days as well as a series of lab-based cognitive tasks. These data revealed that participants reported missing the most activities due to overload (e.g., running out of time) but found missing activities due to somatic complaints as the most bothersome. With regard to daily memory failures, participants reported equal numbers of retrospective and prospective memory failures but reported expecting more future consequences from prospective memory failures. Older participants reported experiencing more missed activities and memory failures but rated these

events as less bothersome, less interfering, and as less likely to bring about future consequences compared with younger adults. Daily failures of attention and concentration were captured using a Likert-style scale that assesses cognitive interference. This questionnaire exhibited adequate reliability and factor structure both between- and within-persons and tapped a construct separable from negative affect. Finally, there was evidence of weak relationships among self-reported cognitive failures and objective cognitive performance. Findings are discussed relative to previous research on self-reported cognitive failures, the importance of assessing other daily processes and their effects on daily cognitive failures, and the continued lack of relationship between self-reported cognitive failures and objective cognitive performance.

DEVELOPMENT OF A DAILY DIARY METHOD FOR THE ASSESSMENT OF EVERYDAY COGNITIVE FAILURES

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Overview

The assessment of cognitive performance outside the lab is critical to understanding an individual's level of real world functioning and can be an important clinical outcome for researchers interested in cognitive deficits related to illness and age. Impairment in everyday cognitive functioning can result in significant consequences for the individual (e.g., forgetting to pay rent or not completing a work task on time). Although researchers have used different approaches to index an individual's ability to meet real world cognitive demands, one approach is through the assessment of self-reported cognitive failures. However, self-reports of everyday cognitive failures remain limited for several reasons. First, self-reports of cognitive failures tend to focus on exclusively on memory failures and neglect other aspects of cognitive functioning. Second these assessments typically do not capture the impact of these failures on daily activities. Research that does examine the impact of everyday cognitive failures restricts assessments to failures well outside the normal range of functioning (e.g., problems with activities of daily living such as dressing). Consequently these assessments lack sensitivity to the impairment related to failures in normally functioning individuals. Third, many previous studies of everyday cognitive failures rely on retrospective self-reports that span relatively long temporal response frames (e.g., 30 days), which can reduce reporting accuracy and introduce bias (Cavanaugh, Feldman & Hertzog, 1998).

The overall objective of the proposed study is to develop a set of self-report tools for the daily assessment of everyday cognitive failures in a population of normally functioning

individuals. These new tools addressed the limitations of previous assessments in three ways. First, they broadened the types of cognitive failures assessed beyond memory failures: participants reported on any missed activities regardless of whether the reason for missing the activity was cognitive. Second, it included items designed to quantify the extent to which reported failures impact daily functioning in cognitively intact individuals. Third, it focused on shortening the reporting time interval to failures that occurred over the previous day.

The proposed research used a daily diary design to assess the type, frequency and impact of everyday cognitive failures in a sample of community residing adults (ages 20-80) and addressed the following general aims. The first aim was to describe the frequency, type (e.g., prospective memory, retrospective memory, and overload), and impact of missed activities and everyday memory failures. Also, the first aim will examine the effects of age on these variables. The second aim was to conduct a psychometric analysis of a Likert-style questionnaire designed to measure lapses in attention and concentration; specifically, to establish its validity and reliability at both the within-person and between-person levels. The third aim was to investigate the relationships between self-reports of daily cognitive failures and objective in-lab cognitive performance.

In the next section of this document I review the strengths and limitations of previous approaches to assessing everyday cognitive functioning. The review begins with a brief consideration of performance-based measures, followed by an in depth discussion of self-report measures; the approach used in the current study. Finally, I address the specific aims of the current study and discuss hypotheses relating to each. In the methods section, I describe the design and measures of the research. I then describe the findings in the current

study as well as possible interpretations and implications. The document will conclude with a discussion of these findings and suggestions for future research based on the findings.

Significance of everyday cognitive functioning

Everyday cognitive functioning refers to an individual's ability to meet the cognitive demands they face in the real world. For example, successful completion of activities such as balancing a checkbook, remembering to take medications, and finding one's way to and from the grocery store depend upon multiple cognitive functions, such as memory, planning, and attention. Severe impairment in the ability to meet these demands is often used as a diagnostic criterion for psychological disorders (e.g., depression; Burdick, Endick, & Goldberg, 2005) and organic diseases (e.g., dementia; Rediess & Caine, 1996). An individual's failure to meet everyday cognitive demands may affect decisions about their ability to live independently in old age (Royall et al., 2007) or following a traumatic head injury (Sveen, Mongs, Roe, Sandvik, & Bautz-Holter, 2008). A common outcome in clinical literature is impairment or improvement in activities of daily living; activities that require cognitive processes to perform (e.g., balancing a checkbook). For example, recent lab-based cognitive interventions examine improvement in completing activities of daily living, focusing particularly on older adults (e.g., Jobe et al., 2001; Willis et al., 2006). Further, older adults' complaints about impaired cognitive performance outside the lab are associated with Alzheimer's pathology and may be present before objective cognitive tests reflect any impairment (Barnes, Schneider, Boyle, Bienias, & Bennett, 2006; van der Flier, 2004).

In addition to possibly signifying underlying neurological damage, impairment in everyday cognitive functioning can have a range of personal consequences (Martin, 1983; Farias et al., 2008) and are a significant concern of older adults (Reese & Cherry, 2004).

Although few studies document the severity of these consequences, it is generally accepted that forgetting to take a medication, failing to pay attention while driving, or getting lost in an unfamiliar neighborhood can have a negative impact on an individual's ability to function (Cohen & Conway, 2008; Kruysse 1992; Reason, 1984). Kruysse (1992) attempted to make a direct connection between everyday cognitive functioning and real-world consequences using an event-contingent diary study of cognitive failures experienced while driving. He found that 27% of the failures were made in situations that were considered moderately to very dangerous and at least one error resulted in an actual collision. However, it is still unclear is how often these lapses occur in other contexts and the impact on an individual's daily functioning. To better understand the normative frequency of these lapses, researchers have used both performance-based and self-report approaches to index an individual's level of everyday cognitive functioning.

Approaches to measuring everyday cognitive functioning

The next section briefly describes performance-based approaches to assessing everyday cognitive functioning. After this, the self-report approach is addressed in detail.

Performance-based measures of everyday cognitive functioning

One approach to measuring everyday cognitive functioning is through the use of performance-based assessments in the lab. Allaire and Marsiske (1999; 2002) developed and evaluated a battery of cognitive tasks that were based on traditional lab-based measures but used stimuli related to medication adherence and food preparation. They demonstrated that these measures had high reliability (α = .69-.88) and were significantly correlated with their traditional lab-based analogs (*r*s = .26-.74). Additionally, this battery predicted real world outcomes such as self-reported performance on activities of daily living (Allaire & Marsiske,

2002) and mortality (Weatherbee & Allaire, 2008) in a sample of older adults. Consistent with lab-based research using more traditional cognitive performance measures, older adults showed significant deficits in performance on this battery (Allaire & Marsiske, 1999).

Another performance-based method presents individuals with real world cognitive demands and asks them to describe how to complete or actually perform daily tasks (Allaire & Marsiske, 2002; Berg, Strough, Calderone, Sansone, & Weir, 1998; Diehl, Willis, & Schaie, 1995). The participant-generated solutions are coded for quantity and quality. Allaire and Marsiske (2002) found that the quality of the solutions significantly predicted self-reports of everyday functioning. Similarly, Allaire and Willis (2006) demonstrated that lower scores on their open-ended measure of everyday cognitive functioning predicted cognitive impairment as well as mortality even after accounting for age and education. As with the battery of performance-based measures designed by Allaire and Marsiske (1999), scores on these assessments decrease significantly with increasing age (for a review see Thornton & Dumke, 2005).

Limitations of performance-based measures

The results of studies on performance-based measures of everyday cognitive functioning suggest that these measures are psychometrically sound and useful for predicting real world outcomes. However, an important limitation of the performance-based approach is the lack of ecological validity. Tasks used in performance-based measures are not personally relevant which may affect the effort or strategies the individual applies to the task. Previous research indicates that individuals use more effective strategies for completing cognitive tasks when the tasks are higher in personal incentives (Klehe & Anderson, 2007; Meacham & Singer, 1977). Additionally, performance-based tasks require tightly controlled conditions

that do not necessarily mirror real world experiences (Farias et al., 2008). In using these tasks researchers minimize the variability in performance by eliminating distractions that are a common part of an individual's natural environment (e.g., cell phone) and controlling the strategies that individual can apply to the task. Some researchers have argued that measures administered in such controlled settings tend to assess an individual's optimal level of performance rather than their average or typical level of performance (Cronbach, 1970). This implies that behavior captured in the lab does not necessarily reflect the full range of functioning that exists in the real world (Smyth & Stone, 2003); this is an idea acknowledged in other areas of research (e.g., industrial-organizational psychology; Klehe & Anderson, 2007) that may be particularly applicable to cognitive aging. That is, as the performance of older adults becomes more variable with progressing age, in lab, or optimal, performance may be less indicative of average, or daily, levels of functioning (e.g., Hultsch, MacDonald, & Dixon, 2002).

Another limitation of performance-based measures is that they are generally not suited for repeated administration over brief periods of time. If researchers are interested in day-to-day variability in everyday cognitive failures, the factors that may affect performance at this level, and the conditions under which failures occur, intensive daily measurements are necessary (Borsboom, Mellenbergh, & van Heerden, 2003; Molenaar, 2008). Performance-based measures often require a trained research assistant to obtain valid scores (Conway et al., 2005) and asking individuals to repeatedly return to a lab over a short period of time is expensive and burdensome for both researchers and participants. Additionally, repeated appointments interrupt a participant's daily life and may impact performance on these measures in unknown ways. Some attempts have been made to allow participants to self-

administer performance-based tasks in their homes (e.g., Allaire & Marsiske, 2005), but this approach raises questions about the validity of scores (e.g., unsupervised participants may cheat or complete tasks incorrectly). Performance-based tasks are also susceptible to practice effects, particularly when administered over short periods of time (Allaire & Marsiske, 2005; Rabbitt, Diggle, Smith, Holland, & McInnes, 2001).

These limitations suggest that performance-based measures of everyday cognitive functioning may not generalize to real-world functioning and may make it difficult to tease apart practice effects from day-to-day variability in functioning caused by other processes. Because of these limitations, the second approach is to have participants report on their ability to meet everyday cognitive demands. These self-report measures tend to focus on the cognitive failures individuals make while attempting to meet everyday cognitive demands.

Self-report measures of everyday cognitive failures

Most, if not all, individuals have experienced cognitive mishaps that affected their ability to complete daily tasks (Martin, 1983; Reason, 1979). Everyday cognitive failures can involve forgetting important information, lapses in attention and concentration, or forgetting to complete a started task. Research on cognitive failures suggests that memory failures tend to be the most often reported, although there is some disagreement over which type of memory failure is most prevalent (i.e., retrospective or prospective; Herrmann & Neisser, 1978; Terry, 1988). Research has found that failures are most likely to occur when the individual is experiencing emotions high in arousal (Yamanaka, 2003) and during the transition between home and work (Reason, 1984; Yamanaka, 2003). In contrast to performance-based research on everyday cognitive functioning, there is less evidence of age differences in self-reported cognitive failures (Crawford, Smith, Maylor, Della Sala, &

Logie, 2003; Hertzog, Park, Morrell, & Martin, 2000; Reese & Cherry, 2006) However, other information regarding the nature and causes of daily cognitive failures is scarce. For example, do memory failures occur more often for information that is recently learned or well known? Theories and lab-based studies of memory suggest memory failures for recently learned information should occur more often (Craik, 1994) but it is unclear whether this applies to everyday memory failures. Most research has focused on the frequency of failures in general, rather than on the specific characteristics of the failures. One purpose of the current study is to gather more detailed information on self-reported everyday cognitive failures individuals.

Self-report methods can be further sub-divided into two categories: global and daily diary assessments. In this context, the term "global assessments" refers to assessments that ask the individual to report failures over weeks or months, or to report their experiences with cognitive failures 'in general.' Daily diary assessments encompasses two different approaches. Event-contingent assessments ask participants to keep a log of the failures they experience as they experience them, whereas time- or signal-contingent assessments require participants to report on as many failures as they can after receiving a signal (or at a particular time of day), as in the current study. The next section describes global assessments of everyday cognitive failures.

Global assessments of everyday cognitive failures

A number of existing global assessments ask about the frequency of different types of failures (e.g., attention and concentration: Thought Occurrence Questionnaire [TOQ]; Sarason, Sarason, Keefe, Hayes, & Shearin, 1986, processing speed: Subjective Cognitive Complaints Questionnaire [SCCQ]; Newson & Kemps, 2006, activities of daily living:

Spector & Fleishman, 1998) over a range of reporting intervals. The total number of failures is thought to indicate an individual's level of everyday cognitive functioning. Some of these questionnaires ask individuals to report how often they believe they experience these failures in general. For example, Johannson, Allen-Burge, and Zarit (1997) asked individuals for ratings of their perception of their cognitive function overall (e.g., on the whole, do you think that you have problems remembering things you want to do or say?).

Other questionnaires focus on more specific time periods that can vary depending on the types of failures of interest. Researchers typically attempt to specify a time period that allows an adequate number of opportunities for individuals to experience a cognitive failure. For example, asking individuals to report on the number of missed appointments over a short period of time may result in no reported failures not because the individual kept all their appointments, but because they had no appointments to keep (Hannon, Adams, Harrington, Fries-Dias, & Gipson, 1995). This is in contrast to failures such as misplacing items and word-finding difficulties, which may be more frequent in daily life. The differences in the assumed baseline probability of real world activities has led to questionnaires that assess failures over weeks (Troyer & Rich, 2002) and months (Roche, Fleming & Shum, 2002), or the extent to which they experience this failure 'in general' to allow ample opportunities for individuals to experience the failures of interest.

Construct validity of global assessments.

Evidence for the construct validity of questionnaire measures of cognitive functioning comes from the relationship between these questionnaires and lab-based measures of cognitive performance. For example, Manly, Robertson, Galloway, and Hawkins (1999) found that individuals with higher scores on the Cognitive Failures Questionnaire

(Broadbent, Cooper, Fitzgerald, & Parkes, 1982) made significantly more errors on a Sustained Attention to Response Task (SART; Robertson, Manly, Andrade, Baddeley, & Yiend, 1997), relative to individuals with lower scores. Likewise, Hertzog and colleagues (Hertzog et al., 2000) found small but significant correlations between their measures of retrospective memory and the Frequency of Forgetting subscale of the Memory Functioning Questionnaire (Zelinski, Gilewski, & Anthony-Bergstone, 1990).

Royall and colleagues (Royall, Palmer, Chiodo, & Polk, 2005) have found some of the strongest relationships among questionnaires and lab-based performance using that their measure of instrumental activities of daily living (IADLs). Self-reported difficulty with daily activities was significantly associated with performance on list memory ($r = .50$) and an executive functioning task ($r = -.48$). It is important to note that the relationships in this study may be inflated given the advanced age ($M_{age} = 77.9$) and impairment (<30% lived independently) of the sample. Additionally, while the measure of IADLs in this study was a self-report scale, it was administered by a trained interviewer rather than as a self-administered paper-and-pencil measure. The introduction of a trained interviewer may have improved the quality of participant reports.

A second source of evidence for the validity of questionnaire-based assessments is that scores on these measures are related to actual neurological impairment. Recent research has found that smaller hippocampi were related to more reports of memory failures (Striepens et al., 2010; van der Flier et al., 2004). Additionally, individuals with brain pathology consistent with Alzheimer's disease report more failures compared with individuals without this brain pathology despite scores that correspond to unimpaired functioning on typical objective measures of cognitive performance (van der Flier et al.,

2004). These questionnaires also differentiate between patient groups and normal controls. For example, patients with head trauma (Sterr, Herron, Hayward, & Montaldi, 2006), dementia (Johansson, Allen-Burge, & Zarit, 1997), and depression (Wagle, Berrios, & Ho, 1999) report significantly more cognitive failures compared to age-matched controls. Similarly, Peres et al. (2006) found that older adults with mild cognitive impairment reported significantly more difficulties with IADLs compared to normal functioning older adults (though still significantly fewer than those diagnosed with dementia).

Cognitive interference as a form of cognitive failure.

Researchers have also extended the definition of "cognitive failures" to include lapses in attention and concentration. Using this liberal definition, assessment of cognitive failures then includes "cognitive interference," or an individual's experience of unwanted or intrusive thoughts and their attempts to control these thoughts (Sarason, Pierce, & Sarason, 1996; Wegner & Zanakos, 1994). Cognitive interference is similar to rumination or worry, and is associated with the psychiatric symptoms of depression, generalized anxiety, and post-traumatic stress disorder (see Sarason, Pierce, & Sarason, 1996 for a review). However, unlike these constructs -- which tend to focus on recurrent negatively-valenced emotional content (e.g., depressive rumination) -- cognitive interference refers to any unwanted thought. Cognitive interference represents a form of cognitive failure by itself; an inability to focus one's thoughts on the task at hand. Additionally, using limited mental resources to suppress an unwanted thought may cause distraction from the current task. While some cognitive failures questionnaires contain items that assess attentional failures (e.g., SCCQ; Newson & Kemps, 2006) measures of cognitive interference focus exclusively on these failures. Cognitive interference questionnaires also assess attempts to control intrusive

thoughts which may influence cognitive performance through the consumption of mental resources. Cognitive failures questionnaires tend not to assess attempts at thought control at all, possibly disregarding an important source of cognitive failures.

Global assessments of cognitive interference.

Cognitive interference questionnaires focus on two aspects of unwanted thoughts. First is the frequency of unwanted thoughts. For example, the Thought Occurrence Questionnaire (TOQ; Sarason, et al., 1986) asks how often an individual experiences thoughts unrelated to their current task. Second is how often the individual attempts to control unwanted thoughts. The Thought Control Questionnaire (TCQ; Wells & Davies, 1994) asks individuals how often they try to replace an unwanted thought with other task-related thoughts. Experiencing and controlling unwanted thoughts likely consumes cognitive resources that could be used to meet daily cognitive demands.

Like the cognitive failures questionnaires described above, these assessments can vary with regard to the time interval under consideration, though many tend to focus on what individuals generally do (e.g., White Bear Suppression Inventory; Wegner & Zanakos, 1994; TCQ; Wells & Davies, 1994). More recent research has introduced a questionnaire that focuses on briefer time intervals (i.e., “Today, during this session”) to assess day-to-day variability in cognitive interference within an individual (Stawski, Mogle, & Sliwinski, in review). One aim of the current study is to examine the psychometric properties of an extension of this measure and its ability to differentiate both between individuals as well as within an individual across different days.

Construct validity of cognitive interference questionnaires.

Because cognitive interference is intended to act as an index of an individual's ability to focus their attention, key evidence for the validity of these questionnaires as measures of cognitive functioning comes from their relationship to attentionally demanding cognitive tasks. For instance, Stawski and colleagues (Stawski, Sliwinski, & Smyth, 2006) demonstrated that individuals reporting more cognitive interference had significantly slower reaction times on a working memory task. Kane et al. (2007) also found that individuals with lower working memory ability reported more off-task thinking during the day, relative to those with higher working memory ability.

Similarly, McVay and Kane (2009) found that individuals were significantly more likely to make mistakes on a go-no go task on trials when they also reported experiencing a task-unrelated thought. This finding implies that when the attentional demands of a task are high, experiencing an unwanted thought can impair performance. In support of this interpretation, Friedman and Miyake (2004) showed that, compared with individuals who were more susceptible to proactive interference, individuals who were better able to resist proactive interference reported lower levels of unwanted intrusive thoughts. Whether daily self-reported cognitive interference is related to other types of in-lab cognitive tasks remains unclear. An aim of the current study is to examine the relationship of these questionnaires to a broader set of cognitive abilities.

One additional piece of evidence for the validity of these measures comes from the finding that individuals with disorders that impair attention report experiencing more cognitive interference. Weyandt and Dupaul (2006) found that college students with a history of attention deficit hyperactivity disorder (ADHD) report experiencing significantly more intrusive thoughts compared to students without these histories. This implies that individuals

with reduced attentional resources experience more difficulties with cognitive interference, strengthening the link between cognitive interference and the ability to attend and concentrate.

Limitations of global assessments.

Despite the utility and validity of global assessments of cognitive failures, this method has been criticized for a number of reasons. One primary limitation is that these assessments may depend more on the individual's *perception* of their cognitive functioning rather than their actual functioning, because the measures require retrospection over long intervals of time (Cavanaugh et al., 1998; Herrmann, 1982). Research suggests that individuals rely on broad frameworks of beliefs to respond to items that require retrospection over intervals longer than a few hours (Cavanaugh et al., 1998; Robinson & Clore, 2002). These responses may be more related to an individual's beliefs about themselves and their abilities (e.g., self-efficacy) rather than their actual performance. Additionally, individuals who experience many cognitive failures may have difficulty in actually recalling these failures making questionnaire responses dependent on already fallible cognitive ability (Gorin & Stone, 2001; Rabbitt & Abson, 1990).

A second self report method for assessing everyday cognitive failures is through daily diary approaches. These methods attempt to circumvent one of the limitations of global assessments by asking individuals to report failures over shorter periods of time. Event-contingent reporting asks individuals to complete assessments regarding their failures as they occur (or are noticed). This method and relevant findings are discussed next.

Event-contingent method of assessing everyday cognitive failures

In studies using the event-contingent reporting method individuals keep a detailed diary of their cognitive failures as they occur throughout the day. In these studies, individuals report their cognitive failures as well as details regarding the time and place of the failure. This additional information provides greater insight into when individuals are vulnerable to cognitive failures. For example, Reason (1984) found that individuals were more likely to report making cognitive errors during transitions between home and work (e.g., I forgot to bring my wallet). Additionally, Yamanaka (2003) found that individuals reported most cognitive failures when they were preoccupied or experiencing an emotion high in arousal (regardless of valence). Event-contingent measures of cognitive failures add to our understanding of failures as they occur in the real world. This approach may reduce reporting biases by capturing failures as they occur, rather than relying on retrospective recall. As the memorability of failures may depend on the type of failure (i.e., prospective or retrospective) or the impact the failure has on daily functioning, asking participants to report on a failure before they can forget it occurred is critical to getting an accurate portrayal of everyday cognitive functioning.

Limitations of the event-contingent method.

One limitation of event-contingent reporting is that these reports may not reflect all of the failures an individual experiences. First, individuals can choose which failures to report and which to ignore, potentially affecting both the type and frequency of reported failures (Morris, 1984). Individuals may choose to report those failures they see as minor to present themselves as better at functioning outside the lab than they really are, leaving out failures that have a greater impact on daily functioning. Second, individuals can only report a failure

if they notice it. This limits reporting to those failures that are brought to the individual's attention (Rabbitt & Abson, 1990), which typically occurs through the experience of consequences. Finally, individuals who are lower in cognitive ability may be more likely to experience cognitive failures but less likely to notice them (Rabbitt & Abson, 1990). If the individuals who make the most failures report the fewest failures, these reports would be poor indicators of actual everyday cognitive functioning. That is, depending on a participant with lower memory ability to self-initiate a report when they do notice a failure might place too much responsibility on the participant and lead to incorrect conclusions about their ability (if frequency of reported failures is used to index their cognitive performance). However, the relationship between objective performance and event-contingent reports remains unclear, as none of the available studies have examined the relationship between reports of failures outside the lab and in-lab cognitive performance.

Although the event-contingent method could capture day-to-day fluctuations in cognitive failures, most of the studies using this method have focused on describing daily experiences of cognitive failures without investigating intraindividual variability. Additionally, though event-contingent reports of failures may reduce some reporting biases, they may introduce reactivity. That is, asking participants to report so frequently on failures may actually change the way an individual approaches daily cognitive demands in order to avoid making failures (and having to report them). Signal- and time-contingent daily measures instead adapt global measures for daily assessments. These assessments provide participants with examples of possible failures and ask whether they occurred throughout the day. These examples act as probes and may assist participants in reporting failures that occurred farther away in time from when the assessment is completed. Participants then only

report on failures once a day, but are given some assistance in recalling their failures over those few hours.

Signal-contingent method of assessing everyday cognitive failures

Neupert and colleagues (Neupert, Almeida, Mroczek, & Spiro, 2006a; 2006b; Whitbourne, Neupert, & Lachman, 2008) adapted the CFQ (Broadbent et al., 1982) for an intensive measurement study of everyday cognitive functioning. Individuals completed revised forms of the CFQ each night for eight days. Researchers found significant intraindividual variability in the reporting of cognitive failures and identified variables that influenced reporting of cognitive failures within an individual. For example, individuals were more likely to report cognitive failures on days when they also reported experiencing a stressor (Neupert et al., 2006a; 2006b) compared with non-stressor days and less likely to report cognitive failures on days they reported engaging in physical activity as opposed to days when no physical activity is reported (Whitbourne et al., 2008).

By examining daily cognitive failures using this method, the aforementioned studies were able to identify variables that reduced (i.e., physical activity) and increased (i.e., stress) the likelihood of reporting of everyday cognitive failures. Consistent with other research on self-reported cognitive failures (e.g., Hertzog et al., 2000), Whitbourne et al. discovered that older adults were no more likely to report cognitive failures than younger adults. Whitbourne et al. (2008) also found no relationship between their measure of cognitive ability and daily reported failures, however, cognitive performance was assessed using a brief measure administered via telephone (Tun & Lachman, 2006) rather than in the lab.

Limitations of signal-contingent method.

The research by Neupert and colleagues (Neupert et al., 2006a; 2006b; Whitbourne, Neupert, & Lachman, 2008) marks the first examination of the day-to-day variability and within-person predictors of cognitive failures. However, the revised forms of the CFQ continue to emphasize memory failures. Evidence from global and diary studies suggest that memory failures are the most prevalent everyday cognitive failures (Reason, 1984; Yamanaka, 2003), yet this may be due to biases in reporting. For instance, it is possible that memory failures may be most noticeable, and therefore more often reported.

Another limitation is that no information regarding the emotional and practical consequences of a particular cognitive failure was collected. Not assessing the consequences of failures neglects the impact these failures are (or are not) having on an individual's ability to function. It may be that certain types of failures are reported frequently (e.g., prospective memory failures) but these failures have little impact on the individual's ability to meet everyday cognitive demands. Conversely, failures reported less frequently (e.g., forgetting someone's name) may cause greater discomfort for the individual and have a greater impact on their daily functioning. Finally, the relationship between daily measures of cognitive failures and lab-based cognitive performance has yet to be investigated, which continues to limit support for the construct validity of daily measures of cognitive failures.

Summary of introduction

Previous research examining everyday cognitive functioning has used both performance-based and self-report measures in an attempt to capture an individual's ability to meet real world cognitive demands. Of these two approaches, self-report measures are more common due to a perception that they are more ecologically valid and easier to use both inside and outside the lab.

There are two types of self-report methods that have been used to index cognitive failures. Global assessments focus on the frequency of specific cognitive failures over prolonged (i.e., weeks or months) time intervals. Event-contingent reports are diaries an individual keeps of their cognitive failures over a brief period of time (e.g., a week). Although studies using these different methods provide valuable information regarding everyday cognitive failures, each method suffers from important limitations. Global assessments have some evidence of construct validity but may be susceptible to retrospection biases, as participants attempt to quantify their failures over long time intervals. Event-contingent reports attempt to reduce retrospection biases by assessing failures as they occur, but these lack evidence of construct validity and may rely too heavily on the participant to notice (and remember to report) their failures.

More recent research has used end of day self reports which involve retrospecting over much shorter periods of time. These end of day surveys assess specific examples of cognitive failures taken from validated global assessments. The resulting measures (e.g., Neupert et al., 2006a; 2006b; Whitbourne et al., 2008) have been used to examine intraindividual variability in everyday cognitive failures and provided evidence of psychosocial variables that both increase and decrease the reporting of cognitive failures within an individual. This marks an important step in the study of cognitive failures, as previous research had not considered day-to-day fluctuations in everyday cognitive failures. However, these measures remain limited in several ways. First, they continue to focus primarily on memory failures. Second, the items on these questionnaires were highly specific (e.g., forgetting the plot of a book) and may have limited the failures that participants could

report. Finally, no research has examined the relationships between lab-based cognitive performance and daily, self-reported cognitive failures.

The current study

The purpose of the current study was to extend previous research by validating an assessment tool of cognitive failures in the context of a daily diary study. The assessment used both rating scales and checklists of missed activities and memory failures to characterize an individual's everyday cognitive failures. The general goal of the current study was to examine the properties of this assessment tool and its ability to capture the type, frequency and impact of cognitive failures in the real world. Specifically, the current study described the nature of everyday cognitive failures, explored the psychometric properties of the daily diary measures where appropriate, and examined the relationship of daily cognitive failures reported using this method to in-lab cognitive measures.

Measurements of cognitive failures designed for the current study were made up of three different assessments. The first checklist asked participants for information regarding incomplete daily activities, the reason the individual failed to complete these activities, as well as follow up questions regarding the consequences they expect to experience from not completing these activities. This is a novel approach to assessing cognitive failures, as it allowed participants to report incomplete activities regardless of the reason for missing the activity. Reasons for not completing activities were then subdivided into cognitive and non-cognitive categories, discussed in detail in the Methods section. A second checklist focused specifically on memory failures, and gathered additional information regarding the nature of the information forgotten (i.e., recently learned vs. known for a while) and the perceived consequences of the failure.

The final set of items addressed problems related to attention and thought control by assessing the extent to which an individual experiences and attempts to control intrusive or unwanted thoughts. Intrusive thoughts and attempts to control these thoughts may distract from current task performance. Because cognitive interference likely occurs frequently throughout the day (Kane et al., 2007; Wegner & Zanakos, 1994), asking participants to report on each separate occasion could create reactivity and induce unwanted thought monitoring. That is, frequently asking individuals about their unwanted thoughts may increase awareness of their thoughts and alter their responses to the questionnaire. To limit reactivity, participants completed a series of items assessing the general frequency of cognitive interference throughout the day. These assessments will provide a broader picture of the cognitive failures a person experiences daily, including lapses in attention, failures related to memory and missed activities.

Aims & Hypotheses

Aim 1

The first aim of the current study was to characterize the missed activities and memory failures individuals reported experiencing. Missed activities were differentiated by reason: those missed for cognitive reasons (i.e., overload, attention and concentration, prospective memory) and those missed for non-cognitive reasons (i.e., somatic). Few previous studies have collected detailed qualitative and quantitative information about missed activities. The structure of the new assessment allowed an in-depth description of daily missed activities including frequency of occurrence, concurrent impact (i.e., bothersomeness and interference with daily schedule), and perceived future impact. To address the first aim, I examined the frequency with which individuals reported failing to meet different demands

for reasons related to cognitive functioning and somatic complaints. These missed activities were further described by the immediate consequences, perceived future consequences and the extent to which the unmet demand is part of the individual's routine. With regard to memory failures, I examined the frequency of the different types of memory failures as well as the characteristics of the most frequently forgotten information (e.g., well-learned versus novel information).

After characterizing everyday missed activities and memory failures, I addressed the following specific hypotheses:

Hypotheses related to Aim 1.

Hypothesis 1. Previous research suggests that individuals will most frequently report missing activities and memory failures related to prospective memory, that is, failure to complete an intended action (Crawford et al., 2003; Terry, 1988). I hypothesized that participants would report more prospective memory failures compared with retrospective memory failures. I also compared these failures on their perceived impact on the individual's daily life. It is possible that these failures do not differ in frequency but that prospective memory failures have a greater perceived impact compared with other types of failures. To illustrate, it is generally accepted that forgetting to take an important medication could have greater consequences compared with forgetting the name of a friend (though perhaps not a supervisor; McDaniel & Einstein, 2007).

Hypothesis 2. In-lab research and theorizing also suggests that individuals are more likely to forget recently learned information compared with well known information (Craik, 1994). However, previous research on everyday cognitive failures has generally ignored the distinction between recently and well-learned information. This information was collected in

the current study: I hypothesized that individuals would report more memory failures for recently learned information compared with well-learned information. Additionally, I hypothesized that more cognitive failures would be reported for tasks that are atypical rather than those that are usually part of the individual's daily routine. I also compared these failures on their associated impact ratings. It is possible that the impact of a failure depends on the nature of missed activity or forgotten information.

Hypothesis 3. Finally, I examined relationship of age to the different types of cognitive failures was examined. In their daily diary study, Whitbourne et al. (2008) found no difference in the number of memory failures reported across their age groups (ages 22-85). This is consistent with other research on self-reported cognitive failures (e.g., Hertzog et al., 2000), but is contrary to lab-based research suggesting that older adults have diminished cognitive ability compared with younger adults (see Hofer & Alwin, 2008). Given that the current study uses self-report methods, I hypothesized older adults in the current study would not report more cognitive failures compared with younger adults. Previous research also has not examined whether the type of cognitive failure modifies the relationship between age and self-reported everyday cognitive failures. For example, it is possible older adults would report more memory failures for recently learned compared with well-known information. In the current study, I examined whether the type of failure reported affected the relationship between age and everyday cognitive failures. Similarly, given that the current study assesses a broader range of failures (both within the category of memory failures and in general), it is possible that previous research found no difference across age because of the limited range of failures assessed. Finally, previous research has framed items for daily assessment in terms of the mistakes that individuals make (e.g., did you fail to recognize, by sight, close relatives

or friends, or fail to recognize famous people seen on TV or in photographs?). Endorsing these items may have negative connotations as the participant must admit difficulty with cognitive functioning. The current study instead asks participants to report on activities they missed and then allowed them to select from a variety of reasons why they missed this activity, not all of which are cognitive in nature. This format may encourage participants (particularly older adults) to report events, as reporting does not necessarily imply difficulty in functioning.

Additionally, I examined whether the perceived impact of failures depended on the age of the participant. The socioemotional selectivity theory of aging suggests that as individual, they shift their priorities away from cognitive to socioemotional goals (Carstensen, 1995). This motivational shift implies that older adults should rate their cognitive failures as lower in impact (i.e., less important) compared with younger adults. Alternatively, some research indicates that older adults worry about their memory deteriorating as this may lead to a loss of independence (Reese & Cherry, 2004). This implies that older adults may rate their failures as higher in impact compared with younger adults. Analyses in the current study examined these competing predictions.

Aim 2

A second aim was to conduct a formal psychometric validation of the cognitive interference rating scale. The first two questions capture information about qualitatively different cognitive failures making these items inappropriate for more traditional psychometric analyses (e.g., reliability or factor analysis). In contrast, the cognitive interference scale consists of nine separate rating scale items designed to assess a single construct reflecting one's ability to focus attention, maintain concentration, and avoid being

distracted by unwanted thoughts. The scale was designed to tap both processes encompassed by cognitive interference: experience of intrusive thoughts as well as the suppression of those thoughts. Before using this scale to quantify cognitive interference it was important to determine that it measured a single reliable construct both between- as well as within-individuals. The repeated nature of the assessments in the current study allowed an examination of the scale's properties at both levels. As noted earlier, little research to date has examined the within-person fluctuations in cognitive interference (Kane et al., 2007; Stawski et al., in review) making this a necessary first step before using this measure in additional analyses.

Hypotheses related to Aim 2.

Hypothesis 4. I predicted that reliable interindividual and intraindividual variability would exist in cognitive interference. Acceptable between-person reliability would indicate that the scale is appropriate for differentiating between individuals while acceptable within-person reliability would indicate that the scale is appropriate for differentiating different types of days (e.g., high vs. low stress) within an individual. I tested whether there is reliable variance at both the between- and within-person levels using generalizabilty theory (cf. Cranford et al. 2006).

Hypothesis 5. Additionally, the hypothesized factor structure was examined using a multi-level factor analysis to determine whether the scale appeared to assess a single, coherent factor at both the between- and within-person levels. I hypothesized that a one-factor solution would best fit the data at both levels.

Given that two distinct functions comprise cognitive interference (i.e., experience of intrusions and attempts to control these intrusions; Wegner & Zanakos, 1994), it is possible

that a two factor solution appropriately describes the data from the measure developed in the current study. Other self-report measures of cognitive interference are specifically designed to measure these two processes (e.g., Impact of Events Scale, Horowitz, Wilner, & Alvarez, 1978; White Bear Suppression Inventory, Wegner & Zanakos, 1994). If a one-factor solution did not fit the data, I was prepared to use a two factor solution with items addressing each of these aspects of cognitive interference.

Hypothesis 6. Finally, to establish the discriminant validity of the cognitive interference scale, I examined the relationship between cognitive interference and negative affect. Cognitive interference is similar to rumination, a construct related to depression and negative affect (Moberly & Watkins, 2008; Nolen-Hoeksema, 2000). It is therefore important to examine the between- and within-person relationships between the cognitive interference and negative affect questionnaires to determine that these were assessing separate constructs at both levels. The original version of the cognitive interference questionnaire was found to measure a construct separable from negative affect (Stawski et al., in review) and I hypothesized that this would apply to the extended version used in the current study.

Aim 3

The third aim was to investigate the relationships of everyday cognitive failures, cognitive interference and individual differences in objective cognitive performance in the lab. Self-report measures of everyday cognitive failures were designed to serve as an index of actual cognitive ability and should be related to objective cognitive performance in the lab. The nature of the questions allowed a more in-depth examination of the differential relationships between self-reported cognitive failures and objective cognitive performance. For example, cognitive failures related to activities that are not part of an individual's routine

may show differential relations to cognitive tasks compared to failures for more familiar activities. Similarly, memory failures for recently learned information may be more related to working memory ability, while failures related to well known information might show stronger relationships with episodic memory. However, previous research on cognitive failures has not made these distinctions when examining the relationships between cognitive failures and objective performance.

Previous research has suggested that cognitive interference (i.e., failures of attention and concentration) is significantly related to working memory ability using global reports of cognitive interference (Klein & Boals, 2001; Stawski et al., 2006). I will test whether this is true of daily reports of cognitive interference and whether cognitive interference is related to any of the other cognitive abilities assessed in the current study.

Hypotheses related to Aim 3.

Hypothesis 7. I tested the specific and general relationships among the different assessments of cognitive functioning used in the present study. For example, I examined the relationships of the specific types of failures are related to performance on specific cognitive tasks (e.g., retrospective memory failures and episodic memory performance). Previous research has found that the relationship between lab-based performance and self-reported of cognitive failures is strongest when these assessments tap similar abilities (e.g., prospective memory; Hertzog et al., 2000). However, this relationship has not been tested with a broader range of cognitive failures. Additionally, no study has looked at the relationship between daily diary reports of everyday cognitive failures and in-lab cognitive performance.

Hypothesis 8. I examined the impact of temporal proximity of the assessments on the relationships among cognitive failures and objective cognitive performance. That is, it is

possible that assessments of cognitive failures completed closer in time to administration of the cognitive measures may be more related to in-lab cognitive performance compared to those completed farther away in time.

Hypothesis 9. I tested the relationship between working memory ability and daily reports of cognitive interference. I hypothesized that objective tests of working memory will be significantly related to self-reports of cognitive interference (c.f. Stawski et al., 2006). I also investigated the relationship of cognitive interference to a broader range of cognitive abilities.

Hypothesis 10. Similar to hypothesis 8, I examined the influence of temporal proximity of the assessments on the relationships between cognitive interference and objective cognitive performance. That is, assessments of cognitive interference completed closer in time to administration of the cognitive measures may be more related to cognitive performance compared to those completed farther away in time.

Method

Design

The current study used a variety of lab-based measures, as well as palmtop computers, to collect information regarding an individual's cognitive performance in and out of the lab. During in-lab sessions, participants completed a number of paper-and-pencil measures assessing personality and affect as well as a battery of computerized exercises examining objective cognitive performance. Outside the lab using the palmtop computers, participants filled out reports of everyday cognitive functioning (i.e., missed activities, memory failures and cognitive interference) and other daily experiences such as stressful events, physical symptoms, sleep quality, and affect while in their usual environments. Data

for the current study were collected as part of a larger project and only a subset of the measures were used in the present analyses.

Participants

One hundred and eighty-eight individuals expressed interest in the current study. Participants were recruited through a number of different methods: 101 were referred to the study from other current participants (53.7%), 48 were participants in previous studies conducted by our lab (25.5%), 11 received a letter about the study (5.5%), 9 saw an ad on the electronic billboard Craig's List (4.5%), 6 saw a flyer posted in a public place (3.2%), 2 were recruited via emails (1%), 10 saw an ad in the local Pennysaver newspaper (6.5%) and one person had no referral data. Recruitment materials appear in Appendix A. Of the 188 individuals that were initially screened in the pre-study, 131 were included in the final dataset for analysis. I describe throughout this section how and why individuals were excluded from the final dataset. In summary, of the 188 individuals that participated in the prescreening study 22 were not eligible, 12 were not interested in continuing, 14 did not complete the longer study despite being eligible and interested, 4 did not return their palm pilots, and 5 completed the 7-day study but did not complete the primary measure of interest (the cognitive failures questionnaire).

The final sample included 131 participants with an average age of 48.53 (SD = 15.86) and 55.7% of the sample was female. On average, the current sample had a little more than a high school education (M = 13.5 years, SD = 2.69) and 39.5% were employed at the time of participation. The race breakdown is similar to the population from which the sample was selected (Upstate New York) with the majority of the participants being Caucasian (54.2%)

followed by individuals identifying as Black (35.1%). The remaining participants were of Hispanic (4.6%), or other (6.1%).

Procedure

The current study consisted of two parts. Participants initially completed a pre-screening study. Participants that adequately completed the pre-screening study (as defined below) were invited to participate in the Full study.

Pre-screening study

Individuals interested in the study received detailed information regarding the commitment related to participating and the general goals of the research. Those who expressed interest, were in the proper age range (i.e., 20-80 years old), spoke fluent English and woke up after 4am but before 11am were invited to participate in the initial pre-screening study. The telephone screening questionnaire can be found in Appendix B.

The pre-screening study was a brief version of the full study and included 2 in-lab sessions and 2 days of ecological momentary assessment (described below). The first session included the consent process, a demographics questionnaire (see Appendix C) and training in the use of the palmtop computer for the daily assessments. For 2 consecutive days following this initial session, participants completed the daily assessments. Participants returned the palmtop computer within 4-5 days of the first session. At this appointment, participants were thanked for their time and effort and compensated for returning the palm pilot. All participants also heard a description of the second part of the study and were asked whether they were interested in the second part of the study if they were determined to be eligible. Of the 188 participants who completed the pre-screening study, 173 (92%) indicated they would be interested in participating in the second part.

Inclusion criteria.

Participants who correctly completed at least one morning survey, one evening survey, and 6 of 10 beeped surveys were invited to complete the second part of the study. To be considered correctly completed, beeped surveys had to be started within 30 minutes of the scheduled beep and could last no longer than 30 minutes from start to finish. Of the 173 individuals who participated in the pre-study and expressed interest in the 7-day study, 153 (88.4%) were eligible for the full study and 140 of these individuals attempted to participate in the 7-day study.

Full study

In lab protocol.

The procedure for the full study included 2 in-lab sessions and 7 days of daily palmtop computer assessments. During the first in-lab session, participants received refresher training with the palmtop computers to ensure familiarity with the daily assessment protocol. At this session, which lasted one and a half hours, they also completed a series of questionnaires assessing personality, health behaviors, stressful events, perceived stress, trait cognitive interference, and social support. Details of the questionnaires used in the current study are described in the measures section and all questionnaires can be found in Appendix D.

On the day following the first session of the full study, participants began completing daily assessments using the palmtop computer and these daily assessments continued through the next 7 days. Eight to ten days after the first session, participants returned for their second session which lasted approximately 2.5 hours. During this session, compliance with the daily assessment protocol was reviewed for compensation purposes. Participants also completed a

battery of cognitive tasks and health measures. The health measures included blood pressure, body fat analysis, hip-waist ratio, height, weight, and glycated hemoglobin (percent Hb_{A1c}); these measures are not used in the proposed analyses for the current study. The cognitive measures in the current study included measures of processing speed, working memory, crystallized intelligence, mental set switching, and episodic memory. The order for administration of these tasks was constant across all participants. Cognitive tasks were administered in the following order: Object Match, Trails, Auditory Verbal Learning Test, Spatial Span, Letter-Number Sequencing, Letter Match, Spatial Memory, Number Match, Subtract 2 Span, Shipley Vocabulary, Symbol Search, Backward Letter Span, Letter Series, and Paired Associates. Task procedures for those tasks used in the current study are described in the measures section below, and descriptions and example problems for all tasks can be found in Appendix E.

Ecological momentary assessment protocol.

Participants received a palmtop computer that they were asked to carry for seven consecutive days. Each day participants completed up to seven assessments: a morning assessment, an evening assessment, and 5 prompted assessments (beeped assessments). Participants completed the morning assessment as soon as they woke (morning assessment) and the evening assessment just prior to going to bed (evening assessment). Participants were not told when the prompted assessments would occur, as these are scheduled for pseudo-random times spaced approximately 2-3 hours apart throughout the day. At recruitment participants provided a normal waking time and this time was used to assign a suitable schedule of beeped assessments during the participant's waking hours. The different possible beep schedules appear in Appendix F. The measures completed during these assessments and

analyzed in the current study are described in the Measures section. All assessment information appears in Appendices G and H.

Measures

Ecological momentary assessment measures

Everyday cognitive functioning.

Full details of these questions are provided in Appendix G.

Incomplete activities and memory failures checklists. Participants completed these measures at the evening assessment. Using a checklist format, they indicated any activities they did not complete that day and reported why they did not complete these tasks (incomplete activities checklist). Participants were able to select as many activities as they wished, and were asked to provide reasons for why they did not complete each task they selected. Reasons an activity may have been missed included "ran out of time," "couldn't concentrate," and "too tired." In addition, participants provided a rating of both the immediate (i.e., how much does not completing [selected activity] bother you now? and how much did not completing [selected activity] interfere with your daily routine?) and future (i.e., do you think not [selected activity] will have consequences beyond today?) consequences associated with not completing the selected task. All ratings were made on a scale from 1-7 (1 = not at all to 7 = very much). For any incomplete activity, participants also indicated whether that activity is part of their regular routine.

A second checklist asked specifically about items the individual forgot that day (memory failures checklist). The individual indicated the type of information forgotten and the impact forgetting had on their daily routine. Like the missed activities checklist, participants rated the immediate and future consequences of the failure. and whether the

forgotten information was part of their routine (i.e., taking medicine, an errand, household chore, appointment) or was well known (i.e., important information, directions, personal date, name). If the individual indicated they experienced no memory failures that day, they filled out a brief questionnaire on the strategies they use for improving their memory (e.g., how often they wrote things down that day). This was done to encourage participants to report memory failures as reporting no failures did not allow them to finish the question more quickly.

Incomplete activities and memory failures reported in these two questions were placed in one of five categories: retrospective memory, prospective memory, attentional demands, overload, and somatic. All but activities missed due to somatic complaints were considered cognitive failures. Retrospective memory failures included memory failures for "directions," "a name," "where you put something," "important information," or "personal date." Prospective memory failures included the categories "taking medicine," "an errand," "household chore," or "an appointment" as well as uncompleted activities reported as "forgot to start it" and "started, but forgot to finish." Attentional demand failures were activities missed because the participant "couldn't concentrate." Overload demand failures included failures due to "ran out of time," "it was too difficult," "decided to avoid it," "was interrupted," and "something more important came up." Somatic-related failures included "not feeling well" and "too tired." (Also see Table 6 for a summary of how failures were categorized as well as frequencies with which each category was reported.)

Cognitive interference. At the evening assessment, participants reported the extent to which they experienced cognitive interference during the day. Using an extended version of the questionnaire developed by Stawski et al. (in review), participants rated on a scale from

1-7 (1 = not at all, 7 = very often) the number of times they experienced unwanted thoughts and made attempts to control these thoughts. The stem for these questions was "today, how often did you" and sample ends include "think about personal worries," "have thoughts that kept jumping into your head," and "try to avoid certain thoughts." The full questionnaire is provided in Appendix G.

Daily psychosocial assessments.

Throughout the seven day period participants also reported on their experience of stressors, affect, physical symptoms, and sleep quality. All items are provided in Appendix H and brief descriptions of those analyzed in the current study are offered below.

Stress. At the beeped surveys, participants reported on any stressors they had experienced since their last assessment. They provided qualitative information on each stressor (e.g., an argument, work stress) as well as quantitative information (e.g., the extent to which this event upset them). If a participant reported not experiencing a stressor they completed another series of questions regarding why they believed they did not experience a stressor. These questions were designed to encourage participants to report their stressful events as not reporting a stressor would not allow them to complete the assessment more quickly.

Affect. At each of the beeped assessments, participants completed two measures of affect to indicate how they had felt since the last assessment. First a series of 4 items presented rating scales with opposing emotions (e.g., stressed v. relaxed) and asked participants to decide which emotion better characterized their feelings. Following this a series of 8 adjectives were presented and participants rated how much each adjective characterized their emotions on a scale from 1 (i.e., not at all) to 7 (i.e., extremely).

The reporting interval for affect differed for each of the assessment types. For the morning assessment, participants were asked to report on how they expected they would feel that day. At the beeped assessments they were asked about their current state. In the evening assessment, they were asked to report how they had felt throughout the day (i.e., in general during the day).

Lab-based cognitive tasks

Participants completed a number of lab-based cognitive tasks assessing a variety of cognitive constructs. Descriptions of cognitive tasks used in the current analyses appear below. Screen shots and descriptions of all cognitive tasks are included in Appendix E.

Episodic memory.

Participants completed 3 measures of episodic memory: the auditory verbal learning test (AVLT; Rey, 1964), a version of the paired associates subtest from the Wechsler Memory Scale (WMS; Wechsler, 1997a) and a spatial memory task.

Auditory verbal learning test. Participants studied a list of 15 words for one minute. At the end of the minute, they were given one minute to recall all the words they can remember. The dependent measure is the number of correctly recalled words in one minute.

Paired associates. Participants saw a list of 8 word-number pairs. Then the word from each pair was presented and the participant recalled the number that was paired with it. There were four trials in this task for a total of 32 responses. The dependent measure is the total number of correctly recalled numbers over all four trials.

Spatial memory. Participants saw a playing card presented in one of four different locations on the screen. After a series of cards presented in different locations, participants were shown a playing card and asked to click the location that playing card appeared. Each

trial included 6 cards and participants completed 4 trials. The dependent measure is the total cards correctly matched to their locations.

Working memory.

Participants completed 3 measures of working memory: a backward letter span (Waters & Caplan, 2002), a subtract 2 task (Waters & Caplan, 2002), and a letter-number sequencing task (Wechsler, 1997a).

Backward letter span. Participants saw a series of letters presented one at a time for 1 second each. At the end of each series participants recalled all of the letters they saw in reverse order. The number of letters in each series varied from 3-7 and participants attempted 2 trials at each length. The dependent measure is the total number of the items for trials that were perfectly recalled.

Subtract 2 span. Participants saw a series of numbers presented one at a time for 1 second each. At the end of each series participants recalled all of the numbers they saw after subtracting 2 from each. The number of digits in each series varied from 3-7 and participants attempted 2 trials at each of those lengths. The dependent measure is the total number of the items for trials that were perfectly recalled.

Letter-number sequencing (LNS). Participants were read a series of letters and numbers in a random (pre-determined) order. They then recalled all the numbers in numerical order and followed by the letters in alphabetical order. The number of items in each set ranges from 2 to 8 and participants attempted 3 trials at each length. The dependent measure is the number of trials that were perfectly recalled.

Inductive reasoning.

Participants completed two measures of inductive reasoning: Ravens matrices (Raven, 1976) and a letter series completion task.

Letter series completion. Participants were provided with a number of letter strings. Each of these letter strings followed a pattern and the participant selected the next letter in the pattern from the options provided. The dependent measure is the total number of items correctly answered in 6 minutes with a possible total of 30.

Ravens matrices. Participants saw an image with a piece missing or set of images with one missing. Participants were provided with a set of possible options and selected the piece that best completed the image or set of images. Participants completed the odd-numbered items only. The dependent measure is the total number of items correctly answered out of a possible 30.

Lab-based psychosocial measures

Participants completed a number of questionnaire measures including assessments of personality and demographic characteristics. All questionnaires are included in Appendices C and D. The questionnaires were administered in the following order: Medical History and Health Behaviors, Perceived Stress Scale, Thought Occurrence Questionnaire, Self-Efficacy, Impact of Events Scale, White Bear Suppression Inventory, Social Support, Life Events Checklist, Thought Control Questionnaire, Health Survey Short Form, Personality Scale, and Center for Epidemiological Studies-Depression Scale. Only the subset of these questionnaires used in the analyses of the current study are described below. All questionnaires appear in Appendices C and D.

Demographics. Participants completed a measure assessing general demographic characteristics including age, gender, education, income, and race.

Personality. Participants completed a measure of personality based on items from the International Personality Item Pool (Goldberg et al., 2006). The items in this pool were developed to tap the Big Five personality characteristics: neuroticism, extraversion, agreeableness, openness to experience, and conscientiousness. Cronbach's alphas in the current study were .83, .64, .67, .76, and .76 for these subscales, respectively.

Thought Control questionnaire. The original scale contained 30 items asking about the strategies individuals typically use to control their intrusive thoughts when they experience one. The current study focused on two of the subscales of the original questionnaire: worry and punishment. Strategies were rated on a 4-point scale from never to almost always. Sample items included "I punish myself for thinking the thought" and "I keep myself busy." The reported total scale reliability is $\alpha = .77$ (Wells & Davies, 1994) and the reliability coefficients for the subscales in the current study were $\alpha = .83$ for the worry subscale and $\alpha = .73$ for the punishment subscale.

Thought Occurrence questionnaire. Participants completed 28 items assessing the types of thoughts they have while "they have to concentrate on something." For example, "I think about how poorly I am doing" and "I think about friends." There was a 5-point response scale from never to very often. Previous research found a Cronbach's alpha of .93 (Sarason et al., 1986) and the alpha was .73 in the current study.

White Bear Suppression inventory. This scale consisted of 15 items designed to assess the experience of intrusive thoughts and what the individual does to control these thoughts. Items included "I wish I could stop thinking about certain things" and "I often do things to distract myself from my thoughts" and responses were made on a 5-point scale from strongly

disagree to strongly agree. Reliability estimates ranged from .87 to .89 in previous studies (Wegner & Zanakos, 1994) and was .92 in the current study.

Impact of Events scale. Participants reported on the most stressful event of their life along with details such as whether they received counseling for this event and whether the event is continuing to cause them stress. After providing details of the event, participants completed a 15-item rating scale assessing the extent to which they thought about this stressful event in the past week. Sample items included "I thought about it when I didn't mean to" and "I tried not to talk about it." Responses to the rating scale questions were made on a 4-point scale from not at all to often. Previous research found adequate reliability for the rating scale portion of the questionnaire (Cronbach's $\alpha = .86$; Horowitz, Wilner, & Alvarez, 1979), a finding replicated in the current study (Cronbach's $\alpha = .89$).

Data preparation

Final sample

One hundred and forty individuals were eligible and interested in the 7-day study following completion of the pre-study. Of these individuals, 4 never returned their palm pilots, 3 experienced hardware failures, and 2 returned their palm pilots but had not completed any of the evening surveys thus providing no data primary measure of interest: the cognitive failures questionnaires. This led to the inclusion of 131 individuals in the final dataset.

Ecological Momentary Assessment data

Prior to conducting any analyses designed to address the study aims, participant compliance and any missing data patterns were examined. First, I determined whether any

assessments were not compliant with the study protocol. Specifically, participants were instructed to complete the evening survey once each evening within an hour of going to bed. In the current sample of 131 participants, there were 917 possible assessments (1 assessment per day for 7 days times 131 participants). Of the possible assessments, participants completed 833 assessments and 758 (91%) were considered compliant for use in the analyses in the current study. In cases where participants completed more than 1 survey for a given day, the first completed survey was used (n = 29). Additionally, assessments completed between midnight and 4am on a particular day were assumed to refer to the previous day's events. Those assessments completed after 4am (but before 8pm) were excluded due to their proximity to morning and beeped assessments on the following day (n = 33). After removing noncompliant assessments, participant compliance was calculated by dividing the number of surveys correctly completed by 7. Average participant compliance was 82.7% (~5.8 surveys). Table 1 includes the breakdown of actual evening assessment completion. More than 80% of the participants completed 5 or more of the surveys correctly over the seven day period.

Compliance was also assessed for beeped assessments to determine which would be included in the confirmatory factor analytic models in Aim 2. Participants were instructed to complete a beeped survey at five pseudo-random times per day. Assessments completed within 15 minutes of the scheduled time were considered compliant with the beeped protocol. There were a total of 4,585 beeped assessments possible over the entire sample and a total of 4,302 beeped assessments were completed. Of these assessments, 226 were outside the 15 minute time window. An additional 32 were eliminated because they were completed after the participant's seven day study period had ended. (Palm pilots continued to beep and some participants continued to do surveys even though the seven days had ended.) As with the

evening survey, in cases where participants completed 2 assessments for the same beep the first of those surveys was included in the final data analysis. This led to the elimination of another 336 assessments. On average participants completed 80.8% of the beeped assessments correctly and the full breakdown of beeped compliance is available in Table 2. In the current sample, 102 of the 131 participants correctly completed 70% or more of the beeped assessments indicating good overall compliance with the study protocol.

Missing Data Analyses

Because of the amount of missing data in the current study, it was important to determine whether the data were 1) missing completely at random, 2) missing at random, or 3) non-ignorable missingness. If the data are missing completely at random (MCAR) this would indicate that there is no underlying relationship between the missing values and other variables (observed or not). This is the best case scenario as the missing data are independent of both predictors and outcomes and will not bias analyses. The second possible case is that data are missing at random (MAR). In this case, the missing values are not completely independent of all variables but can be predicted by observed variables within the dataset. This would imply that although missing values are related to informative variables, those variables were observed and can be used to control for the pattern of missingness in the dataset. Finally, informative missing implies that missing values are dependent on some unobserved variable or variables. Although it is not possible to rule the possibility of informative missingness, it is possible to determine whether any of the observed variables are related to the pattern of missing data. If missing values are dependent on person-level characteristics measured in the current study, these characteristics can be included in predictive models as covariates to control for any spurious relationships driven by

systematically missing values and reduce bias in the estimates due to non-participation (Little & Rubin, 1987).

The first step in assessing missing data patterns was to determine whether missing values were related to any of the demographic, personality, or cognitive variables at the between-person level. Spearman correlations were calculated among these variables and compliance for both the beeped and evening surveys (Table 3) and generally evidenced weak relationships. There was no consistent pattern of relationship between the cognitive variables and compliance. Number of evening surveys completed was marginally associated with episodic memory ability (r = .17, p = .06). On the other hand, better compliance with the beeped surveys was significantly though weakly related to higher fluid intelligence ability (r = .19, p = .03). With regard to personality, compliance with the protocol for both surveys showed small but significant correlations with measures of trait cognitive interference (r's = -.17 to -.26); those individuals reporting less propensity to experience intrusive thoughts were more compliant with survey schedule. Lastly, compliance with both surveys showed small positive correlations with age (r's = .18 and .20) implying that older adults completed more surveys correctly.

The second step used to examine missing data patterns was to determine whether any day-level characteristics (i.e., within-person variables) influenced the completion of a particular evening survey. Non-linear logistic mixed models used day in study, day of week, daily self-reported stressful events, and daily self-reported affect to predict the probability of completing the evening survey. Prior to conducting analyses it was important to determine whether the likelihood that a participant would complete the evening survey changed as the study progressed or was affected by other variables observed in the current study. For

example, it is possible that participants would be less likely to respond on high stress days compared with low stress days. This could bias results if participants systematically fail to complete surveys depending on the characteristics of the day. Day in study significantly predicted compliance with the evening protocol. Participants were less likely to complete the evening assessment as the study progressed ($F[6, 673] = 32.42$, $p < .0001$) though the difference in probability of completion was small (p[completion first day in study] = .91 v. p[completion last day in study] = .88). Conversely, participants were more likely to complete the evening assessment on days when they reported experiencing higher than average positive affect (PA; $F[1, 912] = 5.28$, $p = .022$; p[completion on days with 1 point higher PA] = .90 v. p[completion on days with 1 point lower PA] = .88) and on days when they reported at least one stressor ($F[1, 912] = 8.36$, $p = .004$; p[completion on stress days] = .93 v. p[completion on no stress days] = .86). Day of week and negative affect had no effect on probability of completing the evening assessment (p's > .16).

Finally, before addressing the primary aims of the study, I examined the correlations among personality, self-reported cognitive failures, and the perceived impact of these failures. This was done to determine whether any personality variables appeared to affect the reporting of failures and the perceived severity of their impact. Previous research has found that personality traits such as neuroticism can affect the number of physical symptoms reported (Larsen & Kasimatis, 1991) as well as the severity of discomfort associated with these symptoms. Additionally, previous research has found positive correlations (r's = .28 to .43) between neuroticism and cognitive failures (Broadbent et al., 1982; Merckelbach, Muris, Nijman, & de Jong, 1996; Wallace, 2004). A similar trend appeared in the current data: neuroticism was positively correlated with frequency of failures as well as with their

perceived impact (Table 4). No other personality characteristics were consistently related to both frequency and impact. Because neuroticism did appear to have an effect on the reporting of failures and their impact, I controlled for neuroticism in all models comparing frequency and impact across the different categories of missed activities and memory failures.

Results

The primary purpose of the current study was to design assessment tools for the measurement of missed activities, memory failures, and cognitive interference suitable for administration in a daily diary study. In the following section, I will discuss analyses that evaluate and validate these daily measures in an sample of adults aged 20 to 80. The first aim examined the frequency and impact of several types of missed activities and memory failures and whether the frequency of these missed activities and memory failures depended on typicality of the activity or forgotten information or the age of the participant. Aim 2 examined the psychometric properties of a Likert-style measure of failures related to attentional control. Finally, Aim 3 focused on the relationship between the daily measure of self-reported cognitive failures and performance on traditional lab-based cognitive tasks. The first aim discussed describes the frequency of different failures as well as their perceived impact in detail.

Aim 1

These analyses focused on the two checklists that participants completed assessing incomplete activities and memory failures. Incomplete activities were subdivided into categories addressing both cognitive failures and non-cognitive failures. The memory failures were broken down into failures for intended actions (prospective memory) and for previously learned information (retrospective memory). Before addressing the primary hypotheses for

aim 1, I began by comparing the frequencies of incomplete activities and the frequencies of memory failures across categories. Following these analyses, I then compared the impact ratings across categories separately for each of these items. Finally, I pooled all of the information provided in these items to compare the relative frequencies and impact of missed activities and memory failures.

Frequency of Incomplete Activities and Memory Failures

Incomplete activities

The data analyzed for this aim were gathered using the incomplete activities checklist described in Appendix G. This item asked whether there were any activities the participant wished to complete that day that they were unable to accomplish. There were 7 different activities the participant could report missing as well as an "other" category for events that could not be otherwise classified. Participants reported at least one missed activity on over 50% of evening surveys (n = 430 of 833). On 34.6% of measurement occasions participants reported one missed activity, 2 missed activities 12.7% of measurement occasions, 3 missed activities on 2.6% of occasions and 4 or more missed activities on the remaining 1.7% (n = 14) occasions.

The breakdown of reporting for each of the different activities is reported in Table 5. For any activity endorsed, the participant also indicated why they did not complete the activity and these reasons were divided into four superordinate categories. Table 6 includes the frequency with which each different reason was selected as well as the overall frequency of the associated category. Activities missed for "other reasons" could not be classified into the different failures categories and were excluded from further analysis (*n* = 103; 16.43%). This should be differentiated from "other" activities that were missed. Missed activities

indicated as “other” could be included if the participant indicated a reason that fit in one of the categories. Because of the low frequency of attention failures (n = 11) reported in this item, these failures were excluded from analyses and frequencies were compared across the remaining three categories: overload, prospective memory, and somatic.

The main purpose of aim 1 was to determine whether there were significant differences in the frequency and impact of reported failures across the three categories. To test for differences among the different types of failures, I fit non-linear mixed models (SAS Proc Glimmix) to compare the frequencies of failures across the three most frequent categories of failures—overload, PM and somatic failures. Because these were counts of the number of failures over the seven days of the study, the underlying distribution was modeled using Poisson regression. Model fit was evaluated using the ratio of the Pearson Chi-Square to degrees of freedom. There is no widely accepted rule of thumb for this statistic, researchers generally agree that values closer to 1 and under 2 indicate adequate representation of the underlying distribution. In cases where a Poisson distribution did not appear to model the distribution appropriately, a negative binomial was fit to the data to determine whether this distribution resulted in better model fit. Unless otherwise noted, the Poisson distribution was used to model the distribution. For these models, effect sizes are reported as risk ratios (RR) which reflect the risk of a particular event relative to another event (e.g., the risk of an overload failure relative to the risk of a somatic failure).

Before fitting the first model comparing frequencies, I determined that differences in responding rates were significantly related to the frequency of reported failures. This effect suggested that individuals who responded least to the evening surveys also tended to report fewer failures ($F[5, 650] = 8.24$, $p < .01$). (This may suggest bias as forgetting to complete

the evening survey may be considered a cognitive failure.) Because of this relationship, the response variables (i.e., the number of failures in the different categories) were corrected for frequency of reporting by estimating the number of failures an individual would have reported had they completed all 7 days of assessments based on their rate of failures on the days they actually completed the surveys. For example, an individual who reported 2 failures over the five days of assessment would be adjusted to 2.8 to estimate the rate of failures had they responded to all of the assessments as directed. It is important to note this correction does make the assumption that the likelihood of a failure would be constant over the duration of the study and across individuals with different response rates.

Following correction of the outcome variable, I began by fitting a model to compare the frequency of failures across the three categories. This model compared the frequencies of missed activities due to prospective memory, overload, and somatic reasons. There was a significant effect of category ($F[2, 256] = 96.2$, $p < .01$). Missed activities due to overload were reported significantly more frequently than missed activities for other reasons. Model estimated counts indicated that participants reported 2 missed activities due to overload compared with less than one activities due to somatic reasons over the seven day period (RR = 1.93).

Memory failures

Similar to the incomplete activities item, I began analyses of the memory failures checklist item by examining the frequency of the different types of daily forgetting. There were nine different items participants could indicate they had forgotten during that day as well as an "other" category for a forgotten item that could not be otherwise classified. Participants reported 358 forgotten items over the course of the study. On 23.9% (n = 199) of

measurement occasions participants reported at least 1 memory failure; 2 memory failures on 7.7% of occasions (n = 64), and 3 or more memory failures on the remaining 1.2% (n = 10). Items in this question were classified into two types of memory failures. Table 7 details the number of failures for each type of information as well as the overall frequencies of the superordinate categories. Because "other" items could not be classified as retrospective or prospective, they were treated as a separate category in these analyses (n = 49; 13.7%).

As with the incomplete activities question, I began by comparing the frequencies of prospective memory, retrospective memory, and unclassified memory failures using nonlinear mixed models. There was a significant effect of type of memory failure on reporting frequency (F[2, 256] = 33.04, $p < .01$). The frequency of reporting for prospective memory and retrospective memory failures was not significantly different (p = .13) but both of these memory failures were reported more frequently than unclassified memory failures (p's < .01; RRs = 2.96 and 3.49 respectively).

Impact of incomplete activities and memory failures

For each of the missed activities and memory failures reported, participants also rated the extent to which missing that activity or forgetting the item bothered them, the degree to which the event interfered with their daily schedule and whether they anticipated experiencing future consequences. The means for these ratings broken down by type of missed activity as well as reason and overall category appear in Table 6 and the same data appear in Table 7 for memory failures. Because some participants reported more than 1 event in a given category on a given day, two different means were calculated for each rating. For the mean and standard deviation in column labeled 'Mean-A' the average of these two ratings was taken to calculate the overall category mean while in column labeled 'Mean-M' the

maximum of the two ratings was taken to calculate the overall category mean. The differences between these two calculations of the mean were small and for analyses comparing these ratings across categories the first mean (using the average of the two ratings) was used. For these analyses, effect sizes were calculated using Cohen's *d*. For this measure of effect size, effects ranging from .2 to .5 represent small effects, .5 to .8 medium effects, and greater than .8 large effects.

Incomplete activities.

Because the rating scales were continuous, multilevel linear mixed models (SAS Proc Mixed) were fit to determine whether a particular type of missed activity was rated as more bothersome than the others, creates more perceived interference in an individual's daily activities, or is associated with greater future consequences. Omnibus tests indicated there was no significant difference among the three categories of missed activities in how bothered people were ($p = .16$), how interfering the missed activities were ($p = .09$) or perceived future consequences ($p = .73$). These findings imply that although missed activities due to overload were the most commonly reported incomplete activity, they were not rated as more irritating, interfering or having more future consequences than the other types of missed activities.

Memory failures.

Models were also fit to the three impact ratings to determine whether these ratings were significantly different across the memory failures. For bothersome-ness ratings, the effect of category was significant, $F(2, 64) = 6.45$, $p < .01$ and specific contrasts indicated that prospective and retrospective memory ratings did not differ in their ratings ($p = .93$) though both were significantly higher than ratings of bothersome-ness for unclassified memory failures (p's $< .01$, $d = 0.87$ and 0.89 respectively). Conversely, there was not a

significant difference across the types on their interference ratings ($p = .37$). Finally, with respect to anticipation of future consequences, there were significant differences across the categories ($F[2, 64] = 5.4$, $p < .01$). Prospective memory failures were rated as having significantly greater future consequences than retrospective memory failures ($p = .002$, $d = 0.82$). Unclassified memory and prospective memory failures were not significantly different though the contrast was marginal ($p = .076$, $d = 0.58$) and there was no difference between retrospective and unclassified memory failures ($p = .34$, $d = 0.31$).

All incomplete activities and memory failures

Finally, I combined the information from both the incomplete activities and memory failures checklists to compare the frequencies of memory and other more general cognitive failures (e.g., overload failures). For these analyses, I created a global index of prospective memory failures by adding the failures reported in the incomplete activities checklist with those reported in the memory failures checklist. This was the only category that included information from both cognitive failures questions. I then compared the frequencies of reported failures and the impact of these failures across four categories: overload, somatic, retrospective memory, and prospective memory.

Comparing frequencies across all failures.

As with the initial frequency analyses, I used a nonlinear mixed model to compare the frequency of failures across the four categories. There were significant differences across the categories, $F(3, 384) = 8.27$, $p < .01$, missed activities due to overload were reported more frequently than all other categories. The other categories (somatic, retrospective, and prospective) did not differ from one another (p's > .55). Risk ratios for missed activities due

to overload compared with the other categories were 2.28, 2.05, and 2.02 for somatic, retrospective, and prospective memory, respectively.

Comparing impact across all failures.

I then compared the impact indices across the four categories to determine whether there were any differences in the ratings of bothersome-ness, interference or anticipation of future consequences. There was no significant difference across these categories on the ratings of bothersome-ness ($p = .68$). There were differences across the categories on both interference ($F[3, 145] = 2.85$, $p = .04$) and future consequences ($F[3, 145] = 4.34$, $p = .006$). With respect to interference ratings, somatic failures were rated significantly more interfering than both retrospective memory failures ($d = 0.55$) and prospective memory failures ($d = .40$). Additionally, overload failures were rated as more interfering than retrospective memory failures ($d = 0.34$). For the ratings of future consequences, overload and prospective memory failures were perceived as having significantly greater future consequences than retrospective memory failures ($d's = 0.68$ and 1.02, respectively).

Taken together these analyses imply that while missed activities due to overload are the most frequently reported, they are not considered more bothersome than other types of failures. Additionally, though the frequency of the somatic, prospective and retrospective memory categories were not significantly different from one another they do appear to have different perceived levels of impact on an individual's life. Missed activities due to somatic complaints are rated as more interfering than either of the memory failure categories.

Following this broad examination of the frequency and impact of the different categories of missed activities and memory failures, I proceeded to the hypotheses outlined as part of Aim 1. The hypotheses associated with Aim 1 were designed to examine specific

differences in frequencies or impact of missed activities and memory failures and whether characteristics of the categories (e.g., routine vs. novel) or the individual (e.g., age) affect their frequency or impact.

Hypotheses related to aim 1

Hypothesis 1.

Previous research on self-reported memory failures indicated that failures related to completing an intended action were most frequent (Crawford et al., 2003; Terry, 1988). To examine this I compared the frequency of self-reported prospective memory failures to the frequency of self-reported retrospective memory failures. For this comparison I used the overall index of prospective memory failures that included failures reported for incomplete activities as well as those reported in the memory failures question. There was no significant difference between the reporting frequencies of these two categories ($p = .49$) but there was a significant difference in the impact ratings for these two categories ($p < .01$). Prospective memory failures were rated significantly higher in anticipated future consequences compared with retrospective memory failures ($d = 0.82$). While the reporting frequencies of these two different types of failures did not differ significantly, it appears that they do differ in their impact on daily functioning. The differences found by previous research (Crawford et al., 2003; Terry, 1988) may indicate that prospective memory failures are believed to be more frequent by participants because they have a greater impact on their daily activities.

Hypothesis 2.

The second hypothesis focused on the specific characteristics of memory failures and how these might affect reporting of cognitive failures. Research suggests that individuals are more likely to forget recently learned information compared with well known information

(Craik, 1994). In the current study, participants indicated whether or not the retrospective memory failure was for a recently learned or well-known item and identified the incomplete activities as part of their daily routine. To address the second hypothesis, I fit nonlinear mixed models separately to compare the rates of failures within a particular category to determine whether routine (or well-known) or not (recently learned) were more frequently reported. Risk ratios for this section are reported using non-routine activities (or recently learned information) as the reference. Ratios greater than 1 suggest that failures for routine activities are more likely while ratios below 1 suggest failures for non-routine activities were more likely. Table 8 includes all the relative frequencies and impact ratings for failures broken down by typicality.

Comparing frequencies across failures depending on typicality.

Retrospective memory failures. The first category I examined was retrospective memory failures for well-known compared with recently learned information. It is important to note that these analyses exclude the most frequently reported retrospective memory item: where I put something. Participants were not queried about the length of time they knew this information and while it could be assumed that this is a recently learned (or at least recently encoded) piece of information, it is possible that these failures represent a mixture of time periods (e.g., I forgot where I left the vacuum after I used it last week v. I forgot where I set my sunglasses down today). For this reason, I chose to exclude them from these analyses. As noted above, I used a nonlinear mixed model to compare the probability of reporting a well-known opposed to a recently learned retrospective memory item. Contrary to expectations, failures for well-known information were more frequent than failures for recently learned information ($F[1, 128] = 3.8$, $p = .05$; RR = 1.75).

Missed activities due to overload, prospective memory, and somatic complaints. I then compared the probability of failures for routine and not routine activities for each of the other categories of failures. There was a significant difference in the frequency of missed activities due to overload with significantly more failures reported for non-routine activities compared to routine activities, $F(1, 128) = 19.62$, $p < .01$, RR = 0.61. On the other hand, participants reported missing more routine activities for both the somatic ($F[1, 128] = 4.62$, $p = .03$, RR = 1.38) and prospective memory categories ($F[1, 128] = 9.89$, $p < .01$; RR = 1.58, respectively). One possible explanation for these results is that more routine prospective memory and somatic activities are, by definition, attempted frequently and this would provide more opportunities for missing these types of activities.

Comparing impact across failures depending on typicality.

Retrospective memory failures. I also examined whether the characteristics of the reported failures affected the ratings of irritation, interference or anticipation of future consequences provided by participants. The only significant effect was for ratings of interference; memory failures for recently learned information were more interfering than failures for well-known information ($F[1, 9] = 7.75$, $p = .02$, $d = 3.16$).

Missed activities due to overload, prospective memory, and somatic complaints. For the irritation ratings, only routine and not routine activities missed for somatic reasons received significantly different ratings with failures for routine activities causing greater irritation than failures for non-routine activities ($F[1, 19] = 4.33$, $p = .05$, $d = 0.35$). Missing a routine activity due to overload was more interfering than missing a non-routine activity ($F[1, 32] = 6.06$, $p = .02$, $d = 0.74$). There were no significant differences on any of the ratings of anticipated future consequences (all p's > .23). These findings indicate that missing

routine activities may have a greater impact on participants' daily functioning compared with missing non-routine activities.

These results imply that asking participants for information about the nature of the failure could provide insight into which failures are perceived to create the most difficulties in daily functioning. These characteristics may also affect the relationship between failures and in-lab cognitive performance; a hypothesis that will be investigated further as part of Aim 3.

Hypothesis 3.

Hypothesis 3 was designed to examine whether age affected the frequency of reporting cognitive failures and the perceived impact of these failures when they were reported. To examine this, a main effect of age and the interaction between age and category of failure were added to the nonlinear mixed models comparing frequencies across the different categories of failures. When there was a significant age effect in these models I compared age groups by examining the estimated outcomes for adults one standard deviation below the mean age of the sample (from hereafter referred to as younger adults) and estimated outcomes for adults one standard deviation above the mean of the sample (hereafter referred to as older adults). Risk ratios were calculated using younger adults as the reference group (i.e., denominator). Risk ratios above 1 then indicate greater risk for older adults, while ratios under 1 indicate greater risk for younger adults.

Comparing frequencies of incomplete activities across age. As with the initial models fit at the beginning of Aim 1, I began by comparing the frequency of failures from the incomplete activities items. This involved comparing the frequency of missed activities due to somatic, overload and prospective memory reasons across age. For this model, the main

effect of age was not significant, however, the age by category interaction was significant (F[2, 254] = 3.07, p = .048) indicating that age trajectories differed for each of the different categories of incomplete activities. Both missed activities due to overload and somatic complaints increased with age; older adults reported nearly twice as many missed activities of these types compared with younger adults (RRs = 2.4 and 1.71, respectively). Missed activities in the prospective memory category did not increase with age (RR = 0.76). This finding is consistent with some research suggesting that older adults perform just as well as younger adults on prospective memory tasks outside the lab (e.g., Dobbs & Rule, 1988).

Comparing frequencies of memory failures across age. I then compared the retrospective, prospective, and general memory failures reported. For this model, the main effect of age (F[1, 254] = 7.05, p = .01) and the age by category interaction were significant (F[2, 254] = 6.38, p = .002) and indicated an age related increase in reporting of all types of memory failures though this was most pronounced for retrospective memory failures (RR = 3.01). Prospective memory failures (RR = 1.6) and unclassified memory failures (RR = 1.25) also showed increases with age which is consistent with lab-based research suggesting that memory ability decreases with age across several different types of memory tasks (see Cohn, Emrich, & Moscovitch, 2008 and Old & Naveh-Benjamin, 2008 for reviews). This is in contrast to the research noted above indicating that older adults make fewer prospective memory failures outside the lab.

One possible reason for these contradictory findings is that the items in the memory failures checklist thought to reflect prospective memory failures actually captured both prospective and retrospective memory failures. All prospective memory depends on retrospective memory to some extent (McDaniel & Einstein, 2007). For example,

remembering to go to the store to pick up milk can be seen as two memory tasks. Remembering to go to the store to get something would be defined as the prospective memory portion as it reflects the intention to perform an action. Recalling the item to be picked up at the store (i.e., milk) is a retrospective memory task. The memory failures checklist in the current study does not distinguish between the two components of these activities. A participant reporting they forgot an errand could have forgotten to start the errand (e.g., going to the store; a prospective memory failure) or forgotten the content of the errand (e.g., what to pick up from the store; a retrospective memory failure). Older adults may have more difficulty with the retrospective component causing them to report a failure for that item even though it was classified as a prospective memory item in the current study.

These results suggest that older adults reported significantly more failures than younger adults across most of the categories of failures in the current study (the only exception being missed activities in the prospective memory category) and, in general, this did not depend on whether the failure reflected a routine or non-routine activity. Possibly more important than the frequency of failures is the impact individuals perceive these failures to have on their daily life. Because of this I then added age and the age by category interaction to the models comparing the ratings of irritation, interference, and anticipated future consequences.

Comparing impact of incomplete activities across age. There were significant main effects of age for the comparison of the incomplete activities ($F[1, 48] = 9.76$, $p < .01$) on ratings of irritation. Older participants rated missed activities as less irritating than younger participants (Table 9). There were no significant age effects when comparing the incomplete activities categories on ratings of interference (p's $> .11$). For the ratings of future

consequences there was a significant main effect of age ($F[1, 48] = 9.22$, $p < .01$) which indicated that older adults rated missed activities as lower in future consequences compared with their younger counterparts (Table 9).

Comparing impact of memory failures across age. There were no significant effects of age on irritation ratings or perceived future consequences for memory failures (p's > .15). For ratings of interference, the comparison of the interference ratings for failures from the memory failures checklist was significant ($F[1, 62] = 5.28$, $p = .03$). Again older participants rated their failures as less interfering than younger adults (Table 9).

I also compared the ratings of impact across the routine and non-routine categories to determine whether these ratings were differentially affected by age however, there were no significant age by category interactions for any of the models (all p's > .16; Table 10).

This is one way in which the method of reporting in the current study may help in getting a better estimate of the cognitive failures older adults experience. By asking about missed activities and memory failures each day for a week, older adults can remember more relevant events and provide a more accurate picture of their actual cognitive failures as well as the impact these failures are perceived to have on daily functioning. Unfortunately there were very few missed activities due to attention and concentration reported in the checklist about incomplete activities. However, as noted in the introduction, problems focusing attention may occur frequently throughout day but in fleeting moments without actually keeping individuals from performing daily activities. These moments still reflect failures of the individual to control their attention and may provide an index their ability to focus their thoughts. The assessment tools in the current study included a measure of daily cognitive interference which assesses the extent to which an individual can focus their thoughts on the

task at hand and control their experience of intrusive unproductive thoughts. Aim 2 examines the psychometric properties of the cognitive interference scale designed to capture failures of attention and concentration.

Aim 2

The cognitive interference rating scale was expected to assess a single, reliable construct and capture daily variability in attention failures within an individual as well as differences in attentional failures between individuals. Psychometric analyses were conducted to establish two major points. First, I calculated the reliability of within-person and between-person variability captured by the measure. Second, I determined whether a one-factor solution best fits the data both between individuals as well as within individuals across days. Finally, I investigated the discriminant validity of the scale by examining its relationship to the construct of negative affect (Stawski et al., in review). Establishing that the scale has adequate psychometric characteristics is a critical first step for any scale intended to differentiate between individuals but also within an individual across days. Verifying that the variability captured by the measure is reliable at the within-person level allows researchers to be confident that the variability in responses is not due to the items used or random error.

Before beginning the psychometric analyses, I fit a series of multilevel linear mixed models to the data to extract the between and within person variability. I then calculated the intraclass correlation (ICC), an index of the percentage of between person variability relative to the total variability, for each of the items as well as the total score. The ICCs for the items as well as the total score appear in Table 11. Approximately 61-68% of the variability in the items was due to between person differences in cognitive interference, while 77% of

variability in the total score was due to between person differences. Additionally, I examined models using day in study to predict scores on the items as well as total score to determine whether participant responding changed as the study period progressed. It is possible that asking participants about their cognitive interference caused reactivity; participants may begin to pay more attention to their thoughts and be more mindful of intrusions. There was a significant main effect of day in study on item 8 ($F[6, 621] = 2.22$, $p = .04$). Average responses on this item for the first day in the study were 2.54 (out of 7) compared with 2.17 on the last day in the study. There was also a marginally significant day in study effect on item 3 ($F[6, 621] = 1.97$, $p = .07$). Again average responses on this item decreased slightly over the course of the study, first day $M = 2.56$ v. last day $M = 2.49$. There were no other significant main effects (p's > .21). The effect of day in study was further investigated with Generalizability theory models which will be described next.

After determining that variability existed at both the between and within person levels among the items as well as in total scores, I addressed the hypotheses related to Aim 2.

Hypotheses related to aim 2

Hypothesis 4.

For the first hypothesis of aim 2, I used generalizabilty theory models (SAS proc varcomp) to calculate the amount of variability in the items due to inter- and intraindividual differences in cognitive interference. Generalizability theory (G-theory) uses techniques similar to analysis of variance (ANOVA) to partition the variance in scores into a variety of different sources, referred to in G-theory as facets. Using G-theory models I was able to decompose the variability in the daily measure of cognitive interference into variance related to items, persons, days, and the interactions of each. Any variability not accounted for by

these sources was considered error. For these models, I followed the procedures outlined by Cranford and colleagues (2006). The G-theory models in the current study were estimated using the MIVQUE0 method in order to allow the use of data from participants who did not complete all 7 evening assessments in the current study. Item was treated as a fixed factor as the items in the current study represent the complete set of available items for the daily assessment of cognitive interference at this time. For the first reliability estimate, day was constrained to be fixed and person as well as all higher order interactions with person were treated as random factors. The reliability estimates generated from this variance decomposition then refers to any person measured on a given day. For the second estimate of between-person reliability, the G-theory model was re-estimated treating day as a random factor as well as person. This means that the reliability estimates produced from these variance estimates will refer to a random individual assessed on a random day.

The full results of the G-theory models appear in Table 12. As indicated by the ICCs, much of the variance is due to differences between individuals (~53%) and the remaining variability is mostly accounted for by differences within persons across days (~15%) and within person differences in responding to the different items (~9%). Although the mixed models fit earlier found significant effects for day in study, day in study accounted for relatively little variance in the data as a main effect (.09%) or as an interaction with item (.03%).

Computing between- and within-person reliability estimates. Cranford and colleagues (2006) proposed three equations (see equations 1-3) for quantifying reliable variance at the between and within person levels using the variance components estimated in the G-theory

models. The calculation of these estimates and the values in the current study are described below.

Between-person reliability was calculated as the percentage of variability due to persons and the person by item interaction (indicating that different individuals may vary in their responses the individual items) divided by those terms plus the estimated variability related to error (see Equation 1). When between-person reliability was calculated this way, the estimated reliability was .981. This indicates that scores on the measure reflect relatively stable individual differences in cognitive interference.

Within-person reliability was then calculated as the person by day interaction divided by this same term plus the estimated variance due to error (see Equation 2). This coefficient allowed the evaluation of the amount of reliable variance due to change within-persons across days in the study. That is, it quantifies whether there is reliable interindividual variability in intraindividual change across days. Using the variance decomposition estimates from the model assuming day as a fixed factor the within-person reliability was estimated to .849 implying that this measure was able to reliably assess systematic change in cognitive interference within an individual.

One limitation to these analyses is that day was treated as a fixed effect rather than random. This implies that the reliability coefficient derived would only apply if all individuals were measured on the same fixed day. I estimated G-theory models treating both day and person (as well as all higher order interactions involving these factors) as random to estimate reliability coefficients that would account for the fact that subsequent research will use new individuals (person random effect) and assess them on different days (day random effect). Equation 3 is an extension of equation 1 treating day as a random rather than fixed

effect. This equation includes day and the day by person interaction in the denominator to account for these additional sources of variability when day is treated as a random effect. The inclusion of these additional effects reduced the between-person reliability to .746 in the current study. The reduction in the reliability estimate indicates that the ability of the measure to differentiate between individuals when individuals are measured on different days is lower though still in the acceptable range. However, estimating within-person reliability within the random effects model left the estimate relatively unchanged at .85 indicating the measure reliably discriminates within an individual across days regardless of the day of measurement.

These reliability estimates indicate that reliable variance exists in the cognitive interference measure at both the within and between person levels. The scale appears to be capturing both differences between persons as well as differences within a person across days. The next step was then to examine the factor structure of the scale, particularly focusing on the unidimensionality of the scale.

Hypothesis 5.

I conducted a multi-level exploratory factor analysis (using Mplus) to determine whether a one factor solution best fit the data at both the between- and within-person levels. The number of factors was evaluated in three ways. First, I examined the scree plot graphing the eigenvalues for the extracted factors to determine whether a one factor solution appears to describe the data. The graph of these values appears in Figure 1. For the between-person analysis, there was a clear one factor solution. This is supported by the scree plot as well as applying Kaiser's rule to the eigenvalues and the factor loadings (Table 13). For the within-person solution however, there is a possible two factor solution. Two of the eigenvalues are

above 1, the first factor accounting for 44.5% of the variance and the second accounting for 13% of the variance. Examining the model fits, a multilevel model constraining the between structure to one factor and the within structure to two factors fit the data significantly better than a model with one factor at each level, $\chi^2_{diff}(8) = 254.58$, $p < .0001$. The TLI and RMSEA also indicated that this model fit the data well. The TLI was .913, which exceeds the .9 criterion for this index suggested by Bentler (1990). The RMSEA for the between-level model was .04 and.03 for the within-level model, both below the .05 criterion that indicates excellent model fit (Browne & Cudeck, 1992). Inspection of the factor loadings indicated that items 1, 2, 3, 4, and 6 loaded on the first factor, items 7, 8, and 9 loaded significantly on the second factor. Item 5 had equivalent loadings on both factors. Item content suggested that the first factor reflected the experience of intrusive thoughts (e.g., think about personal worries) while the second factor includes items assessing attempts to control and avoid intrusive thoughts (e.g., try to put problems out of your mind). Although item 5 loaded on both factors, the content of this item (i.e., try to avoid certain thoughts) implied that it belonged on the second factor. The correlation between these factors was .686, $p < .0001$.

The finding of two factors at the within level was unexpected but the solution offers insight into the underlying processes captured by the scale. The scale appears more than adequate for tracking changes in cognitive interference within an individual across days. The two factor solution indicated that the scale was able to differentiate the two major facets of cognitive interference (experience and avoidance) at the within-person level. At the between-person level, the one factor solution differentiates among levels of ability of these processes combined. The final step for examining the psychometrics of this measure was to establish the discriminant validity of the cognitive interference scale. It was particularly important to

determine whether the cognitive interference scale was capturing attempts and failures of thought control or a more general construct related to that person's mood that day. On days when an individual reports experiencing higher negative affect, they may also report difficulties with concentration and thinking about personal worries. The cognitive interference scale was intended to capture attentional failures in general, not simply those related to negative affect.

Hypothesis 6.

The construct of cognitive interference assessed in the current study is closely related to that of rumination, a construct that has been used to characterize depression (Nolen-Hoeksema, 2000). What differentiates cognitive interference from rumination is a lack of emphasis on negative affect and a more general focus on distracting or unwanted thoughts and attempts to control these thoughts. In order to establish that the cognitive interference scale assessed this broader construct, I examined the relationship between this scale and the negative affect scale administered as part of the evening assessment.

Using a multilevel confirmatory factor analysis, I fit two models to the negative affect and cognitive interference data (Table 14). The first of these models assumed that all of the items would load on a single factor. The second model assumed two different factors at the between person level (one for negative affect and one for cognitive interference) and three factors at the within person level: two factors for cognitive interference as suggested by the multilevel exploratory factor analysis in hypothesis 5 and one factor for the negative affect items at the within person level. Because these models are nested, model fit was assessed using the amount of change in the chi-square statistic between the two models. Comparing these models indicated that the model constraining the negative affect and cognitive

interference to load on separate factors fit the data significantly better, $\chi^2_{diff}(4) = 878.33$, $p < .0001$. This implies that negative affect and cognitive interference form distinctly different factors in this model.

I performed similar tests using the negative affect reports from each of the beeped assessments throughout the day as well as the average of the negative affect items for the beeped assessments. This resulted in fitting 10 additional models: 2 for each of the 5 beeped assessments, one constraining all the items to load on a single factor and a second allowing negative affect and cognitive interference to load on separate factors. The chi-square fits for these models appear in Table 14. In no case did the one factor model fit the data better than the two factor model. These findings were confirmed by the other model fit statistics. For the one factor models the TLI ranged from .351 to .652, well below the .9 criterion for adequate model fit. Similarly the RMSEA indices were all above .1 indicating poor model fit. The models allowing negative affect and cognitive interference to load on separate factors had TLI fits from .91 to .932 all indicating good model fit. The RMSEAs for these models also indicated an excellent fit to the data as all were below .05. Finally, I examined the correlations between negative affect and cognitive interference factors. These correlations were high at the between-person level (r's = .61 to .75) indicating that individuals who tended to experience more cognitive interference also tended to report more negative affect. The correlations at the within person level were smaller; correlations with the interference factor ranged from .22 to .54 and correlations with the avoidance factor ranged from .12 to .39. The highest correlations among the factors were found with the negative affect data collected at the evening assessment, the only time when negative affect and cognitive interference were assessed concurrently.

These analyses provide support for the cognitive interference scale having adequate psychometric properties at both the between- and within-person levels. The scale taps reliable variability at both levels and a supportable factor analytic model fit the data well showing that the scale was sensitive to the major facets of cognitive interference at the within-person level while differentiating individuals on the construct at the between-person level. The final analyses established the discriminant validity of cognitive interference from negative affect indicating that the cognitive interference scale is capturing variability related to an individual's cognitive state outside of their actual mood. Although individuals who report more negative affect were more likely to report more cognitive interference, the relationship at the between-person level never approached a correlation higher than .75 and the relationships at the within-person level were small to moderate at best. These results indicate that the cognitive interference scale and scores derived from the items are psychometrically valid in that they appear to reliably reflect the construct that I intended to assess at the outset of the study. In aim 3 further analyses will be conducted to examine the construct validity of this scale as well as the missed activities and memory failures checklists to determine how the events reported in this study relate to in-lab cognitive performance.

Aim 3

The final aim of the current study focused on the construct validity of the daily cognitive failures questionnaire. In the current study, participants completed a battery of lab-based cognitive tasks that tapped working memory, episodic memory, and fluid intelligence. One of the hurdles of assessing self-reported cognitive failures is establishing a relationship between self-reports and actual cognitive performance. Previous research on daily self-

reported cognitive failures has not looked at whether performance on in-lab cognitive tasks is related to daily self-reports.

Before examining whether self-reported cognitive failures were related to cognitive performance, I determined whether it was appropriate to create composite scores for each of the cognitive constructs measured in the current study. I first examined the correlations among the cognitive performance tasks and found that tasks within each of the constructs (working memory, episodic memory, and fluid intelligence) were significantly correlated and in general these correlations were higher within a construct compared with correlations across constructs (Table 15). I then fit an exploratory factor analytic model to the data to determine whether the tasks formed three separable factors. Given previous relationships of these constructs the factor solution allowed the factors to be correlated using a Promax rotation. This model extracted three factors with a eigenvalues greater than 1. Upon inspection of the factor loadings, the tasks loaded as expected with the working memory tasks loading on one factor, the episodic memory tasks loading on the second factor, and the fluid intelligence tasks loading on the final factor. Some tasks did crossload on other factors but this was expected given the correlated nature of these constructs (Table 16); all tasks had their highest loading on their hypothesized factor.

After establishing that these tasks did appear to tap three separable constructs, I then created composite scores for each individual by standardizing scores on each task and then taking the sum of these standardized scores as an index of each of the different abilities. These composite scores were then used to determine whether self-reported cognitive failures were related to in-lab cognitive performance. First, I examined the Spearman correlations among the composite scores and the frequency of failures for each of the different categories

(Table 17). For this analysis, the frequencies were adjusted for response rate by dividing the total number of failures reported in a given category by the number of evening surveys correctly completed. These correlations suggested that the episodic memory composite score was significantly related to reports of retrospective memory failures and missed activities due to overload and the working memory composite was significantly related to the reporting of missed activities due to somatic complaints. These relationships were small at best suggesting only a weak relationship between cognitive performance and self-reported cognitive failures.

Hypotheses related to Aim 3

Hypothesis 7.

The next step was to fit nonlinear mixed models using cognitive performance to predict missed activities and memory failures. As with the models comparing frequency of missed activities and memory failures across categories, these models also included neuroticism to control for differences in reporting and cognitive performance due to personality. I fit models to test whether each of the three composite scores was related to self-reports of missed activities and memory failures. Where there were significant effects I examined these effects by calculating the predicted outcomes for individuals of low and high ability defined as one standard deviation below and above the average. Unless otherwise specified risk ratios for these models were computed using high ability individuals as the reference group. Risk ratios over 1 indicate greater risk for low ability individuals while ratios below 1 indicate greater risk for high ability individuals.

Predicting cognitive failures with cognitive performance. In the first model using working memory to predict frequency of reports in the four categories of missed activities

and memory failures (overload, somatic, retrospective memory and prospective memory), there was a significant category by working memory composite interaction (F[3, 381] = 4.24, $p < .01$). This indicated that the relationship between working memory and failures depended upon the category of failure being reported. Further examination of this finding indicated that higher working memory scores were related to reporting fewer somatic failures ($p = .01$) however, there were no other significant relationships (p's > .10). A risk ratio comparing frequency of missed of activities due to somatic complaints for high and low WM ability individuals was 1.43. Next, predicting frequency of failures with the composite score for episodic memory there was a significant main effect of episodic memory performance (F[1, 381] = 16.82, $p < .0001$). Higher episodic memory performance was related to reporting fewer retrospective memory failures and fewer missed activities due to somatic complaints (p's < .01; RRs = 1.51 and 1.64). Episodic memory performance was also marginally related to missed activities due to overload ($p = .06$); again higher performance predicted fewer reported overload failures (RR = 1.24). Finally, the fluid intelligence composite score was not significantly related to reported failures either as a main effect or as part of an interaction (all p's > .14).

Age as a moderator between self-reported cognition and cognitive performance. Age did not moderate any of the relationships between self-reported missed activities, memory failures, and cognitive performance with one exception. Including age in the model with episodic memory as a predictor of failures led to a significant three way interaction of age, episodic memory, and category (F[3, 375] = 3.94, $p < .01$). The interaction indicated that episodic memory ability was more predictive of the frequency of failures in younger adults compared with older adults.

Predicting atypical and typical failures with cognitive performance. Another potential moderator could be characteristics of the failures themselves. To test this, I also examined whether the relationship between cognitive performance and the categories of failures broken down by routine and non-routine failures. Again typicality did not moderate the relationship except in the case of missed activities due to somatic complaints. For working memory there was a significant interaction with typicality; working memory significantly predicted missed activities due to somatic complaints only for activities classified as not routine (RR = 1.67).

These results imply that, consistent with previous research, the relationships between cognitive performance and self-reported cognitive failures are small regardless of characteristics of the person and of the failures. Although cognitive performance was a significant predictor of some self-reported missed activities and memory failures, most of the categories were not predicted by cognitive performance. None of the cognitive composite scores significantly predicted missed activities due to overload regardless of whether the missed activity was routine or not routine. The most common finding was that cognitive ability was related to missed activities due to somatic reasons: better ability was related to fewer reported missed activities. This may imply a greater relationship between cognitive performance and health rather than an important relationship between cognitive failures and cognitive performance as somatic complaints are a non-cognitive reasons for missing an activity. Possible reasons for these poor relationships will be discussed in detail in the discussion section.

Hypothesis 8.

A further set of analyses was conducted to examine whether the temporal proximity of the assessments of failures affected their relationship with objective cognitive

performance. Failures reported closer in time to the second in-lab session (when the cognitive tasks were administered) might show differential relationships compared with those reported farther away in time. To test this hypothesis I included the cross-level interaction between day in study (time) and the composite score representing cognitive ability. However, there was no significant interaction between day in study and cognitive performance for any of the categories of failures (p's > .11). This implies that the relationship between cognitive performance and self-reports of cognitive failures did not depend on whether the failures were reported closer to or farther from when the reports occurred.

Hypothesis 9.

After attempting to relate the counts of self-reported missed activities and memory failures to cognitive performance, I also examined the relationship between the Likert-style scale assessing failures of thought control and cognitive performance. As with the analyses for hypothesis 7, I used composite scores representing each of the three cognitive ability variables to predict scores on the cognitive interference scale. I created a sum score for the entire scale but because the analyses in Aim 2, hypothesis 5 suggested that a two factor structure best fit the data at the within person level, I also created two subscale scores to determine whether the relationship between cognitive performance and cognitive interference was more related to the experience of intrusive thoughts (intrusions subscale) or the individual's attempts to avoid and suppress these thoughts (avoidance subscale). Before fitting mixed models to these data, I examined the correlations between the cognitive interference scores and the cognitive performance composites (Table 18). These correlations were generally weak and only episodic memory was significantly correlated with total scores and scores on the intrusions subscale.

Predicting cognitive interference with cognitive performance. To examine these relationships I fit multilevel linear mixed models using cognitive performance to predict the cognitive interference score. Working memory was not significantly related to any of the cognitive interference scores (p's > .12). Similarly, fluid intelligence was not related to overall scores nor the subscale scores (p's > .09). Episodic memory did significantly predict total scores on the cognitive interference scale, specifically individuals with better episodic memory ability had higher cognitive interference scores, $F(1, 129) = 4.22$, $p = .04$. However, when examining the effect of episodic memory and the subscale scores, episodic memory was significantly related to reported intrusions ($F[1, 129] = 4.83$, $p = .03$) but only marginally related to avoidance ($F[1, 129] = 3.14$, $p = .07$). Estimated means for each level of ability appear in Table 19.

Predicting cognitive interference with cognitive performance across age. I then added age to each of these models to determine whether age affected the relationship between cognitive interference and cognitive performance. For all of these models, age was significantly related to cognitive interference total scores and subscale scores such that older adults reported less cognitive interference, both on the intrusions subscale and the avoidance subscale (all p's < .01; Table 20). Age interacted with episodic memory performance to predict both total scores ($F[1, 124] = 3.98$, $p = .05$) and scores on the intrusion subscale ($F[1, 124] = 4.47$, $p = .04$). For younger adults, higher episodic memory ability was related to higher cognitive interference total scores and higher scores on the intrusions subscale however this effect was reversed for older adults; higher episodic memory ability was related to lower scores on both (Table 21). No other age by cognitive performance interactions were significant (p's > .13).

Hypothesis 10.

The last set of proposed analyses also examined whether the temporal proximity of the cognitive interference assessment to the cognitive testing affected the relationship between cognitive performance and cognitive interference. As with the analyses in hypothesis 8, it may be that assessments completed closer in time to the cognitive testing session are more related to cognitive performance than those completed farther away in time. To test this, I added day in study to each of the models and examined the cross-level interaction between cognitive performance and day in study. Day in study did not interact with working memory performance to predict any of the cognitive interference scores (p's > .13). The interaction between episodic memory performance and day in study was significant for cognitive interference total scores, $F(6, 614) = 2.84$, $p = .01$ and avoidance subscale scores, $F(6, 614) = 3.72$, $p < .01$. This effect implied that assessments completed in the middle of the study period (i.e., days 2-5) were more related to episodic memory performance compared to days at the end of the study. The interaction was not significant for the intrusions subscale ($p = .20$). With regard to the models using fluid intelligence to predict cognitive interference, the interaction between day in study and fluid intelligence was significant in predicting scores on the avoidance subscale ($F[1, 615] = 3.00$, $p < .01$) though not the total scores or the intrusions subscale (p's > .10). Assessments completed in the beginning and middle of the week were more related to fluid intelligence performance compared with assessments completed at the end of the study period.

I also examined models including cognitive performance, day in study as well as age to predict cognitive interference. In none of these models was the day in study interaction

with age or the three-way interaction with age, performance, and day in study significant (*p*'s > .22).

These models again suggested small relationships between cognitive performance and daily self-reported cognitive failures. Although episodic memory was significantly related to cognitive interference, working memory was not as previous research would suggest (Stawski et al., 2006). This may have been related to the measures that make up the working memory construct in the current study and will be discussed in detail in the discussion section.

Supplemental analyses examining the construct validity of cognitive interference

Given that the relationships between cognitive performance and cognitive interference were small, to provide additional evidence of construct validity for the cognitive interference scale I also used the trait measures of cognitive interference administered in the study to predict daily reports of cognitive interference. Showing that daily reports of intrusive thinking are related to global trait assessments would provide evidence that the daily reports taken outside the lab are tapping a similar construct as that assessed using validated measures in the lab. In the current study, participants completed the Thought Occurrence questionnaire, the Impact of Events scale, the White Bear Suppression inventory, and the punishment and worry subscales of the Thought Control questionnaire. All of these questionnaires significantly predicted scores on the cognitive interference total scores and both subscale scores (all *p*'s < .02). In all cases, higher scores on the trait measure were related to higher daily self-reports of cognitive interference in general, as well as both subscales (Table 22). These relationships also did not depend on age (all *p*'s > .2).

These trait questionnaires were completed prior to the seven days of daily assessments. As with the cognitive performance analyses, it is possible that assessments completed closer in time to the completion of the trait measures might be more strongly related than those completed farther away in time. I included day in study in all of the models to determine whether the cross-level interaction was significant. Only one of these interactions was significant. Using the Thought Occurrence questionnaire and day in study to predict scores on the intrusions factor indicated that assessments completed in the middle of the week were more related to trait scores compared to those completed at the beginning and end of the week ($F[6, 604] = 2.12$, $p = .05$). All other interactions did not reach significance (p's > .09). I also added age to these models but there were no significant age by day in study or age, day in study, and trait measure interactions (p's > .27). These analyses provide additional evidence of the construct validity for the daily reports of cognitive interference.

Discussion

Summary of results

An age-diverse sample of participants completed seven days of daily assessments as well as a battery of cognitive tests and personality measures. During the daily assessments, participants reported on activities they did not complete, any memory failures they experienced, and their perception of their ability to control their thoughts that day. The main goal of the current study was to examine and validate these assessment tools for the measurement of cognitive failures to determine whether they are appropriate for use in daily diary studies.

For Aim 1 overload failures were most frequently reported but had less perceived impact on daily functioning compared with missed activities due to non-cognitive reasons,

that is somatic complaints. Importantly, frequency and impact of reported failures did depend on typicality of the failures. Older adults reported significantly more missed activities and memory failures across categories but found these events less irritating, less interfering and less likely to be related to future consequences than younger adults.

Aim 2 found that the cognitive interference questionnaire assessed reliable variance at both the between and within person levels. The factor structure suggested a unidimensional scale between-persons and a two factor scale within-persons indicating good discrimination of the processes involved in cognitive interference at the within-level. This scale tapped a construct distinct from negative affect providing evidence of discriminant validity for the scale.

The final aim demonstrated that, consistent with previous research on self-reported cognitive failures, there were weak relationships among objective cognitive performance measures and daily self-reported cognitive failures. Higher episodic memory performance scores were significantly related to lower reports of certain types of missed activities and memory failures however the other measures of cognitive performance were not. These relationships did not depend on age or the characteristics of the reported events themselves. Lower episodic memory ability was also related to greater reports of unproductive repetitive thoughts but only in older adults.

Discussion of the results will begin with the findings from aim 1; specifically the frequency and impact of daily cognitive failures and implications for current research in the area.

Frequency and impact of cognitive failures

Results from the current study provide more detailed information regarding the relative frequency perceived impact of daily missed activities and memory failures compared with previous research. Research has yet to incorporate measures of perceived impact of daily cognitive failures on an individual's functioning. Assessing impact as well as frequency allowed the current study to begin to investigate which daily missed activities and memory failures were most frequently reported but also which had the greatest perceived impact on an individual's ability to meet daily cognitive demands. Previous research had suggested that prospective memory failures would be the most frequently reported memory failure outside the lab (Terry, 1988). This is coupled with the belief that these failures will be associated with significant personal consequences (McDaniel & Einstein, 2007; Reason, 1984), though this had not been tested empirically. Data in the current study suggests that prospective memory failures are in fact not reported more frequently than retrospective memory failures. Instead the only difference between prospective memory and retrospective memory failures was the ratings of anticipated future consequences.

Differences in the perceived consequences of prospective and retrospective memory failures suggests two reasons why previous research has found that prospective memory failures were more frequent. First, because of the research and theorizing on the importance of prospective memory in daily life (see McDaniel & Einstein, 2007), previous efforts aimed at studying everyday cognitive failures have focused primarily on prospective memory failures. For example, the 10-item measure developed by Whitbourne and colleagues (2008) includes 5 items assessing prospective memory failures. This oversampling of prospective memory failures compared with retrospective memory failures would lead to the misleading conclusion that prospective memory failures are more common simply because participants

have more opportunities to report on those failures. Second, in order for a participant to report on a daily cognitive failure they must first notice that they have even experienced a failure. Following noticing the failure they must also be able to recall the failure when actually filling out the questionnaire (Rabbitt & Abson, 1990). Failures associated with greater future consequences would be more likely to be remembered when the participant is filling out a questionnaire. Therefore, because prospective memory failures have a greater impact on daily life, they are more likely to be reported on self-report measures of cognitive failures when participants retrospect over long periods of time. The shorter time frame in the current study allowed participants to depend less on biased memory processes to recall failures.

This stresses the importance of the reporting interval for cognitive failures. To be recalled, the memories of cognitive failures must be retained until the participant completes the questionnaire. The research suggesting that prospective memory failures are most frequent in everyday life used long reporting intervals which likely forced participants to attempt to recall their failures over weeks and months. Researchers hypothesize that global self-reports like these are based more on a participant's beliefs about their memory; beliefs that are formed by those failures that can be remembered rather than all instances of failures (Cavanaugh et al., 1998). Because prospective memory failures have a greater impact on the individual's daily functioning, they are more likely to be remembered and reported on global reports of cognitive failures. On the other hand, retrospective memory failures may be underreported due to their relatively lower impact. The current study used a shorter reporting interval (i.e., during the day today) which might have allowed participants to better recall their retrospective memory failures while completing the assessment. This might also explain

why the current study found no difference in the frequencies of prospective and retrospective memory failures. The shorter reporting interval supported recall of failures of both types of memory failures rather than capturing just those failures that are most memorable (i.e., prospective memory failures). This shortened interval reduced the recall bias associated with prospective memory failures and likely provided a more accurate description of the relative frequency of memory failures in daily life.

The current study also permitted a closer look at specific types of retrospective memory failures, that is, whether the failure occurred for recently learned or well-known information. Previous research on self-reported cognitive failures has tended not to distinguish between the nature of the information forgotten in this way but lab-based research would suggest that well-known information would be less likely to be forgotten compared with recently learned information (Craik, 1994). In the current study, however, participants reported more failures for well-known information. This was in contrast to the impact ratings which indicated that forgetting well-known information was more interfering with daily activities. One possible reason for the difference in frequency is that well-known information is accessed more often than recently learned information so there are more opportunities for failures. The impact ratings indicate that forgetting a piece of recently learned information, though less common, causes greater problems in daily life. Importantly this suggests that memory training programs and aids (e.g., Rebok, Carlson, & Langbaum, 2007) should target recently learned information rather than well-known information. In this way ratings of impact can assist in directing interventions toward remediating those failures that create the most difficulty in everyday life. This focused approach to designing interventions to improve

everyday cognitive functioning could increase the effectiveness of training programs outside the lab (c.f. Jobe et al., 2001).

A potential limitation of these findings is that the end of day reporting strategy used in the current study is still subject to some degree of forgetting and reappraisal. The current study did not probe when failures actually occurred throughout the day and it is likely that failures that occurred farther away in time from the end of the day assessment were less likely to be recalled compared with those closer in time. One remedy for this is to have participants report failures as they occur throughout the day (cf. Yamanaka, 2003). Unfortunately, reappraisal of the failure can play a role even over these shortened reporting intervals. Participants may reframe failures at the time of reporting to preserve their beliefs about their cognitive abilities (Cavanaugh et al., 1998).

This emphasizes a possible benefit of the approach in the current study. Previous research on daily cognitive failures used items framed such that the participant had to admit having problems with cognitive activities (Neupert et al., 2006a; 2006b; Whitbourne et al., 2008). Admitting problems with cognitive functioning has negative implications and connontations for all individuals and older adults may be particularly sensitive to this as inability to complete cognitive activities of daily living can impact their ability to live independently (Reese & Cherry, 2004; 2006). In the current study, a participant could report missing activities because they were instead too tired, too ill or had to deal with a more important activity rather than simply admitting they had difficulty. They were also given an opportunity to indicate the extent to which the missed activity or memory failure impacted their day which may have encouraged reporting from participants; they could report

forgetting something but also indicate that the memory failure would not have future consequences.

Effects of age on frequency and impact of cognitive failures

Previous research had found that older adults do not report more daily cognitive failures than younger adults (Neupert et al., 2006a; 2006b; Whitbourne et al., 2008). However, consistent with lab-based research on cognitive performance (Burgess et al., 2006; Cohn, Emrich, & Moscovitch, 2008; Old & Naveh-Benjamin, 2008) older adults reported poorer daily cognitive functioning than younger adults in the current study. Importantly, older adults were less bothered by their failures, considered them less interfering, and less likely to be related to future consequences. Taken together these findings begin to provide some explanation for the inconsistent findings in the current study and previous research (Whitbourne et al., 2008). There are three general reasons the findings in the current study differ from previous research. First, the shorter reporting interval may aid in the recall of failures at the time of reporting. Second, previous research has provided a limited number of examples of failures and framed these failures in ways that may threaten older adults. Third, older adults place less importance on their failures making them less likely to be recalled. Each of these points will be discussed in detail below.

Finding that older adults report more failures than younger adults is in contrast to other self-report studies using global self-reports of failures and finding no age differences (Hertzog et al., 2000; Reese & Cherry, 2007). One potential reason for the difference in findings is the shortened reporting interval in the current study. Rabbitt and Abson (1990) noted that "individuals with poorer memories are more likely to 'forget that they forget'" (p. 3), an effect that may be more important as individuals age. Lab evidence shows that even in

normal aging, older adults are experiencing some degree of memory loss (Cohn, Emrich, & Moscovitch, 2008; Old & Naveh-Benjamin, 2008). This memory loss then makes it more difficult for them to remember what they have forgotten leading to an underreporting of cognitive failures. This effect is compounded as poorer memory leads to both more failures as well as more failures being forgotten. As adults age then, their accuracy of self-reporting memory failures becomes impaired, particularly when reporting over long intervals of time. Shortening the reporting interval can assist with this problem by reducing the interval between the occurrence of the failure and reporting but does not completely eliminate it as evidenced by the findings of Whitbourne and colleagues (2008; see also Neupert et al., 2006).

The current study extended the range of failures assessed and allowed participants to report on any missed activity regardless of why it was incomplete. Whitbourne and colleagues (2008) focused their cognitive failures assessment on memory failures in general and prospective memory failures in particular. While this focus is appropriate given previous research suggesting that prospective memory failures are common in everyday life (Crawford et al., 2003; Harris, 1984; Terry, 1988) and a primary concern among older adults (Kleigl & Martin, 2003), it also limits the scope of failures that can be reported by the individual. The current study allowed participants to report on a wider range of failures and included an "other" option for activities and memory failures that did not seem to fit in the other categories. Additionally, as noted earlier, framing events as missed activities rather than as mental mistakes may have encouraged participants, particularly older adults, to report events separate from the negative appraisals of those events. Similarly, older participants could also indicate that although a failure had occurred it had not negatively impacted their daily

activities, effectively indicating that their cognitive failures were not necessarily impairing their functioning.

The age effects on the impact ratings provide a third reason for previous findings of no age differences in self-reported cognitive failures. Older adults may actually experience more failures outside the lab than they report because these failures are not associated with meaningful consequences in their daily life. Failures that do not have an impact on daily life may be less likely to be noticed and remembered. Additionally older adults may place less importance on the impact that failures have on their daily life. Socioemotional selectivity theory proposes that older adults place more importance on social relationships and positive emotional experiences while reducing the importance placed on the cognitive aspects of their life (Carstensen, 1995). The impact data from the current study support this idea with the finding that older adults reported less irritation, less interference, and fewer consequences from their failures despite the fact that they report significantly more failures. If older adults place less importance on their cognitive failures they may be less motivated to remember their failures and, by virtue of this, less able to report on these failures. Additionally, the current study allowed older adults to report events as well as the impact of these events. Older adults may have felt more comfortable reporting a cognitive failure when they could also indicate that this failure had little to no impact on their daily functioning. The lack of age effects in previous studies might be partially due to older adults remembering fewer failures in general as they complete assessments of cognitive failures regardless of when the assessment occurs.

Limitations of assessing failure subtypes

Allowing participants to report on the "reason" they missed an activity is a novel approach to the assessment of everyday cognitive failures. These "reasons" were broken into four categories based on a priori hypotheses of how they would be related to cognitive processes. Missed activities due to overload consisted of more "reasons" than any other category. Missed activities due to overload reflected both external demands (e.g., something more important came up) as well as poor planning on the part of the participant (e.g., out of time) which lead to more opportunities for failures outside the lab. This is likely one reason why missed activities due to overload were the most frequently reported. A post hoc examination of the between-person relationships of failures reported for the different "reasons" revealed that while some of these classifications were related to one another as anticipated (i.e., frequencies were significantly correlated within category) other relationships were apparent (Table 24). For example, reports of failures for "out of time", "interrupted" and "something more important came up" were categorized as overload failures and were correlated with one another (r's = .13 to .30) but "too difficult" and "avoided it" (also included in the category of overload failures) were more strongly related to "couldn't concentrate" (r's = .20 to .22). Similarly, while "interrupted" was related to other reasons in the overload category, it was also significantly related to failures reported as "started, but forgot to finish" (r = .33), a failure categorized as due to prospective memory. These findings suggest that the overload failures category may have reflected a more diverse range of cognitive failures than originally anticipated.

Similarly, for memory failures not all a priori categorizations of failures were reflected in the correlations. For example, failure to complete an errand was categorized as a prospective memory failure however inspection of the correlations suggested that a failure

for an errand was more strongly related to items classified as retrospective memory failures (information: r = .25, date: r = .34, and directions: r = .24; Table 25) than other items classified as prospective memory (r's = -.02 to .08). As indicated earlier, there is a retrospective memory component to every prospective memory task and these failures likely represent some combination of these failures. Similarly supplying participants with more forgotten items would allow a better differentiation of categories of failures as well as more reports of failures in general. While the a priori categories in the current study have theoretical merit, future research should refine the categories of failures.

Another limitation was the inability of the current assessment to directly measure failures due to poor attention and concentration. Only 11 attention failures were reported using the current categorization scheme. It is likely that some attentional failures were captured as part of some other cognitive failure. For example, not focusing attention while someone is being introduced might make it difficult or impossible to recall their name at a later point in time. That is, the failure of attention affects the encoding process but is reported as a retrospective memory failure at a later date. Similarly, attentional processes are hypothesized to be responsible for noticing environmental cues that indicate it is time for the individual to complete a prospective memory task (McDaniel & Einstein, 2007; Smith & Bayen, 2006). A failure of attention could impair the individual's ability to notice the environmental cue leading to a prospective memory failure. Although the attentional failure actually preceded and likely caused the prospective memory failure, the individual may report on the outcome of the process, in this case, the prospective memory failure. This is likely one reason why attention failures were underreported as part of the categories of cognitive failures.

In the current study, these items were supplemented by a Likert-style questionnaire specifically tapping a participant's perception of their ability to attend and focus their thoughts that day. It may be that asking individuals to report on a single instance of an attentional failure is difficult because the attentional failure, by its very nature, is unlikely to be noticed. A thought sampling paradigm would circumvent this burden to some extent (e.g., Kane et al., 2007), however, thought sampling may also create reactivity as participants monitor thoughts more than they typically would due to the frequency of reporting. The Likert scale in the current study attempts to capture participants' perceptions of the frequency of these failures during the previous day without significantly impacting participant's daily experiences with cognitive interference.

Reliability and validity of the cognitive interference questionnaire

The cognitive interference questionnaire in the current study provided a quantitative assessment of attention and concentration throughout the day. The quantitative nature of this scale allowed a psychometric analysis of its properties to establish that it was appropriate for a daily diary study. As is typical in the development of a scale, I first investigated the reliability of the scale for assessing between person differences as well as within-person variability in cognitive interference. Just as researchers would not use a scale for assessing between-person differences without first assessing the reliability of the scale, development of a scale for the assessment of within-person variability should include an examination of the psychometric properties of the scale at this level. Instead, daily diary studies use measures that have known psychometric properties for between-person comparisons and assume this information is relevant for their use in within-person analyses. There are very few examples of reliability analyses that address the utility of measures for capturing within-person

processes in daily diary studies (e.g., Cranford et al., 2006). Analyses in the current study suggested that the extended cognitive interference scale adequately assessed reliable variability both between and within individuals. Establishing this property indicates that the scale would be appropriate for assessing fluctuations in an individual's ability to focus their attention over brief intervals (i.e., days) and allow the identification the day level factors associated with these fluctuations (e.g., daily stress; e.g., Sliwinski, Smyth, Hofer & Stawski, 2006; Stawski et al., 2006).

Testing the ergodicity assumption in the cognitive interference questionnaire

The second set of psychometric analyses the factor structure at each level of analysis. Daily diary research tends to implicitly make the ergodicity assumption; that the factor structure of a set of indicators observed at the between-person level also describes the structure that would be observed within persons (Borsboom, Mellenbergh, & van Heerden, 2003; Molenaar, 2008). However this assumption needs to be explicitly tested before drawing conclusions regarding within-person processes (Hofer & Piccinin, 2010). In the current study, I found that the ergodic assumption did not hold; the factor structure at the within-person level was different from that at the between-person level. At the between-person level a one factor structure best fit the data, however at the within-person level a two factor structure best fit the data. The within-person factor structure reflects the different facets of cognitive interference identified in the introduction: experience of intrusive thoughts and suppression of those thoughts. This is similar to the factor structure proposed (though not always found) for standard trait measures of cognitive interference. For example, the Impact of Events Scale and White Bear Suppression Inventory were specifically designed and have been shown to assess two factors: intrusions and attempts at suppression (Creamer,

Bell, & Failla, 2003; Hoping & de Jong, 2003). It would appear that at the momentary level these two processes are more easily differentiated than when measured at the trait level. It is possible that within-persons these processes function somewhat independently of one another. That is, a person may experience intrusions without actively attempting to avoid or suppress them. It is also possible to have an intrusive thought that is not actively suppressed. On the other hand, it is also possible to have just a few intrusive thoughts and to attempt to control each and every one. In the first instance, the experience and control would be less tightly coupled than in the second case. The daily measure of cognitive interference is able to pick up on these day-to-day differences in the coupling of these processes. However, individuals who, on average, experience higher levels of intrusive thoughts have more opportunities to attempt to avoidance and suppress these thoughts than individuals who experience fewer intrusive thoughts. This would indicate that averaging over time makes it difficult, if not impossible, to separate the processes.

Separation of cognitive interference and negative affect

Due to the strong relationship between cognitive interference and constructs like rumination I also tested whether negative affect and cognitive interference were separable constructs at both the between and within person levels. Previous work has shown that these constructs are strongly correlated between individuals (r's > .45; Erksine, Kvavilashvili, & Kornbot, 2007; Rude, Maestas, & Neff, 2007) as well as within (Moberly & Watkins, 2008). Models in the current study examined whether the extended cognitive interference scale tapped a construct that was separable from negative affect (which is closely related to depressive rumination; Moberly & Watkins, 2008). There was evidence of discriminant

validity of the cognitive interference scale and negative affect at both the between and within person levels.

Providing evidence of the dissociation of cognitive interference processes (i.e., intrusions v. control) at the within-person were the correlations between the cognitive interference factors and negative affect. Similar to the findings of Courvoisier et al. (2009), I found that the intrusions factor was generally more strongly correlated with negative affect than the suppression factor. These results imply that the extended cognitive interference measure is able to distinguish these two processes at the within-person level. This is particularly useful as these processes may be influenced by different day-level processes. Being able to differentiate between two distinct processes will provide a better understanding of within-person relationships of cognitive interference with other related constructs (e.g., rumination, perseverative thinking, stress, negative affect).

These analyses provide strong evidence for the use of this measure in daily diary studies on intraindividual variability in attentional failures but also serve as a caution for researchers interested in daily diary research. Measures developed to tap a construct at the between-person level may not exhibit the same psychometric characteristics when attempting to assess day-to-day variability.

Linking self-report and lab-based cognitive measures

There was only weak evidence of a relationship between self-reported cognitive failures and cognitive performance in the lab. The lack of a strong relationship between daily self-reported failures and cognitive performance in the lab was disappointing but not unexpected. Previous research relating self-reports and lab-based cognitive tasks has often found small correlations except where the lab-based tasks directly mirror the cognitive

demand outside the lab (Liu & Park, 2004; Hertzog et al., 2000). Episodic memory ability was significantly related to reports of somatic failures, retrospective memory failures, and cognitive interference scores. This suggests that the episodic memory tasks tapped a more general set of cognitive processes that are employed outside as well as inside the lab to complete memory tasks. On the other hand, the working memory tasks, which had been predicted to be related to cognitive interference but were not, may have focused too tightly on specific processes that are not recruited as often outside the lab as they are in the lab.

Weak relationships between self-reported and lab-based cognition

Three potential reasons for the weak relationships between self-reports of cognitive failures and cognitive performance are discussed next. First, the in-lab cognitive assessments may have been too narrow compared with the processes tapped by the self-reported cognitive failures. Second, cognitive failures in normal functioning individuals may be more related to environmental demands than cognitive ability. Third, the sample in the current study was highly selective, possibly restricting the range of ability assessed in the lab.

The first possible reason for the weak relationship found in the current study is that the tasks selected for the in-lab assessment tapped cognitive processes that were not key to the cognitive failures outside the lab. To meet cognitive demands outside the lab a variety of different cognitive processes are likely recruited by the individual concurrently to complete the cognitive task (Cohen & Conway, 2008). In the lab however tasks are designed to isolate and tap only one of these processes at a time. For example, the working memory tasks in the current study were designed to specifically assess updating and manipulation processes. It may be that when cognitive processes are recruited outside the lab to meet a cognitive demand, the specific processes assessed in the lab are only recruited to a small extent and

others (e.g., resistance to distraction, planning) are recruited to a greater extent. This would account for the small though significant relationships found between failures and specific cognitive processes. These failures are due to some extent on the measured cognitive process but also depend on other processes (e.g., task switching, mental updating).

A second potential reason for these weak relationships is that, within the normal range of functioning, cognitive failures outside the lab may have more to do with environmental factors than with actual ability. Typical everyday cognitive demands may not tax individuals to the limit of their abilities. Because of this external factors (e.g., stress, somatic complaints or being interrupted) that disrupt functioning have a greater impact on an individual's ability to meet daily cognitive demands. Researchers have found that daily processes such as the experience of a daily stressor are significantly related to poorer performance on cognitive tasks both in the lab (Sliwinski, et al., 2006) as well as more memory failures outside the lab (Neupert et al., 2006). It may be only when daily cognitive demands push individuals to the limits of their ability or they experience significant impairment in their ability (e.g., head trauma or MCI) that it plays a role in whether these demands are met. This may be one reason why memory complaints are related to actual cortical damage in older adults (Striepens et al., 2010; van der Flier et al., 2004). For individuals within the normal levels of cognitive ability the number of cognitive failures made is better predicted by external events (e.g., stressors, physical symptoms) rather than their cognitive ability.

A third potential reason for the weak relationships in the current study, particularly between working memory and cognitive interference, is the selectivity of the sample in the current study. The current study included a pre-study component that required participants to

complete all of surveys correctly (i.e., on time, remembering to complete morning or evening survey) on their own. Individuals with lower cognitive ability either forgot to complete the surveys and were excluded from the longer study or may have chosen to not to continue their participation due to the high demands. This could have restricted the range of cognitive ability sampled in the current study with an under-sampling of individuals at the low end of the ability scale. Although the distributions for each of the cognitive tasks appeared approximately normal the mean of the distributions may have been shifted to the right implying poor representation of the left side of the distribution (i.e., low cognitive ability).

Construct validity of the cognitive interference scale

Though the relationship between cognitive interference and cognitive performance was weak, there was some evidence of construct validity for the cognitive interference scale as it was related to more traditional paper-based measures of trait cognitive interference. All of the validated measures were related to scores on the daily cognitive interference scale with higher trait levels of cognitive interference predicting higher daily reports of cognitive interference. This indicates that reports completed outside the lab over a shortened time period are tapping the same construct as the trait measures in the lab. Although the lack of relationship with cognitive performance is problematic, the daily measure of cognitive interference does appear to capture the same construct as the trait measures of cognitive interference.

Limitations of the current study and suggestions for future research

There are several limitations in the current study. One major limitation in the current study was the lack of a baseline for individuals' daily activities. Without knowing more about a given participant's routine it is impossible to tell how many opportunities they had to

experience a missed activity. A participant with no activities planned that day has no chance to miss those activities whether for cognitive reasons or otherwise. Individuals with different social roles will experience different environmental demands during their daily routine. For example, someone employed as a caregiver will have a different schedule and must meet different demands compared with a stockbroker. Future research should include measures of daily activities and routines to determine an individual's level of busyness on any given day. Optimally, this would be part of a morning assessment as busyness likely varies daily but could also be included as a global measure of environmental demands (e.g., Martin & Park, 2003). Another potential method would be to specifically recruit individuals with similar social roles (e.g., nurses, caregivers, or teachers).

Another recommendation for future research is to include more focused questions about activities missed due to problems with attention and concentration. One possibility would be to include a question about consequences related to intrusive thoughts that day (e.g., To what extent did these thoughts prevent you from getting things done?). Additionally, some cognitive tasks that one might deal with in daily life were not included in the measure. Activities like mental math (e.g., tip calculation), reading, and writing were not specifically mentioned in the questions and might be more susceptible to cognitive failures. Although these activities were likely reported as part of another category (e.g., reading a book as a recreational activity or an "other" activity) they may have gone underreported by not being specifically included. Similarly with the memory failures question, prospective memory failures that include arriving in a location without remembering why you were there might be a common failure that was not reported because the option was not presented. These failures might have been reported as "other" in that item but also may not have been reported at all.

Adding some of these activities and memory failures would likely increase the number of failures reported as well as improve the relationships between this measure and cognitive performance in the lab. For example, mental math (e.g., tip calculation) often requires maintenance and updating of information in working memory and might be more related to the working memory tasks in the current study compared with some of the failures currently assessed.

A third suggestion for future studies would be to include a cue to remind participants to complete the evening questionnaire. Although compliance was high in the current study (> 80%), participants more likely to report prospective memory failures were also more likely to forget to do the evening survey. Including a beep at the approximate time when the participant is supposed to do a survey would likely help participants remember to do the survey. Similarly, asking participants to complete the survey earlier in the evening might improve recall of failures during the major portion of the day. Participants were asked to complete the survey when they went to bed each night. A little over 20% of the surveys were completed after midnight which might have been too far removed from some of the events for the participant to recall them. Asking participants to complete the survey earlier in the evening might improve recall for events that occurred earlier in the day.

Finally, the current study focused on just one attribute of the cognitive failures: whether the missed activity was part of the participant's regular routine or not. It's possible that other characteristics of failures are more important for relating them to cognitive performance and impact on daily functioning. A failure for an activity or information that are high in personal relevance or would have led to significant personal gain might be differentially related to cognitive performance. Collecting information on these attributes of

the failures would allow failures to be broken down based on these factors to provide a more specific definition of the failures and this might change the relationship between failures and cognitive performance.

Synopsis of key findings

,Assessing daily cognitive failures presents a unique challenge for researchers interested in understanding how cognitive demands are met (or not) outside the lab. The current study examined a novel approach to assessing these failures and provided data suggesting this measure was able to provide insight on daily cognitive failures and their impact on the individual. Three important findings emerged from the analysis of the daily diary data in the current study.

First, allowing participants to distinguish between the occurrence of an event and the impact that event has on their daily functioning may have encouraged more accurate reporting of missed activities and memory failures than in previous research. Particularly with older adults, providing participants the opportunity to indicate the extent to which their functioning was compromised by particular memory failures and missed activities may have increased their comfort with indicating that these events occur in their daily lives.

A second important finding is that the processes hypothesized to be involved in cognitive interference (i.e., intrusions and avoidance) can be differentiated with intensive daily assessments of intrusive thinking without introducing significant reactivity to this assessment. These processes have been proposed but are difficult to separate at the between-person level. However analyses in the current study demonstrated that within-persons over days two distinct, measurable processes exist. In-depth examination of these processes at this

level may begin to provide researchers with more information about an individual's daily cognitive experience.

Finally, daily self-reports of memory failures and missed activities remain unrelated to objective cognitive performance. This begins to suggest that, for normal functioning individuals, environmental demands may have a greater impact on cognitive functioning outside the lab rather than an individual's cognitive ability. There is no relationship between self-reported cognitive failures and objective performance because daily cognitive demands only require a minimal amount of cognitive ability to complete while in-lab tasks push individuals to the limits of their ability. Rather than focusing on the lack of relationship between these two assessments of cognition, researchers should examine what environmental demands and external factors cause failures outside the lab; cognitive ability may only play a small role in what daily cognitive demands an individual is able to meet.

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Table 1
Breakdown of participant compliance on the evening survey

Number of Evening Assessments Completed	*N*	%	*Cumulative %*
7	63	48.09	48.09
6	26	19.85	67.94
5	18	13.74	81.68
4	9	6.87	88.55
3	7	5.34	93.89
2	6	4.58	98.47
1	2	1.53	100

Table 2
Breakdown of participant compliance for the beeped surveys

Number of Beeped Assessments completed	*N*	%	*Cumulative %*
100%	10	7.63	7.63
90%-99%	46	35.11	42.75
80%-89%	33	25.19	67.94
70%-79%	13	9.92	77.86
60%-69%	11	8.4	86.26
50%-59%	6	4.58	90.84
< 50%	12	9.16	100

Table 3
Correlations among personality, age, and cognitive performance with compliance

	Beeped Compliance	Evening Compliance
Extraversion	-0.15	**-0.18**
Conscientiousness	0.11	0.09
Neuroticism	-0.03	-0.12
Openness	-0.05	-0.03
Agreeableness	-0.15	0.12
Thought Occurrence Questionnaire	**-0.26**	**-0.18**
Thought Control Questionnaire Worry Subscale	-0.11	-0.14
Thought Control Questionnaire Punishment Subscale	-0.08	**-0.21**
White Bear Suppression Inventory	**-0.18**	-0.13
Episodic Memory Composite Score	0.04	*0.17*
Working Memory Composite Score	0.09	0.10
Fluid Intelligence Composite Score	**0.19**	0.13
Age	**0.18**	**0.20**

*Note: Values in bold indicate p<.05, values in italics indicate p<.07. Due to missing data on the questionnaire measures n's vary from 128-131.

Table 4
Correlations among cognitive failure frequencies, impact ratings and neuroticism

	Frequencies*				
	Overload	PM	RM	Attention	Somatic
Neuroticism	.03	**.26**	**.17**	.10	**.20**
	Bother Ratings				
	Overload	PM	RM	Attention	Somatic
Neuroticism	**.27**	**.28**	**.28**	.33	.00
	Interference Ratings				
	Overload	PM	RM	Attention	Somatic
Neuroticism	**.29**	**.28**	.12	.34	-.06
	Consequence Ratings				
	Overload	PM	RM	Attention	Somatic
Neuroticism	.09	**.25**	**.28**	-.69	-.13

Note. Due to missing data sample sizes differ for the impact rating correlations (n = 8 - 84). * Frequency correlations used frequency of failures adjusted for number of days the evening survey was correctly completed to control for reporting biases. Frequency correlations were calculated using Spearman correlations.

Table 5
Frequency of failures reported by category and reason

	Meet/Talk with someone	Recreational Activity	Physical Activity	School Activity	Work Activity	Self-Care Activity	Household Activity	Other	Total	% of all Failures
Out of time	15	21	7	4	17	4	29	19	116	18.50
Interrupted	1	5	7	4	7	3	10	8	45	7.18
Forgot to start	2	3	3	0	1	2	3	3	17	2.71
Couldn't Concentrate	0	1	0	2	2	0	6	0	11	1.75
Something more important	3	14	12	0	3	5	24	10	71	11.32
Started but, forgot to finish	1	0	0	0	0	1	8	3	13	2.07
Avoided it	7	2	7	1	6	5	30	8	66	10.53
Too difficult	5	1	4	2	4	2	6	3	27	4.31
Tired	5	9	5	2	7	6	23	2	59	9.41
Ill	14	9	25	0	2	7	29	13	99	15.79
Other	20	12	19	5	8	11	7	21	103	16.43
Total	73	77	89	20	57	46	175	90		
% of all Failures	11.64	12.28	14.19	3.19	9.09	7.34	27.91	14.35		
									Overall Total 627	

Table 6
Frequency and impact ratings for each category of missed activities

		Bother Ratings		Interference Ratings		Consequence Ratings	
	Frequency	*Mean*-A (*SD*)	*Mean*-M (*SD*)	*Mean*-A (*SD*)	*Mean*-M (*SD*)	*Mean*-A (*SD*)	*Mean*-M (*SD*)
Overload Failures	325	3.11 (1.61)	2.97 (1.54)	2.59 (1.50)	2.47 (1.41)	2.69 (1.65)	2.55 (1.55)
Out of time	116	2.77 (1.56)	2.71 (1.55)	2.27 (1.44)	2.24 (1.44)	2.37 (1.53)	2.33 (1.49)
Interrupted	45	2.93 (1.59)	2.88 (1.52)	2.75 (1.46)	2.66 (1.42)	2.38 (1.63)	2.31 (1.61)
Something more important	71	2.62 (1.51)	2.61 (1.50)	2.42 (1.45)	2.41 (1.45)	2.38 (1.63)	2.37 (1.63)
Avoided it	66	3.30 (1.51)	3.26 (1.47)	2.39 (1.32)	2.34 (1.31)	2.93 (1.49)	2.89 (1.45)
Too difficult	27	4.08 (1.61)	4.06 (1.57)	3.68 (1.44)	3.64 (1.39)	3.20 (1.89)	3.16 (1.84)
Prospective Memory Failures	30	3.03 (1.53)	3.04 (1.53)	2.37 (1.57)	2.35 (1.55)	3.00 (1.92)	2.98 (1.89)
Forgot to start	17	3.31 (1.70)	3.31 (1.70)	2.00 (1.46)	2.00 (1.46)	2.69 (1.96)	2.66 (1.90)
Started but, forgot to finish	13	2.64 (1.21)	2.64 (1.21)	2.91 (1.64)	2.85 (1.61)	3.45 (1.86)	3.45 (1.86)
Attention Failures	11	3.64 (1.29)	3.64 (1.29)	2.45 (1.21)	2.45 (1.21)	3.09 (1.45)	3.09 (1.45)
Couldn't Concentrate	11	3.64 (1.29)	3.64 (1.29)	2.45 (1.21)	2.45 (1.21)	3.09 (1.45)	3.09 (1.45)
Somatic Failures	158	3.67 (1.64)	3.50 (1.53)	3.27 (1.51)	3.05 (1.37)	2.65 (1.55)	2.48 (1.42)
Tired	59	3.35 (1.57)	3.29 (1.53)	2.94 (1.50)	2.85 (1.39)	2.51 (1.45)	2.43 (1.35)
Ill	99	3.84 (1.64)	3.68 (1.55)	3.44 (1.48)	3.23 (1.41)	2.69 (1.59)	2.49 (1.52)
Other	103	3.71 (1.99)	3.70 (2.00)	2.96 (1.97)	2.94 (1.95)	3.31 (2.21)	3.28 (2.19)

Note. Mean-A = Mean using average of ratings on days when participants reported more than 1 failure in the same category, Mean-M = Mean using maximum of ratings on days when participants reported more than 1 failure in the same category. Overall category appears in italics.

Table 7
Frequency and impact of memory failures by category and item type

	Frequency	% of all failures	Bother		Interference		Consequences	
			Mean-A (*SD*)	*Mean*-M (*SD*) *	*Mean*-A (*SD*)	*Mean*-M (*SD*) *	*Mean*-A (*SD*)	*Mean*-M (*SD*) *
Retrospective Memory Failures	157	43.85	3.27 (1.88)	3.18 (1.86)	2.55 (1.68)	2.51 (1.68)	2.30 (1.75)	2.24 (1.70)
Put	82	22.91	3.15 (1.85)	--	2.56 (1.63)	--	2.10 (1.58)	--
Date	11	3.07	3.91 (1.76)	--	2.82 (1.66)	--	3.09 (1.92)	--
Directions	10	2.79	3.10 (1.60)	--	2.90 (1.60)	--	2.30 (1.57)	--
Name	54	15.08	2.26 (1.25)	--	1.59 (0.96)	--	1.44 (0.74)	--
Information	22	6.15	4.64 (2.17)	--	3.91 (2.09)	--	4.09 (2.27)	--
Prospective Memory Failures	130	36.31	3.58 (1.83)	3.54 (1.82)	2.72 (1.76)	2.69 (1.75)	3.24 (1.83)	3.19 (1.80)
Appointment	13	3.63	4.31 (1.49)	--	2.54 (1.66)	--	3.31 (1.70)	--
Errand	30	8.38	3.20 (1.52)	--	2.37 (1.45)	--	2.77 (1.33)	--
Medication	55	15.36	3.81 (1.98)	--	2.89 (1.91)	--	3.44 (1.99)	--
Chore	32	8.94	3.03 (1.77)	--	2.69 (1.71)	--	3.09 (1.91)	--
Unclassified Memory Failures (Other)	49	13.69	2.34 (1.74)	--	2.31 (1.77)	--	2.35 (1.64)	--
Total number of memory failures	358							

Note. Mean-A = Mean using average of ratings on days when participants reported more than 1 failure in the same category, Mean-M = Mean using maximum of ratings on days when participants reported more than 1 failure in the same category. Overall category appears in italics. *Participants reported only one failure for forgotten item type and a second mean using maximum ratings was not required.

Table 8
Frequency and impact of failures broken down by typicality

Retrospective Memory Failures	Frequency	Bother *Mean*-A (*SD*)	Bother *Mean*-M (*SD*)	Interference *Mean*-A (*SD*)	Interference *Mean*-M (*SD*)	Consequences *Mean*-A (*SD*)	Consequences *Mean*-M (*SD*)
Recently learned	37	3.00 (1.89)	2.97 (1.90)	2.97 (1.82)	2.94 (1.83)	2.51 (1.72)	2.50 (1.70)
Well-known	60	3.09 (1.87)	3.06 (1.84)	1.98 (1.48)	1.98 (1.48)	2.16 (1.84)	2.11 (1.74)
Prospective Memory Failures	Frequency	Bother *Mean*-A (*SD*)	Bother *Mean*-M (*SD*)	Interference *Mean*-A (*SD*)	Interference *Mean*-M (*SD*)	Consequences *Mean*-A (*SD*)	Consequences *Mean*-M (*SD*)
Routine	93	3.71 (1.93)	3.64 (1.90)	2.95 (1.89)	2.90 (1.86)	3.47 (1.95)	3.37 (1.92)
Not routine	67	3.31 (1.58)	3.27 (1.58)	2.27 (1.38)	2.23 (1.36)	2.87 (1.60)	2.86 (1.59)
Overload Failures	Frequency	Bother *Mean*-A (*SD*)	Bother *Mean*-M (*SD*)	Interference *Mean*-A (*SD*)	Interference *Mean*-M (*SD*)	Consequences *Mean*-A (*SD*)	Consequences *Mean*-M (*SD*)
Routine	128	3.19 (1.53)	3.08 (1.46)	3.03 (1.59)	2.91 (1.55)	2.77 (1.67)	2.68 (1.59)
Not routine	197	2.99 (1.64)	2.88 (1.58)	2.27 (1.33)	2.20 (1.29)	2.52 (1.60)	2.41 (1.50)
Somatic Failures	Frequency	Bother *Mean*-A (*SD*)	Bother *Mean*-M (*SD*)	Interference *Mean*-A (*SD*)	Interference *Mean*-M (*SD*)	Consequences *Mean*-A (*SD*)	Consequences *Mean*-M (*SD*)
Routine	97	3.90 (1.59)	3.71 (1.48)	3.39 (1.48)	3.23 (1.35)	2.66 (1.62)	2.54 (1.48)
Not routine	62	3.17 (1.62)	3.13 (1.62)	2.85 (1.49)	2.80 (1.49)	2.33 (1.40)	2.31 (1.38)

Note. Mean-A = Mean using average of ratings on days when participants reported more than 1 failure in the same category, Mean-M = Mean using maximum of ratings on days when participants reported more than 1 failure in the same category. Overall category appears in italics.

Table 9
Estimated ratings of impact by age

	Bother		Interference		Consequences	
	Young	Old	Young	Old	Young	Old
	M (SE)	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*
Overload Failures	2.78 (0.47)	1.88 (0.42)	2.61 (0.47)	2.05 (0.41)	2.44 (0.46)	1.92 (0.41)
Prospective Memory Failures	2.99 (0.51)	2.01 (0.44)	2.66 (0.50)	1.69 (0.43)	2.78 (0.50)	2.16 (0.44)
Retrospective Memory Failures	2.96 (0.54)	2.09 (0.43)	2.47 (0.52)	1.63 (0.42)	2.10 (0.54)	1.33 (0.42)
Somatic Failures	3.03 (0.52)	2.13 (0.48)	2.81 (0.50)	2.30 (0.46)	2.46 (0.51)	1.56 (0.47)

Note. Model estimated means for each category of failures. Young = 1 SD below the mean in age (~30 years old), Old = 1 SD above the mean in age (~65 years old)

Table 10
Model based estimates of impact by failure typicality and age

	Bother		Interference		Consequences	
	Young	Old	Young	Old	Young	Old
Retrospective Memory Failures	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*
Recently Learned	2.88[a] (1.20)	1.50[a] (0.97)	3.12[h] (0.92)	2.04[h,j] (0.75)	2.68[k] (0.98)	1.51[k] (0.79)
Well-known	2.96[b] (1.24)	1.92[b] (0.92)	2.18[i] (0.95)	1.07[i,j] (0.71)	2.12[l] (1.01)	1.35[l] (0.75)

	Bother		Interference		Consequences	
	Young	Old	Young	Old	Young	Old
Prospective Memory Failures	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*
Routine	2.05 (0.78)	1.85 (0.70)	1.85 (0.75)	0.98 (0.67)	1.78 (0.77)	1.50 (0.69)
Not routine	2.57 (0.83)	1.40 (0.69)	0.95 (0.79)	0.83 (0.66)	1.87 (0.81)	1.28 (0.68)

	Bother		Interference		Consequences	
	Young	Old	Young	Old	Young	Old
Overload Failures	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*
Routine	2.15[c] (0.60)	1.46[c] (0.54)	2.03 (0.57)	1.71 (0.52)	2.35 (0.62)	2.26 (0.56)
Not routine	2.16[d] (0.57)	1.38[d] (0.50)	1.50 (0.54)	1.17 (0.48)	2.57 (0.58)	1.82 (0.52)

	Bother		Interference		Consequences	
	Young	Old	Young	Old	Young	Old
Somatic Failures	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*
Routine	4.01[e] (0.78)	3.39[e,g] (0.76)	3.63 (0.70)	2.97 (0.70)	3.56[m] (0.71)	2.56[m,o] (0.71)
Not routine	3.92[f] (0.80)	2.73[f,g] (0.72)	3.33 (0.73)	2.77 (0.63)	3.12[n] (0.75)	2.34[n,o] (0.65)

Note. Model estimated means for each category of failures. Young = 1 SD below the mean in age (~30 years old), Old = 1 SD above the mean in age (~65 years old). Means with the same subscript are significantly different from one another.

Table 11
Intraclass correlations for cognitive interference items and total score

Item	ICC
1. Think about personal worries?	0.65
2. Think about something you didn't mean to think about?	0.64
3. Have trouble concentrating?	0.63
4. Have thoughts that kept jumping into your head?	0.63
5. Try to avoid certain thoughts?	0.62
6. I have thoughts that you could not stop?	0.64
7. Try to put problems out of your mind?	0.61
8. Do things to distract yourself from your thoughts?	0.66
9. Stay busy just to keep thoughts from entering your mind?	0.68
Total score	0.77

Note. ICC = Intraclass Correlation

Table 12
Generalizability theory variance decomposition models

Source	Fixed	%	Random	%
Person	1.11	51.41	1.11	51.41
Day	0.00	0.09	0.00	0.08
Item	0.06	2.57	0.06	2.57
Person*Day	0.30	14.15	0.30	14.16
Person*Item	0.20	9.21	0.20	9.20
Day*Item	0.00	0.03	0.00	0.08
Error	0.49	22.53	0.48	22.51
Total	2.15		2.15	

Note. The fixed column refers to constraining factors in the G-theory model to be fixed. The random column refers to allowing factors in the G-theory model to be random.

Table 13
Factor loadings and eigenvalues for multilevel exploratory factor analysis

Item	Between Factor	Within Factor 1	Within Factor 2
1. Think about personal worries?	0.865	**0.574**	0.378
2. Think about something you didn't mean to think about?	0.938	**0.712**	0.370
3. Have trouble concentrating?	0.815	**0.580**	0.264
4. Have thoughts that kept jumping into your head?	0.951	**0.752**	0.423
5. Try to avoid certain thoughts?	0.976	*0.596*	***0.592***
6. I have thoughts that you could not stop?	0.972	**0.624**	0.480
7. Try to put problems out of your mind?	0.978	0.427	**0.674**
8. Do things to distract yourself from your thoughts?	0.963	0.441	**0.798**
9. Stay busy just to keep thoughts from entering your mind?	0.924	0.354	**0.706**
Eigenvalue for factor	7.845	4.016	1.166

Note. Loading for items that were later constrained to be on that factor are in bold. Item 5, which loads highly on both within-person factors, is in italics.

Table 14
Model fits for multilevel confirmatory factor analysis models examining cognitive interference and negative affect

	Evening NA		Beep 1 NA		Beep 2 NA		Beep 3 NA		Beep 4 NA		Beep 5 NA	
	1 Factor Model	2 Factor Model	1 Factor Model	2 Factor Model	1 Factor Model*	2 Factor Model	1 Factor Model	2 Factor Model*	1 Factor Model	2 Factor Model	1 Factor Model	2 Factor Model*
Model Fits												
Chi-square	1212.5	334.2	1647.3	297.3	1767.9	329.1	1526.1	305.9	4063.0	357.4	1803.1	325.5
df	130	126	130	126	131	126	130	127	130	126	131	127
p-value	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001	<.001
TLI	0.60	0.92	0.38	0.93	0.35	0.92	0.39	0.93	-0.65	0.91	0.35	0.93
RMSEA	0.10	0.05	0.12	0.04	0.12	0.04	0.11	0.04	0.19	0.04	0.12	0.04
Correlations												
Between												
NA and CI	--	.69	--	.68	--	.65	--	.74	--	.61	--	.75
Within												
NA and Intrusions	--	.54	--	.22	--	.23	--	.28	--	.39	--	.23
NA and Control	--	.39	--	.12	--	.23	--	.30	--	.21	--	.20
Intrusions and Control	--	.68	--	.69	--	.69	--	.69	--	.69	--	.69

Note. Correlations cannot be computed for 1 factor models. *These models required an additional constraint for model estimation. The negative affect item 3 (upset) had a negative residual that was constrained to be a small value (.001). CI = cognitive interference, NA = negative affect, RMSEA = Root Mean Square Error of Approximation, TLI = Tucker Lewis Fit Index.

Table 15
Correlations among cognitive tasks

	1	2	3	4	5	6	7	8
1. Backward Letter Span	--							
2. Subtract 2 Span	**.48**							
3. Letter-Number Sequencing	**.44**	**.44**						
4. Card Location Memory	-.03	-.12	-.02					
5. AVLT List Memory	.08	.11	**.18**	**.26**				
6. Paired Associates	.16	.10	**.29**	**.39**	**.41**			
7. Ravens	**.35**	**.36**	**.46**	.13	**.29**	**.31**		
8. Letter Series	**.35**	**.37**	**.43**	**.25**	**.35**	**.39**	**.59**	
Mean	9.38	15.66	10.33	11.47	8.71	7.59	20.96	12.38
SD	8.00	11.15	2.20	3.40	2.51	6.22	5.42	5.29
Skew	1.25	0.94	-0.09	0.34	0.10	1.04	-0.97	-0.07
Kurtosis	1.23	1.15	0.81	0.23	-0.27	0.41	0.24	-0.64

Note. Correlations in bold significant at $p < .05$. Correlations in boxes represent the three constructs working memory, episodic memory, and fluid intelligence.

Table 16
Factor analysis results for cognitive tasks

Task	Factor 1	Factor 2	Factor 3
1. Backward Letter Span	**0.650**	0.024	0.100
2. Subtract 2 Span	**0.692**	-0.048	0.125
3. Letter-Number Sequencing	**0.643**	0.159	0.186
4. Card Location Memory	-0.172	**0.442**	0.278
5. AVLT List Memory	0.097	**0.404**	0.303
6. Paired Associates	0.206	**0.939**	0.053
7. Ravens	0.475	0.200	**0.510**
8. Letter Series	0.418	0.291	**0.663**
Eigenvalue	14.676	3.899	1.032

Inter-factor correlations

	Factor 1	Factor 2
Factor 2	0.211	
Factor 3	0.453	0.338

Table 17
Correlations among cognitive composite scores and cognitive failures

	Prospective Memory Failures	Retrospective Memory Failures	Overload Failures	Somatic Failures
Working Memory Composite Scores	-.02	.02	.22*	-.16†
Episodic Memory Composite Scores	-.02	-.26*	-.07	-.16†
Fluid Intelligence Composite Scores	-.08	-.16†	.04	-.08

Note. * $p < .05$, † $p < .10$. Frequency correlations used frequency of failures adjusted for number of days the evening survey was correctly completed to control for reporting biases. Frequency correlations were calculated using Spearman correlations.

Table 18
Correlations among cognitive interference and cognitive performance composite scores

	Cognitive Interference Total Score	Intrusions Subscale Score	Thought Control Subscale Score
Working Memory Composite Scores	-.11	-.07	-.15†
Episodic Memory Composite Scores	.18*	.19*	.15†
Fluid Intelligence Composite Scores	-.04	.03	-.12

Note. * $p < .05$, † $p < .10$.

Table 19
Model estimated means of cognitive interference at different levels of cognitive performance

	Working Memory			Episodic Memory			Fluid Intelligence		
	Low	Average	High	Low	Average	High	Low	Average	High
	M (SE)	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*	*M (SE)*
Cognitive Interference Total Score	21.57 (0.94)	21.11 (0.87)	20.66 (0.94)	20.33 (0.94)	21.11 (0.86)	21.89 (0.94)	21.35 (1.00)	21.11 (0.87)	20.87 (1.00)
Intrusion Subscale Score	11.97 (0.52)	11.82 (0.48)	11.67 (0.52)	11.36 (0.51)	11.82 (0.47)	12.28 (0.51)	11.73 (0.55)	11.82 (0.48)	11.91 (0.55)
Control Subscale Score	9.59 (0.45)	9.29 (0.41)	8.99 (0.45)	8.97 (0.45)	9.29 (0.41)	9.61 (0.45)	9.62 (0.48)	9.29 (0.42)	8.96 (0.48)

Note. SE = standard estimate, Low = individuals performing at 1 standard deviation below the mean, Average = individuals performing at the mean, High = individuals performing at 1 standard deviation above the mean.

Table 20
Cognitive interference differences across age

	Young	Old
	M (SE)	*M (SE)*
Cognitive Interference Total Score	23.79 (1.17)	18.53 (0.84)
Intrusion Subscale Score	13.30 (0.64)	10.39 (0.63)
Control Subscale Score	10.48 (0.56)	8.14 (0.55)

Note. SE = standard estimate, Young = 1 SD below the mean in age (~30 years old), Old = 1 SD above the mean in age (~65 years old).

Table 21
Model based estimates of cognitive interference for different levels of episodic memory performance across age

	Young		Old	
	Low EM	High EM	Low EM	High EM
	M (SE)	*M (SE)*	*M (SE)*	*M (SE)*
Cognitive Interference Total Score	21.70 (1.34)	23.01 (1.03)	19.53 (1.01)	18.30 (1.46)
Intrusion Subscale Score	12.04 (0.74)	12.88 (0.57)	10.91 (0.56)	10.26 (0.81)
Control Subscale Score	9.66 (0.65)	10.14 (0.50)	8.62 (0.49)	8.04 (0.71)

Note. EM = Episodic memory, SE = Standard estimate.

Table 22
Descriptive statistics for trait cognitive interference measures

Measure	*N*	*Mean*	*SD*	Min	Max
Thought Occurrence Questionnaire	131	29.05	5.64	17	51
Thought Control Questionnaire (Worry Subscale)	131	9.63	3.09	6	24
Thought Control Questionnaire (Punishment Subscale)	130	7.78	2.21	6	16
White Bear Suppression Inventory	130	46.96	12.32	15	70
Impact of Events Scale	129	34.88	10.33	15	56

Note. Differences in sample size are due to participants refusing to complete certain items on the questionnaires.

Table 23
Estimates relating trait cognitive interference and daily cognitive interference

	Cognitive Interference		Intrusions		Control	
	Estimate	*SE*	Estimate	*SE*	Estimate	*SE*
Thought Occurrence Questionnaire	4.03	0.84	2.08	0.47	1.94	0.41
Impact of Events Scale	2.59	0.80	1.36	0.44	1.22	0.39
White Bear Suppression Inventory	3.93	0.81	1.94	0.46	1.99	0.39
Thought Control Questionnaire - Punishment Subscale	2.79	0.80	1.38	0.45	1.41	0.39
Thought Control Questionnaire - Worry Subscale	2.25	0.89	1.17	0.50	1.08	0.44

Note. All estimates significant at $p < .05$.

Table 24
Correlations among reasons for missed daily activities

		Overload Failures					Prospective Memory		Attention Failures	Somatic Failures
		Out of Time	Interrupted	Something more important came up	Avoided it	Too difficult	Forgot to start	Started but forgot to finish	Couldn't concentrate	Too tired
Overload Failures	Interrupted	**.30**								
	Something more important came up	**.27**	.13							
	Avoided it	-.01	.14	.09						
	Too difficult	.07	-.01	.10	.05					
Prospective Memory	Forgot to start	.13	.11	.07	**.20**	-.02				
	Started but forgot to finish	.14	**.33**	.10	.03	.05	**.25**			
Attention Failures	Couldn't concentrate	-.13	.11	.04	**.20**	**.22**	-.10	.03		
Somatic Failures	Too tired	.05	**.24**	.09	.09	.06	-.15	**.23**	.09	
	Ill	-.11	.09	.16	-.05	**.20**	-.03	.02	.04	**.22**

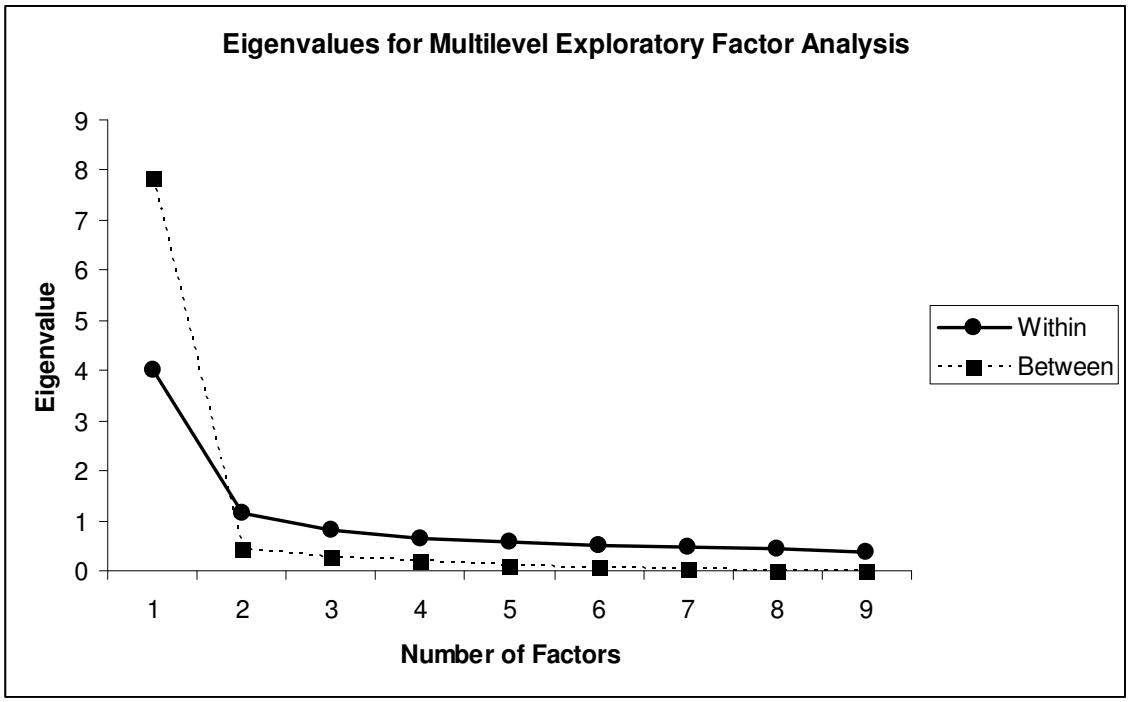
Note. Bolded correlations are significant, $p \leq .05$.

Table 25
Correlations among memory failure items

		Retrospective Memory					Prospective Memory			
		Put something	Date	Directions	Name	Information	Appointment	Errand	Medication	Chore
Retrospective Memory	Date	.02								
	Directions	**.18**	.15							
	Name	**.27**	.14	**.27**						
	Information	**.17**	.13	**.19**	**.21**					
Prospective Memory	Appointment	-.05	.06	.04	**.21**	.16				
	Errand	.06	**.23**	.18	.16	**.28**	.14			
	Medication	.13	.06	-.02	.02	.04	-.05	.08		
	Chore	-.07	.04	-.06	.02	-.02	**.36**	-.03	**.17**	
	Unclassified	.11	-.06	.05	.16	.12	.05	.04	**.17**	.15

Note. Bolded correlations are significant, $p \leq .05$.

Figure 1
Eigenvalues for Multilevel Exploratory Factor Analysis



Equations

$$r_{bp} = \frac{\sigma^2_{person} + [\sigma^2_{person*item/m}]}{\sigma^2_{person} + [\sigma^2_{person*item/m}] + [\sigma^2_{error/m}]} \quad (1)$$

$$r_{wp} = \frac{\sigma^2_{person*time}}{[\sigma^2_{person*time}] + [\sigma^2_{error/m}]} \quad (2)$$

$$r_{bp} = \frac{\sigma^2_{person} + [\sigma^2_{person*item/m}]}{\sigma^2_{person} + [\sigma^2_{person*item/m}] + \sigma^2_{time} + \sigma^2_{person*time} + [\sigma^2_{error/m}]} \quad (3)$$

Appendices

Appendix A

Sample Recruitment Advertisements

A-3 Classified ad

WE ARE LOOKING FOR YOU! The **Cognition Health and Aging Projects** (CHAP) are hosting studies on cognition and health. By telling us about your everyday experiences and doing mental exercises, you can help us gain a better understanding about health and the aging process. ***Participants will be compensated $100 and free parking is provided!*** Are you a man or woman between the ages of 20 and 80? Want to learn more or sign up to participate? **Please contact us at: (315) 443-2428.** We are located in the CNY Medical Building, 739 Irving Ave., Suite 340B, Syracuse, NY 13210.

A-4 Individual flyer front

We are looking for you!

The **Cognition Health and Aging Projects** (CHAP) are hosting studies on cognition and health. By telling us about your everyday experiences and doing mental exercises, you can help us gain a better understanding about health and the aging process.

Participants will be compensated $100
and free parking is provided!

Are you a man or a woman
between the ages of 20 and 80?
Want to learn more or sign up to participate?
Please contact us at:
Phone: (315) 443-2428

All appointments must be scheduled by phone;
no walk-ins, please.
Email: CHAP@syr.edu
Web Site: Chap.syr.edu

Sponsored by the National Institutes of Health and Syracuse University

CHAP is located in the
CNY Medical Building
739 Irving Ave.
Suite 340B
Syracuse, NY 13210

A-4 Individual flyer back

Thank you for your interest in research with the Cognition, Health and Aging Projects (CHAP) at Syracuse University. We are currently recruiting volunteers for a study that looks at the relations between health, aging and thinking. Participants in this study are asked to attend two 1 ½ to 2 hour sessions that take place about ten days apart. During the first session, participants are asked to complete questionnaires and are trained in the use of a handheld computer. At home, in between the two sessions, participants use the handheld computer to answer a series of questions about their daily experiences. Participants are also asked to collect saliva samples from themselves in between the two sessions. During the second session, participants do various mental exercises, and allow us to take basic health measurements, such as height, weight and blood pressure. Participants are compensated for their time and effort. They receive $25 for each of the sessions and $50 for the computerized questions and saliva samples, for a total of $100 for completing all portions of the research. Free parking is available in the garage next to our office in the CNY Medical Center. Participants in this study are volunteers, and they can withdraw from the study at any time without penalty.

Interested in learning more? Would you like to schedule an appointment? Just call 315-443-2428!

Appendix B

Telephone Screening Form

B-2 Sample telephone screening form

Scheduled **Tracking #**
Session 1:
Session 2: Date called CHAP: ___ / ___ /___

CHAP-SAWM Telephone Screening

Thank you for your interest in research with the Cognition, Health and Aging Projects (CHAP) at Syracuse University. We are currently recruiting volunteers for a study that looks at the relations between health, aging and thinking. Can you please tell me your date of birth? And how old does that make you today?

DOB _____ **Age** _____

1) Is English your first language? YES NO (if no, ask:)

At what age did you learn English? _____

2) Can you read and write comfortably in English? YES NO

(If NO, then explain that proficiency in English is a requirement for this study).

3) In this study you will be asked to fill out questions on a small palmtop computer. To be able to answer the questions, you will need to be able to read normal size print like in a book or magazine, meaning you cannot have severe vision problems that are not corrected by glasses (or contacts). Do you have any severe vision problems that would prevent you from reading normal size print?
(circle one) YES NO

If YES, please specify limitation and severity:
_____

4) Also, on the palmtop computer you will use a small instrument, similar to a pen or pencil, to answer the questions. Most people who are able to move their fingers enough to do a crossword puzzle or use a television remote control can fill out the questions on the palmtop computer. Do you have any physical problems with your fingers or hands that would make you unable to answer questions on the palmtop computer?

(circle one) YES NO

If YES, please specify limitation and severity:
_____

(IF between 20 and 80 years of age, proficient in English, and lacking visual or fine motor problems that would exclude the participant, continue:) **Participants in this study will be asked to attend two 1 ½ to 2 hour sessions that take place about one to two weeks apart. During these sessions, participants will be asked to do various mental exercises, complete questionnaires, and allow us to take basic health measurements, such as height, weight and blood pressure. At home, between the two sessions, participants will be asked to answer questions about their daily experiences using a small handheld palmtop computer. Participants will be compensated for their time and effort. They will receive $25 for completing the first session, $50 for answering the daily questionnaires and providing daily saliva samples, and $25 for completing the second session, for a total of $100 for completing all portions of the research. Free parking is available in the garage next to our office in the CNY Medical Center. Participants in this study are volunteers, and they can withdraw from the study at any time without penalty. Do you have any questions? Does this sound like something you would like to do?** ***(If YES, then proceed to Question 1.)***

1. How did you hear about this study? _____

2. Name: _____

3. Address:

   _____

   _____

   _____

4. Phone: (_____) _____

5. Sex (circle one): Male Female

6. We use a small electronic device to measure body fat. However, we do NOT like to use this with individuals who think they might be pregnant or who have any sort of implanted electrical device, like a pacemaker or defibrillator.

   Do you think you might be pregnant? (circle one) YES NO

   Do you have a pacemaker or defibrillator? (circle one) YES NO

7. As mentioned earlier, your participation involves <u>two</u> visits to our research office. The first visit will last about 3 hours and the second about 1 hour. The visits will be scheduled 4-5 days apart, and in between you will be asked to complete daily questionnaires and collect saliva samples. Will you be able to come to the office to attend both scheduled appointments? (circle one) YES NO

8. As we talked about, part of the study will involve answering questions about your daily experiences on a palmtop computer for several days. In order to make your participation as convenient as possible, we will need to know about your typical sleep-wake times.

   What time do you **wake up** on a typical weekday? _____ AM PM (circle one)

   What time do you **go to bed** on a typical weekday? _____ AM PM (circle one)

9. Preferred days and times for appointments: _____

   _____

10. Convenient times to call: _____

11. E-mail Address: _____

Appendix C

Demographics Questionnaire

BURST # _____ SESSION #_____

COGNITION HEALTH AND AGING PROJECT

DATE:___/___/___ PARTICIPANT ID#:_____

Participant Information/ Syracuse University

1.0	Gender	Male/Female	
1.1	What is your name?	Correct/Incorrect	
1.2	What is your date of birth?	___/____/____ mo day yr	
1.3	How old are you now?	_____ years	
1.4	Where were you born?	_____ (city, state, country)	
1.5	Was English your first language?	1-YES 0-NO (If yes, skip to 1.6)	
1.51	If English was NOT your first language, at what age did you learn English?	_____ years	
1.6	To which ethnic group do you belong?	1-White 2-Black 3-Hispanic, White	4-Hispanic, Black 5-Asian 6-Other (specify-_____)
1.7	How many years of education have you received?	_____ years	
1.8	What is the highest degree you hold?	1–None 2-High School 3-Bachelors	4-Masters 5-Doctorate 6-Other (GED)

BURST # _____ SESSION #_____

COGNITION HEALTH AND AGING PROJECT

DATE:___/___/___ PARTICIPANT ID#:_____

1.9	What is/was your primary occupation?	_____	
2.0	Are you working now as either a volunteer or in a paid position?	1-YES (If no, skip to 2.2)	0-NO
2.1	How many hours per week do you work?	_____ hours/week	
2.2	How financially comfortable do you feel at this time?	0- Very uncomfortable 1- Somewhat uncomfortable 2- Somewhat comfortable 3- Very comfortable	
2.3	What is your current income?	1- < $10,000 2- $10,000 – $19,999 3 - $20,000 - $29,999 4- $30,000 - $39,999 5- $40,000 - $49,999	6 - $50,000 – $74,999 7 – $75,000 - $99,999 8 – $100,000 and up 9 - Don't Know 0 - Refused
2.4	With whom do you currently live?	1- Live alone 2- Spouse 3- Friend	4- Brother/Sister 5- Child 6- Other

BURST # _____ SESSION #_____

COGNITION HEALTH AND AGING PROJECT

DATE:___/___/___ PARTICIPANT ID#:_____

2.7	What is your current marital status?	1- Married 2- Separated 3- Widowed	4- Divorced 5- Never Married- (skip to 3.0)
2.8	How long have you been married?	_____ year(s)	
2.9	In what year were you divorced/ separated?	_____	
3.0	Do you have children? If so, how many living children do you have?	_____	
3.1	Which hand do you usually write with?	0- Left 1- Right 2- Both	

BURST # _____ SESSION #_____

COGNITION HEALTH AND AGING PROJECT

DATE:___/___/___ PARTICIPANT ID#:_____

3.2	Do you consider yourself left-handed, right-handed?	0- Left-handed 1- Right-handed 2- Ambidextrous
3.3	Were you ever left-handed as a child and then asked to switch?	0- No 1- Yes 9- Don't know

Appendix D

Psychosocial Questionnaires

Here are a number of characteristics that may or may not apply to you. Please circle an answer to indicate the extent to which you agree or disagree with statement.

	Disagree Strongly	Disagree A Little	Neither Agree Nor Disagree	Agree A Little	Agree Strongly
1. Is talkative……..	DS	D	N	A	AS
2. Tends to find fault with others……..	DS	D	N	A	AS
3. Does a thorough job……..	DS	D	N	A	AS
4. Is depressed, blue……..	DS	D	N	A	AS
5. Is original, comes up with new ideas…...	DS	D	N	A	AS
6. Is reserved……..	DS	D	N	A	AS
7. Is helpful and unselfish with others……	DS	D	N	A	AS
8. Can be somewhat careless……..	DS	D	N	A	AS
9. Is relaxed, handles stress well……	DS	D	N	A	AS
10. Is curious about many different things…...	DS	D	N	A	AS
11. Is full of energy……	DS	D	N	A	AS
12. Starts quarrels with others……	DS	D	N	A	AS
13. Is a reliable worker……..	DS	D	N	A	AS
14. Can be tense……	DS	D	N	A	AS
15. Is ingenious, a deep thinker……..	DS	D	N	A	AS
16. Generates a lot of enthusiasm……..	DS	D	N	A	AS
17. Has a forgiving nature……	DS	D	N	A	AS
18. Tends to be disorganized……..	DS	D	N	A	AS
19. Worries a lot……	DS	D	N	A	AS
20. Has an active imagination……..	DS	D	N	A	AS
21. Tends to be quiet……..	DS	D	N	A	AS
22. Is generally trusting……..	DS	D	N	A	AS
23. Tends to be lazy……..	DS	D	N	A	AS
24. Is emotionally stable, not easily upset….	DS	D	N	A	AS

Here are a number of characteristics that may or may not apply to you. Please circle an answer to indicate the extent to which you agree or disagree with statement.

	Disagree Strongly	Disagree A Little	Neither Agree Nor Disagree	Agree A Little	Agree Strongly
25. Is inventive.....	DS	D	N	A	AS
26. Has an assertive personality.....	DS	D	N	A	AS
27. Can be cold and aloof.....	DS	D	N	A	AS
28. Perseveres until the task is finished.....	DS	D	N	A	AS
29. Can be moody.....	DS	D	N	A	AS
30. Values artistic, aesthetic experiences.....	DS	D	N	A	AS
31. Is sometimes shy, inhibited.....	DS	D	N	A	AS
32. Is considerate and kind to almost everyone	DS	D	N	A	AS
33. Does things efficiently.....	DS	D	N	A	AS
34. Remains calm in tense situations.....	DS	D	N	A	AS
35. Prefers work that is routine.....	DS	D	N	A	AS
36. Is outgoing, sociable.....	DS	D	N	A	AS
37. Is sometimes rude to others.....	DS	D	N	A	AS
38. Makes plans and follows through with them.....	DS	D	N	A	AS
39. Gets nervous easily.....	DS	D	N	A	AS
40. Likes to reflect, play with ideas.....	DS	D	N	A	AS
41. Has few artistic interests.....	DS	D	N	A	AS
42. Likes to cooperate with others.....	DS	D	N	A	AS
43. Is easily distracted.....	DS	D	N	A	AS
44. Is sophisticated in art, music, or literature..	DS	D	N	A	AS

ID# _____ DATE _____ SESSION ____ ROOM _____

These questions will tell us about your medical history and overall health. Please read each question carefully. Ask the researcher for help if you have any questions.

1. Have you visited the hospital in the last 12 months?
   (include visits to the ER) ☐ YES ☐ NO (skip to # 2)

   Were you admitted? ☐ YES ☐ NO

   How many days did you spend in the hospital? _____days

   What was the reason for your hospital admission? _____
   _____

2. How many times have you visited a physician in the last month?
   (Include visits to specialists but not visits to hospitals.) _____times

3. In the last month, how many days have you spent sick in bed? _____days

4. Have you ever been diagnosed with cancer? ☐ YES ☐ NO (skip to # 5)

   What type? _____

   When were you diagnosed? _____/_____ (Mo & Yr)

   Did you receive chemotherapy? ☐ YES ☐ NO

   If yes, when was your last treatment? _____/_____ (Mo & Yr)

   Did you receive radiation? ☐ YES ☐ NO

   If yes, when was your last treatment? _____/_____ (Mo & Yr)

5. Have you ever had asthma? ☐ YES ☐ NO (skip to # 6)

   Do you presently have asthma? ☐ YES ☐ NO

   If yes, does it interfere with your daily activities?
   ☐ YES ☐ NO

   Do you take daily medication for your asthma?
   ☐ YES ☐ NO

PLEASE TURN THE PAGE

ID# _____ DATE _____ SESSION ____ ROOM _____

6. Do you have allergies or hay fever? ☐ YES ☐ NO (skip to # 7)

   Are you currently having allergy or hay fever symptoms?

   ☐ YES ☐ NO

   If yes, does it interfere with your daily activities?

   ☐ YES ☐ NO

   Do you take daily medication for your allergies?

   ☐ YES ☐ NO

7. Do you have emphysema or COPD (chronic obstructive pulmonary disease)?

   ☐ YES ☐ NO (skip to # 8)

   Does this condition interfere with your daily activities?

   ☐ YES ☐ NO

   Compared to 6 months ago, is your condition:

   ☐ the same ☐ improved ☐ worsened

8. Have you ever had a heart attack? ☐ YES ☐ NO (skip to # 9)

   How many heart attacks have you had? _____

9. Has a physician ever told you that you were in congestive heart failure? ☐ YES ☐ NO

10. Have you ever had a seizure? ☐ YES ☐ NO (skip to # 11)

    How old were you when you have your first seizure? _____ yrs

    When did your have your most recent seizure? _____/_____(Mo & Yr)

    Are you taking any medication to control your seizures? ☐ YES ☐ NO

PLEASE TURN THE PAGE

ID# _____ **DATE** _____ **SESSION** ____ **ROOM** _____

11. Have you ever had an injury to your head that resulted in bleeding, required stitches, or caused you to lose consciousness?

☐ YES ☐ NO (skip to #12)

When did this occur? _____/_____(Mo & Yr)

What was your age? _____ yrs

If you lost consciousness (were knocked out), how long were you unconscious?

_____

If you have had more than one injury to your head, please tell the researcher so we can ask you some additional questions. Thank you!

12. Do you have leg pain when you walk? ☐ YES ☐ NO (skip to #13)

Is the pain relieved within 5 to 10 minutes by resting? ☐ YES ☐ NO

13. Do you ever have chest pain while exerting yourself? ☐ YES ☐ NO

14. Have you ever had a stroke? ☐ YES ☐ NO (skip to #15)

Have you had more than 1 stroke? ☐ YES ☐ NO

When did you have the (most recent) stroke? _____/_____(Mo & Yr)

15. Have you ever tested positive for HIV or been diagnosed with AIDS? ☐ YES ☐ NO (skip to #16)

How old were you when you tested positive? _____ yrs

16. Have you ever smoked cigarettes? ☐ YES ☐ NO (skip to # 17)

At what age did you begin smoking? _____ yrs

Do you currently smoke? ☐ YES ☐ NO

If no, at what age did you stop smoking? _____ yrs

Approximately how many cigarettes per day would you/do you smoke?_____ per day

PLEASE TURN THE PAGE

ID# _____ DATE _____ SESSION ____ ROOM _____

17. Have you ever drank any alcoholic beverage (such as wine beer or liquor)?

☐ YES ☐ NO (skip to # 18)

How many drinks per week do you have? (Please note that one standard drink equals:
12 oz beer **OR** 5 oz wine **OR** 1.5 oz shot of liquor straight or in a mixed drink.)

_____ drinks per week

18. How many cups of caffeinated coffee do you drink per day (a cup = 8 oz.)?

_____ cups

19. How many cups of caffeinated tea do you drink per day (a cup = 8 oz.)?

_____ cups

20. How many cans of caffeinated soda do you drink per day? _____

21. Typically, what time of the day do you feel the sharpest mentally?

☐ Early Morning ☐ Late Morning ☐ Early Afternoon
☐ Late Afternoon ☐ Evening

22. Typically, what time of the day do you feel most physically energetic?

☐ Early Morning ☐ Late Morning ☐ Early Afternoon
☐ Late Afternoon ☐ Evening

Have you ever been diagnosed with…?	**(Circle One)**		**If YES, what medication(s) do you <u>currently</u> take for this?**
hypertension (high blood pressure)	**NO**	**YES**	
hypotension (low blood pressure)	**NO**	**YES**	
high cholesterol	**NO**	**YES**	
hyperthyroidism	**NO**	**YES**	
hypothyroidism	**NO**	**YES**	
arthritis (Please circle type below.) osteoarthritis rheumatoid arthritis	**NO**	**YES**	

PLEASE TURN THE PAGE

ID# _____ DATE _____ SESSION _____ ROOM _____

Have you ever been diagnosed with…?	**(Circle One)**		**If YES, what medication(s) do you <u>currently</u> take for this?**
other chronic joint pain	**NO**	**YES**	
carpal tunnel	**NO**	**YES**	
spine or orthopedic problems (describe) _____ _____	**NO**	**YES**	
diabetes	**NO**	**YES**	
hepatitis (please note type) _____	**NO**	**YES**	
autoimmune disease (describe) _____ _____	**NO**	**YES**	
depression	**NO**	**YES**	
anxiety disorder	**NO**	**YES**	
bipolar disorder (manic depression)	**NO**	**YES**	
attention deficit disorder (ADD or ADHD)	**NO**	**YES**	
other learning disabilities (describe) _____ _____	**NO**	**YES**	
other psychiatric conditions (describe)_____ _____	**NO**	**YES**	
Alzheimer's disease	**NO**	**YES**	
Parkinson's disease	**NO**	**YES**	
Other dementia (describe) _____	**NO**	**YES**	
multiple sclerosis	**NO**	**YES**	
meningitis	**NO**	**YES**	
encephalitis	**NO**	**YES**	
migraine headaches	**NO**	**YES**	
Other neurological conditions (describe) _____ _____	**NO**	**YES**	
Other medical conditions not already listed (describe) _____ _____ _____	**NO**	**YES**	

PLEASE TURN THE PAGE

ID# _____ **DATE** _____ **SESSION** ____ **ROOM** _____

Information on additional head injuries (to be completed by researcher as needed).

Head injury #1

When did this occur? _____/_____(Mo & Yr)

What was your age? _____ yrs

If you lost consciousness (were knocked out), how long were you unconscious?

_____

Head injury #2

When did this occur? _____/_____(Mo & Yr)

What was your age? _____ yrs

If you lost consciousness (were knocked out), how long were you unconscious?

_____

Head injury #3

When did this occur? _____/_____(Mo & Yr)

What was your age? _____ yrs

If you lost consciousness (were knocked out), how long were you unconscious?

_____

Head injury #4

When did this occur? _____/_____(Mo & Yr)

What was your age? _____ yrs

If you lost consciousness (were knocked out), how long were you unconscious?

_____

Head injury #5

When did this occur? _____/_____(Mo & Yr)

What was your age? _____ yrs

If you lost consciousness (were knocked out), how long were you unconscious?

_____

PLEASE TURN THE PAGE

PSS

The set of questions refer to feelings and thoughts you may have had DURING THE LAST MONTH. In each case, you will be asked to indicate how frequently you have had different feelings or thoughts. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number or times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate. Please circle the letters in the appropriate box indicating **NEVER, ALMOST NEVER, SOMETIMES, FAIRLY OFTEN,** OR **VERY OFTEN**.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
1. In the last month, how often have you been upset because of something that happened unexpectedly?	N	AN	S	FO	VO
2. In the last month, how often have you felt that you were unable to control the important things in your life?	N	AN	S	FO	VO
3. In the last month, how often have you felt nervous and "stressed"?	N	AN	S	FO	VO
4. In the last month, how often have you dealt successfully with irritating life hassles?	N	AN	S	FO	VO
5. In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?	N	AN	S	FO	VO
6. In the last month, how often have you felt confident about your ability to handle your personal problems?	N	AN	S	FO	VO
7. In the last month, how often have you felt that things were going your way?	N	AN	S	FO	VO
8. In the last month, how often have you found that you could not cope with all the things that you had to do?	N	AN	S	FO	VO
9. In the last month, how often have you been able to control irritations in your life?	N	AN	S	FO	VO
10. In the last month, how often have you felt that you were on top of things?	N	AN	S	FO	VO
11. In the last month, how often have you been angered because of things that happened that were outside of your control?	N	AN	S	FO	VO
12. In the last month, how often have you found yourself thinking about things that you have to accomplish?	N	AN	S	FO	VO
13. In the last month, how often have you been able to control the way you spend your time?	N	AN	S	FO	VO
14. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	N	AN	S	FO	VO

PLEASE TURN THE PAGE

TOQ

This questionnaire concerns the kind of thoughts that go through people's heads when they have to concentrate on something, such as homework, taking an exam, or reading a book. The following is a list of thoughts, which in your past experience, you may have had while working on various types of tasks. Please estimate how often each thought has occurred to you by circling the appropriate choice next to each statement.

	Never	Once	A Few Times	Often	Very Often
1. I think about how poorly I am doing.	N	Once	AFT	Often	VO
2. I think about what someone will think of me.	N	Once	AFT	Often	VO
3. I think about how I should be more careful.	N	Once	AFT	Often	VO
4. I think about how well others can do on what I am trying to do.	N	Once	AFT	Often	VO
5. I think about how difficult what I am doing is.	N	Once	AFT	Often	VO
6. I think about my level of ability.	N	Once	AFT	Often	VO
7. I think about the purpose of what I am doing.	N	Once	AFT	Often	VO
8. I think about how I would feel if I were told how I performed.	N	Once	AFT	Often	VO
9. I think about how often I get confused.	N	Once	AFT	Often	VO
10. I think about other activities (for example, assignments, work).	N	Once	AFT	Often	VO
11. I think about members of my family.	N	Once	AFT	Often	VO
12. I think about friends.	N	Once	AFT	Often	VO
13. I think about something that makes me feel guilty.	N	Once	AFT	Often	VO
14. I think about personal worries.	N	Once	AFT	Often	VO

PLEASE TURN THE PAGE

	Never	Once	A Few Times	Often	Very Often
15. I think about something that makes me feel tense.	N	Once	AFT	Often	VO
16. I think about something that makes me feel angry.	N	Once	AFT	Often	VO
17. I think about something that happened earlier in the day.	N	Once	AFT	Often	VO
18. I think about something that happened in the recent past (for example, in the last few days).	N	Once	AFT	Often	VO
19. I think about something that happened in the distant past.	N	Once	AFT	Often	VO
20. I think about something that might happen in the future.	N	Once	AFT	Often	VO
21. I think about stopping.	N	Once	AFT	Often	VO
22. I think about how unhappy I am.	N	Once	AFT	Often	VO
23. I think about how hard it is.	N	Once	AFT	Often	VO
24. I think about how I can't stand it anymore.	N	Once	AFT	Often	VO
25. I think about quitting.	N	Once	AFT	Often	VO
26. I think about running away.	N	Once	AFT	Often	VO
27. I think about taking something (e.g., pills, a drink) to make it easier.	N	Once	AFT	Often	VO
28. I think about going to bed/or to sleep.	N	Once	AFT	Often	VO

PLEASE TURN THE PAGE

Please use the rating scale below to describe how TRUE each statement is in describing *you*. Read each statement and then check a box to indicate how true the statement is of you. Describe yourself as you generally are now, not as you wish to be in the future.

	Not at all true	Hardly true	Moderately true	Exactly true
1. I can always manage to solve difficult problems if I try hard enough.				
2. If someone opposes me, I can find the means and ways to get what I want.				
3. It is easy for me to stick to my aims and accomplish my goals.				
4. I am confident that I could deal efficiently with unexpected events.				
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.				
6. I can solve most problems if I invest the necessary effort.				
7. I can remain calm when facing difficulties because I can rely on my coping abilities.				
8. When I am confronted with a problem, I can usually find several solutions.				
9. If I am in trouble, I can usually think of a solution.				
10. I can usually handle whatever comes my way.				

PLEASE TURN THE PAGE

Please take a moment to consider the MOST STRESSFUL EVENT of your life. After you have thought of this experience, please answer the following questions based on this event.

1. Was the one most stressful experience:

- ☐ the death of a loved one
- ☐ a divorce/separation of parents
- ☐ a physical threat or assault
- ☐ a sexual experience
- ☐ a stressful or upsetting academic upheaval
- ☐ a change in living situation
- ☐ a physical illness
- ☐ other

If other, please specify the nature of the experience: _____

---

2. How stressful was this experience for you?

- ☐ Not at all stressful
- ☐ Slightly stressful
- ☐ Moderately stressful
- ☐ Very stressful
- ☐ A great deal stressful

3. How much did you disclose/confide in someone else about this experience?

- ☐ Not at all
- ☐ A small amount
- ☐ Somewhat
- ☐ A fair amount
- ☐ A great deal

4. Was counseling or other help received for this experience? ☐ Yes ☐ No

5. Please indicate the date of the occurrence by month and year. If the event was either ongoing or recurring, please indicate the duration of the experience (for example, 06/97 – 02/98): _____

PLEASE TURN THE PAGE

Below is a list of comments made by people after stressful life events. Again consider the MOST STRESSFUL EVENT of your life. Please circle the letters in the appropriate column that correspond to your answer for each item. Please indicate whether the comments were true for you DURING THE PAST SEVEN DAYS by indicating **NOT AT ALL, RARELY, SOMETIMES,** or **OFTEN**.

During the past **SEVEN DAYS**,	Not At All	Rarely	Sometimes	Often
1. I thought about it when I didn't mean to.	NAA	R	S	O
2. I avoided letting myself get upset when I thought about it or was reminded of it.	NAA	R	S	O
3. I tried to remove it from my memory.	NAA	R	S	O
4. I had trouble falling asleep or staying asleep.	NAA	R	S	O
5. I had waves of strong feelings about it.	NAA	R	S	O
6. I had dreams about it.	NAA	R	S	O
7. I stayed away from reminders of it.	NAA	R	S	O
8. I felt as if it hadn't happened or wasn't real.	NAA	R	S	O
9. I tried not to talk about it.	NAA	R	S	O
10. Pictures about it popped into my mind.	NAA	R	S	O
11. Other things kept making me think about it.	NAA	R	S	O
12. I was aware that I still had a lot of feelings about it, but I didn't deal with them.	NAA	R	S	O
13. I tried not to think about it.	NAA	R	S	O
14. Any reminder brought back feelings about it.	NAA	R	S	O
15. My feelings about it were kind of numb.	NAA	R	S	O

WBSI

This survey is about your thoughts. We would like to ask you about the thought you have. There are no right or wrong answers. Please circle the answer that you feel best describes the thoughts you have.

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

PLEASE TURN THE PAGE

FRIENDS AND FAMILY

1. In the past six months, how many people could you really count on to help you **feel more relaxed** when you were under pressure or tense? (Please circle a number.)

   0 1 2 3 4 5 6 7 8 9 10+

   How satisfied were you with the availability of this type of help/support? (Please check a box.)

Very Dissatisfied	Fairly Dissatisfied	A little Dissatisfied	A little Satisfied	Fairly Satisfied	Very Satisfied
☐	☐	☐	☐	☐	☐

2. In the past six months, how many people **accepted you totally**, including your best and worst points? (Please circle a number.)

   0 1 2 3 4 5 6 7 8 9 10+

   How satisfied were you with the availability of this type of help/support? (Please check a box.)

Very Dissatisfied	Fairly Dissatisfied	A little Dissatisfied	A little Satisfied	Fairly Satisfied	Very Satisfied
☐	☐	☐	☐	☐	☐

3. In the past six months, how many people could you really count on to **care about you**, regardless of what was happening to you? (Please circle a number.)

   0 1 2 3 4 5 6 7 8 9 10+

   How satisfied were you with the availability of this type of help/support? (Please check a box.)

Very Dissatisfied	Fairly Dissatisfied	A little Dissatisfied	A little Satisfied	Fairly Satisfied	Very Satisfied
☐	☐	☐	☐	☐	☐

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FRIENDS AND FAMILY, continued

4. In the past six months, how many people could you count on to **console you** when you were very upset? (Please circle a number.)

0 1 2 3 4 5 6 7 8 9 10+

How satisfied were you with the availability of this type of help/support? (Please check a box.)

Very Dissatisfied	Fairly Dissatisfied	A little Dissatisfied	A little Satisfied	Fairly Satisfied	Very Satisfied
☐	☐	☐	☐	☐	☐

The questions that follow ask you about your life experiences **DURING THE PAST 12 MONTHS.** In each case, you will be asked whether or not you have experienced a certain event. If so, you will be asked how much of an impact that event had on you. Next you will be asked how this event affects you CURRENTLY.

The best approach is to answer each question fairly quickly. That is, you should choose the alternative, which you feel, is the most reasonable estimate of the impact of a specific event. Please check the ONE alternative that you feel is the best indicator.

During the *PAST TWELVE MONTHS* have you experienced …

1. Detention in jail or comparable institution ☐ **YES** ☐ **NO (skip to #2)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

2. Death of spouse ☐ **YES** ☐ **NO (skip to #3)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

3. Major change in sleeping habits (much more or much less sleep) ☐ **YES** ☐ **NO (skip to #4)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

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During the *PAST TWELVE MONTHS* have you experienced …

4. Death of close family member:

a. Mother ☐ **YES** ☐ **NO (skip to #4b)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

b. Father ☐ **YES** ☐ **NO (skip to #4c)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

c. Brother ☐ **YES** ☐ **NO (skip to #4d)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

d. Sister ☐ **YES** ☐ **NO (skip to #4e)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

e. Grandfather ☐ **YES** ☐ **NO (skip to #4f)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

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During the *PAST TWELVE MONTHS* have you experienced …

4. (continued) Death of close family member:

f. Grandmother ☐ **YES** ☐ **NO (skip to #4g)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

g. Death of family, other (specify)_____ ☐ **YES** ☐ **NO (skip to #5)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

5. Major change in eating habits (much more or much less food intake) ☐ **YES** ☐ **NO (skip to #6)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

6. Foreclosure on mortgage or loan ☐ **YES** ☐ **NO (skip to #7)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

7. Death of close friend ☐ **YES** ☐ **NO (skip to #8)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

PLEASE TURN THE PAGE

During the *PAST TWELVE MONTHS* have you experienced …

8. Minor law violations ☐ YES ☐ NO (skip to #9)

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

9. Changed work situation ☐ YES ☐ NO (skip to #10)

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

10. Serious illness or injury of close family member:

a. Sister ☐ YES ☐ NO (skip to #10b)

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

b. Brother ☐ YES ☐ NO (skip to #10c)

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

c. Spouse ☐ YES ☐ NO (skip to #10d)

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

PLEASE TURN THE PAGE

During the *PAST TWELVE MONTHS* have you experienced …

10. Serious illness or injury of close family member (continued):

d. Illness / Injury of family, other (specify)_____ ☐ **YES** ☐ **NO (skip to #11)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

11. Sexual difficulties ☐ **YES** ☐ **NO (skip to #12)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

12. Trouble with employer
(in danger of losing job, demoted, etc…) ☐ **YES** ☐ **NO (skip to #13)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

13. Trouble with in-laws ☐ **YES** ☐ **NO (skip to #14)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

14. Major change in financial status ☐ **YES** ☐ **NO (skip to #15)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

PLEASE TURN THE PAGE

During the *PAST TWELVE MONTHS* have you experienced …

15. Major change in closeness of family members (increased or decreased closeness) ☐ **YES** ☐ **NO (skip to #16)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

16. Change of residence ☐ **YES** ☐ **NO (skip to #17)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

17. Marital separation from mate ☐ **YES** ☐ **NO (skip to #18)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

18. Major change in church activities ☐ **YES** ☐ **NO (skip to #19)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

19. Major change in number of arguments with spouse ☐ **YES** ☐ **NO (skip to #20)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

PLEASE TURN THE PAGE

During the *PAST TWELVE MONTHS* have you experienced …

20. *Married Male:* Change in wife's work outside the home ☐ **YES** ☐ **NO (skip to #21)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

21. *Married Female:* Change in husband's work outside the home ☐ **YES** ☐ **NO (skip to #22)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

22. Major change in recreation activities ☐ **YES** ☐ **NO (skip to #23)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

23. Borrowing more than $10,000 ☐ **YES** ☐ **NO (skip to #24)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

24. Borrowing less than $10,000 ☐ **YES** ☐ **NO (skip to #25)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

PLEASE TURN THE PAGE

During the *PAST TWELVE MONTHS* have you experienced …

25. Being fired from job ☐ **YES** ☐ **NO (skip to #26)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

26. Major personal illness or injury ☐ **YES** ☐ **NO (skip to #27)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

27. Major change in social activities ☐ **YES** ☐ **NO (skip to #28)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

28. Major change in living conditions ☐ **YES** ☐ **NO (skip to #29)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

29. Divorce ☐ **YES** ☐ **NO (skip to #30)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

PLEASE TURN THE PAGE

During the *PAST TWELVE MONTHS* have you experienced …

30. Serious illness or injury of a close friend ☐ **YES** ☐ **NO (skip to #31)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

31. Ending of formal schooling ☐ **YES** ☐ **NO (skip to #32)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

32. Separation from spouse ☐ **YES** ☐ **NO (skip to #33)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

33. Breaking up with boyfriend/girlfriend ☐ **YES** ☐ **NO (skip to #34)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

34. Leaving home for the first time ☐ **YES** ☐ **NO (skip to #35)**

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

PLEASE TURN THE PAGE

During the *PAST TWELVE MONTHS* have you experienced …

LIST AND RATE OTHER RECENT NEGATIVE EXPERIENCES THAT HAVE HAD AN IMPACT ON YOUR LIFE DURING THE PAST 12 MONTHS. Examples of other possibly negative experiences are: engagement; marriage; pregnancy; abortion; gaining a new family member (through birth or adoption); outstanding personal achievement; new job; marital reconciliation with spouse; and reconciliation with boyfriend/girlfriend.

35. _____

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

36. _____

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

37. _____

IF YES:	Extremely Negative	Moderately Negative	Slightly Negative	No Negative Impact
How much impact did this event have on you WHEN IT OCCURRED?	☐	☐	☐	☐
How does this event affect you CURRENTLY?	☐	☐	☐	☐

PLEASE TURN THE PAGE

TCQ

Most people experience unpleasant and/or unwanted thought (in verbal and/or picture form), which can be difficult to control. We are interested in the techniques that you GENERALLY use to control such thoughts. Below are a number of things that people do to control these thoughts. Please read each statement carefully, and indicate how often you use each technique by circling the appropriate number. There are no right or wrong answers. Do not spend too much time thinking about each one.

When I experience an unpleasant/unwanted thought I:

	Never	Sometimes	Often	Almost Always
1. I call to mind positive images instead	N	S	O	AA
2. I tell myself not to be so stupid	N	S	O	AA
3. I focus on the thought	N	S	O	AA
4. I replace the thought with a more trivial bad thought	N	S	O	AA
5. I don't talk about the thought to anyone	N	S	O	AA
6. I punish myself for thinking the thought	N	S	O	AA
7. I dwell on other worries	N	S	O	AA
8. I keep the thought to myself	N	S	O	AA
9. I occupy myself with work instead	N	S	O	AA
10. I challenge the thoughts validity	N	S	O	AA
11. I get angry at myself for having the thought	N	S	O	AA
12. I avoid discussing the thought	N	S	O	AA
13. I shout at myself for having the thought	N	S	O	AA
14. I analyze the thought rationally	N	S	O	AA
15. I slap or pinch myself to stop the thought	N	S	O	AA
16. I think pleasant thoughts instead	N	S	O	AA
17. I find out how my friends deal with these thoughts	N	S	O	AA
18. I worry about more minor things instead	N	S	O	AA

PLEASE TURN THE PAGE

When I experience an unpleasant/unwanted thought I:

	Never	Sometimes	Often	Almost Always
19. I do something that I enjoy	N	S	O	AA
20. I try to reinterpret the thought	N	S	O	AA
21. I think about something else	N	S	O	AA
22. I think more about the minor problems I have	N	S	O	AA
23. I try a different way of thinking about it	N	S	O	AA
24. I think about past worries instead	N	S	O	AA
25. I ask my friends if they have similar thoughts	N	S	O	AA
26. I focus on different negative thoughts	N	S	O	AA
27. I question the reasons for having the thought	N	S	O	AA
28. I tell myself that something bad will happen if I think the thought	N	S	O	AA
29. I talk to a friend about the thought	N	S	O	AA
30. I keep myself busy	N	S	O	AA

PLEASE WRITE THE DATE AND TIME YOU FINISH COMPLETING THIS SECTION. DATE __ / ___ / __ Time __:__ AM/PM (Circle one).

Thank you for completing all three sections of your Activities Booklet! Please remember to bring this completed booklet to your final appointment.

Your Health and Well-being

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. Thank you for completing this survey!

For each of the following questions, please mark and X in the one box that best describes your answer.

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

Excellent	Very good	Good	Fair	Poor
☐	☐	☐	☐	☐

2. Compared to one year ago, how would you rate your health in general now?

Much better than one year ago	Somewhat better than one year ago	About the same as one year ago	Somewhat worse than one year ago	Much worse than one year ago
☐	☐	☐	☐	☐

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

	Yes, limited a lot	Yes, limited a little	No, not limited at all
a) Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports	☐	☐	☐
b) Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	☐	☐	☐
c) Lifting or carrying groceries	☐	☐	☐
d) Climbing several flights of stairs	☐	☐	☐
e) Climbing one flight of stairs	☐	☐	☐
f) Bending, kneeling, or stooping	☐	☐	☐
g) Walking more than a mile	☐	☐	☐
h) Walking several hundred yards	☐	☐	☐
i) Walking one hundred yards	☐	☐	☐
j) Bathing or dressing yourself	☐	☐	☐

4. During the past 4 weeks, how much of the time have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a) Cut down on the amount of time you spent on work or other activities	☐	☐	☐	☐	☐
b) Accomplished less than you would like	☐	☐	☐	☐	☐
c) Were limited in the kind of work or other activities	☐	☐	☐	☐	☐
d) Had difficulty performing the work or other activities (for example, it took extra effort)	☐	☐	☐	☐	☐

5. During the past 4 weeks, how much of the time have you had any of the following problems with your work as a result of any emotional problems (such as feeling depressed or anxious)?

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a) Cut down on the amount of time you spent on work or other activities	☐	☐	☐	☐	☐
b) Accomplished less than you would like	☐	☐	☐	☐	☐
c) Did work or other activities less carefully than usual	☐	☐	☐	☐	☐

6. During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors or groups?

Not at all	Slightly	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

7. How much bodily pain have you had during the past 4 weeks?

None	Very mild	Mild	Moderate	Severe	Very severe
☐	☐	☐	☐	☐	☐

8. During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

Not at all	A little bit	Moderately	Quite a bit	Extremely
☐	☐	☐	☐	☐

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

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a) Did you feel full of life?	☐	☐	☐	☐	☐
b) Have you been very nervous?	☐	☐	☐	☐	☐
c) Have you felt so down in the dumps that nothing could cheer you up?	☐	☐	☐	☐	☐
d) Have you felt calm and peaceful?	☐	☐	☐	☐	☐
e) Did you have a lot of energy?	☐	☐	☐	☐	☐
f) Have you felt downhearted and depressed?	☐	☐	☐	☐	☐
g) Did you feel worn out?	☐	☐	☐	☐	☐
h) Have you been happy?	☐	☐	☐	☐	☐
i) Did you feel tired?	☐	☐	☐	☐	☐

10. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?

All of the time	Most of the time	Some of the time	A little of the time	None of the time
☐	☐	☐	☐	☐

11. How TRUE or FALSE is each of the following statements for you?

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
a) I seem to get sick a little easier than other people.	☐	☐	☐	☐	☐
b) I am as healthy as anybody I know.	☐	☐	☐	☐	☐
c) I expect my health to get worse.	☐	☐	☐	☐	☐
d) My health is excellent.	☐	☐	☐	☐	☐

CESD-1

Below is a list of the ways you may have felt or behaved recently. For each statement, there are four possible answers: **NOT AT ALL, A LITTLE, SOMEWHAT** OR **VERY MUCH**. Please circle the letters in the appropriate column that best describes how you are feeling AT THE CURRENT TIME.

	Not At All	A Little	Somewhat	Very Much
1. I am bothered by things that don't usually bother me.	NAA	AL	S	VM
2. I do not feel like eating, my appetite is poor.	NAA	AL	S	VM
3. I feel that I cannot shake the blues even with help from my family and friends.	NAA	AL	S	VM
4. I feel that I am just as good as other people.	NAA	AL	S	VM
5. I have trouble keeping my mind on what I am doing.	NAA	AL	S	VM
6. I feel depressed.	NAA	AL	S	VM
7. I feel that everything I do is an effort.	NAA	AL	S	VM
8. I feel hopeful about the future.	NAA	AL	S	VM
9. I think my life has been a failure.	NAA	AL	S	VM
10. I feel fearful.	NAA	AL	S	VM
11. My sleep is restless.	NAA	AL	S	VM
12. I am happy.	NAA	AL	S	VM
13. I talk less than usual.	NAA	AL	S	VM
14. I feel lonely.	NAA	AL	S	VM
15. People are unfriendly.	NAA	AL	S	VM
16. I enjoy life.	NAA	AL	S	VM
17. I have crying spells.	NAA	AL	S	VM
18. I feel sad.	NAA	AL	S	VM
19. I feel that people dislike me.	NAA	AL	S	VM
20. I cannot get going.	NAA	AL	S	VM

PLEASE TURN THE PAGE

Appendix E

Cognitive Tasks

ID _____ **DATE** _____ **SESSION** _____ **ROOM** _____

AVLT LIST 1—Free Recall

Say **"I am going to show you a list of words. You will have one minute to study them."**

Place the list of words in front of the subject. Time them using your stopwatch. Allow one minute.

When minute is up say **"OK. Time's up".** Take page away from subject.

Say **"Now I would like you to tell me all the words on the list. Tell me as many as you can remember. Go ahead."**

Time recall using your stopwatch. Allow one minute for recall. Write responses below:

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
_____
_____
_____

Total correct _____ **Repetitions** _____ **Non-list words** _____

ID _____ DATE _____ SESSION _____ ROOM _____

desk

ranger

bird

shoe

stove

mountain

glasses

towel

cloud

silver

lamb

gun

pencil

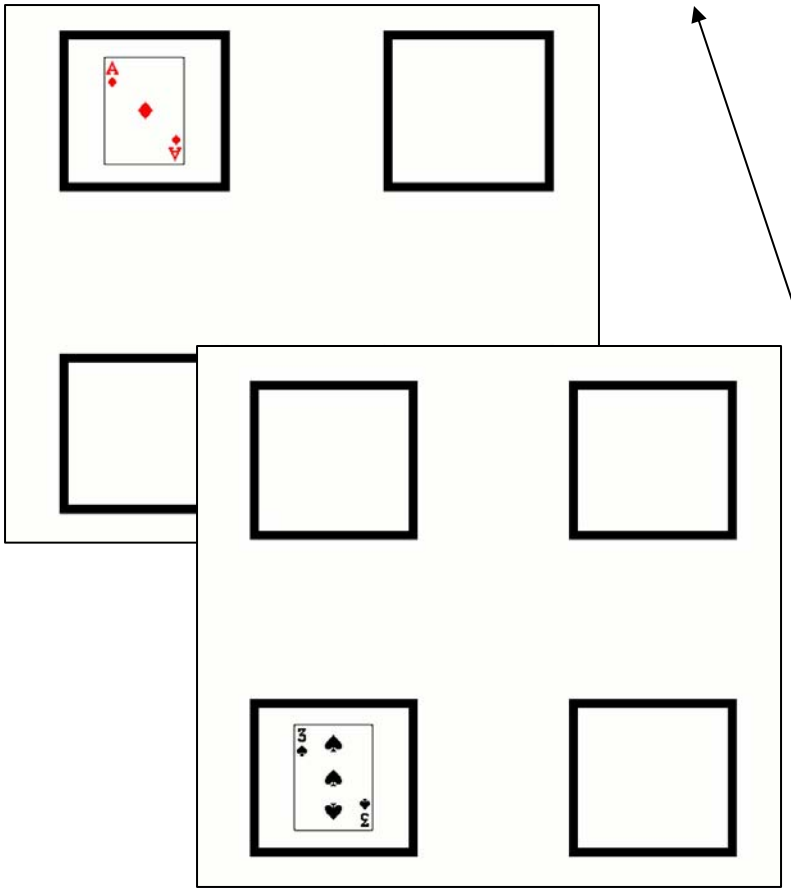
church

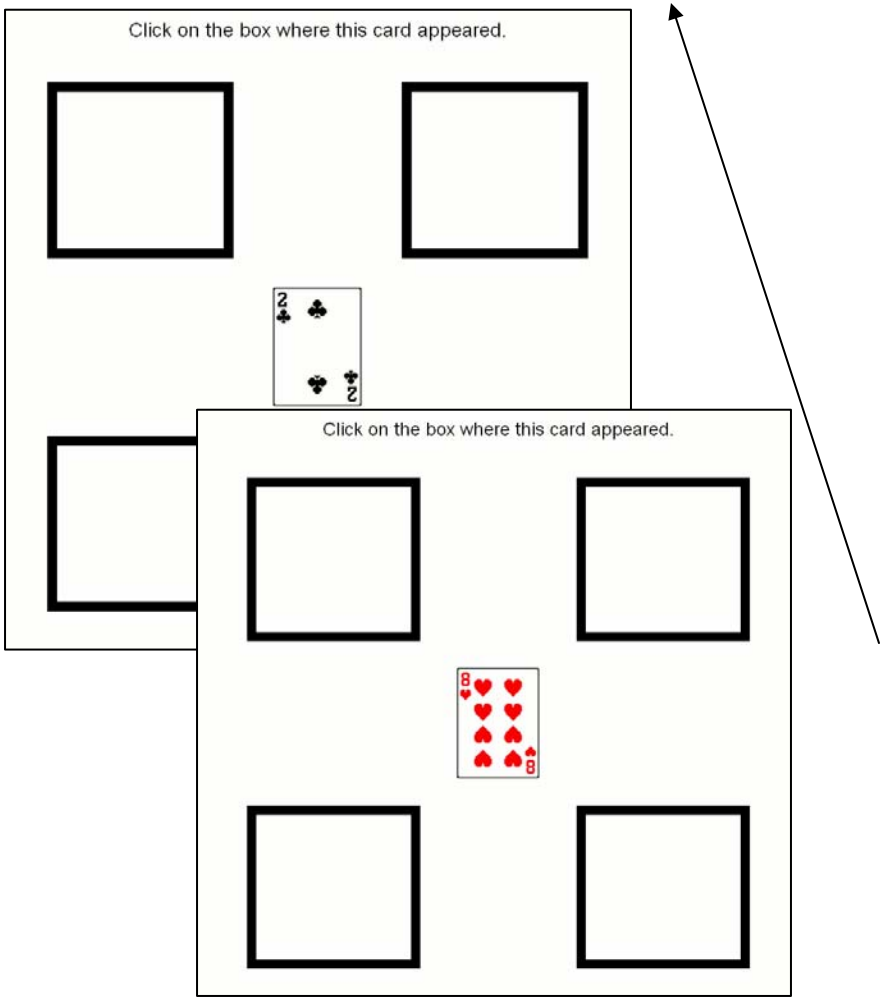
fish

Spatial Memory

Study Phase

Test Phase





ID _____ **DATE** _____ **SESSION** _____ **ROOM** _____

WMS III – Verbal Paired Associates

Say **"I am going to say a word and then say another word that goes with it. I will say a whole list of words like that. Listen carefully because when I am finished I will say the first word, and I want you to tell me the word that goes with it. For example, if the word pairs were Fruit-West, Gold-Walk, then when I say the word Fruit you would answer** (pause) **West. When I say the word Gold, you would answer** (pause) **Walk. Do you understand?**

If the examinee begins to repeat the word pairs as you are reading, stop and instruct him / her to wait until you are finished. If the examinee does not understand the instructions, you may repeat them, paraphrasing where necessary.

Read the word pairs at the rate of one pair of words every 3 seconds; that is, the words are spoken about 1 second apart, with 2 seconds separating the pairs.

When you are sure the examinee understands the instructions, **say "Now listen carefully to the list of word pairs as I read them."**

Read List A from the Record Form.

After reading List A, pause for five seconds and present Recall A. Ask **"Which word goes with_____?"**

Read the first word of each pair. Allow a maximum of five seconds for the examinee's response. Record the examinee's response.

If the examinee responds correctly, say **"That's right"** and proceed to the next word in the Recall List.

If the examinee responds incorrectly, say **"No, _____ goes with _____"** and provide the examinee with the correct response. Then proceed to the next word in the Recall List.

If the examinee gives no response within 5 seconds, score the item 0, provide the examinee with the correct response, and proceed to the next word in the Recall List.

After completing List A, pause for five seconds. Then say **"Now I will read the same list again, except with the word pairs in a different order. Listen carefully."**

Read List B from the Record Form.

After reading List B, pause for five seconds and present Recall B, using the same procedures as with Recall A. You may repeat the question **"Which word goes with_____?"** if necessary.

Continue with List C and Recall C, followed by List D and Recall D.

ID _____ DATE _____ SESSION _____ ROOM _____

WMS III – Verbal Paired Associates

List A	Recall A / Response	Score 1 or 0
Truck – Arrow	1. Bank (Cartoon)	
Insect – Acorn	2. Reptile (Clown)	
Reptile – Clown	3. Star (Ladder)	
Bank – Cartoon	4. Rose (Bag)	
Star – Ladder	5. Elephant (Glass)	
Raccoon – Paper	6. Truck (Arrow)	
Rose - Bag	7. Insect (Acorn)	
Elephant - Glass	8. Raccoon (Paper)	
		Total =

List B	Recall B / Response	Score 1 or 0
Star – Ladder	1. Elephant (Glass)	
Elephant - Glass	2. Insect (Acorn)	
Insect – Acorn	3. Reptile (Clown)	
Truck – Arrow	4. Rose (Bag)	
Reptile – Clown	5. Star (Ladder)	
Bank – Cartoon	6. Raccoon (Paper)	
Raccoon – Paper	7. Bank (Cartoon)	
Rose - Bag	8. Truck (Arrow)	
		Total =

List C	Recall C / Response	Score 1 or 0
Rose - Bag	1. Insect (Acorn)	
Raccoon – Paper	2. Star (Ladder)	
Star – Ladder	3. Truck (Arrow)	
Reptile – Clown	4. Rose (Bag)	
Elephant - Glass	5. Elephant (Glass)	
Insect – Acorn	6. Reptile (Clown)	
Bank – Cartoon	7. Bank (Cartoon)	
Truck – Arrow	8. Raccoon (Paper)	
		Total =

List D	Recall D / Response	Score 1 or 0
Raccoon – Paper	1. Star (Ladder)	
Truck – Arrow	2. Rose (Bag)	
Star – Ladder	3. Insect (Acorn)	
Insect – Acorn	4. Raccoon (Paper)	
Rose - Bag	5. Elephant (Glass)	
Reptile – Clown	6. Bank (Cartoon)	
Bank – Cartoon	7. Reptile (Clown)	
Elephant - Glass	8. Truck (Arrow)	
		Total =

Total of all four lists = _____

ID _____ DATE _____ SESSION _____ ROOM _____

In the task below, the first word in each line is printed in capital letters. Opposite it are four other words. Circle the word which means the same thing as the first word. A sample has been worked out for you. If you don't know, guess.

	LARGE	red	(big)	silent	wet
1.	TALK	draw	eat	speak	sleep
2.	PERMIT	allow	sew	cut	drive
3.	PARDON	forgive	pound	divide	tell
4.	COUCH	pin	eraser	sofa	glass
5.	REMEMBER	swim	recall	number	defy
6.	TUMBLE	drink	dress	fall	think
7.	HIDEOUS	silvery	tilted	young	dreadful
8.	CORDIAL	swift	muddy	leafy	hearty
9.	EVIDENT	green	obvious	skeptical	afraid
10.	IMPOSTOR	conductor	officer	book	pretender
11.	MERIT	deserve	distrust	fight	separate
12.	FASCINATE	welcome	fix	stir	enchant
13.	INDICATE	defy	excite	signify	bicker
14.	IGNORANT	red	sharp	uninformed	precise
15.	FORTIFY	submerge	strengthen	vent	deaden
16.	RENOWN	length	head	fame	loyalty
17.	NARRATE	yield	buy	associate	tell
18.	MASSIVE	bright	large	speedy	low
19.	HILARITY	laughter	speed	grace	malice
20.	SMIRCHED	stolen	pointed	remade	soiled

ID _____ DATE _____ SESSION _____ ROOM _____

21.	SQUANDER	tease	belittle	cut	waste
22.	CAPTION	drum	ballast	heading	ape
23.	FACILITATE	help	turn	strip	bewilder
24.	JOCOSE	humorous	paltry	fervid	plain
25.	APPRISE	reduce	strew	inform	delight
26.	RUE	eat	lament	dominate	cure
27.	DENIZEN	senator	inhabitant	fish	atom
28.	DIVEST	dispossess	intrude	rally	pledge
29.	AMULET	charm	orphan	dingo	pond
30.	INEXORABLE	untidy	involatile	rigid	sparse
31.	SERRATED	dried	notched	armed	blunt
32.	LISSOM	moldy	loose	supple	convex
33.	MOLLIFY	mitigate	direct	pertain	abuse
34.	PLAGIARIZE	appropriate	intend	revoke	maintain
35.	ORIFICE	brush	hole	building	lute
36.	QUERULOUS	maniacal	curious	devout	complaining
37.	PARIAH	outcast	priest	lentil	locker
38.	ABET	waken	ensue	incite	placate
39.	TEMERITY	rashness	timidity	desire	kindness
40.	PRISTINE	vain	sound	first	level

Total Correct _____

Participant ID _____ Date _____ Burst # _____ Session # _____ Room _____

WAIS III – Vocabulary

Say **"Now we are going to do something different. In this next section, I want you to tell me the meanings of some words. Now listen carefully and tell me what each word I say means. Are you ready?"**

Begin with Item 4 (Winter). Open the stimulus book to Item 4 of the Vocabulary subtest. Place it in front of the participant and use the same method of presentation for all words:
Simultaneously point to and say:
"Tell me what _____ means."

If the participant obtains a score of 0 or 1 on either Item 4 or Item 5, administer Item 1 – 3 in **reverse** sequence until the participant obtains perfect (2 point) scores on **two** consecutive items. If the participant obtained a perfect score on Item 4, count it in the reverse sequence. When this criterion is met, give full credit for any preceding items that were not administered. Then proceed with the subtest until the discontinue criterion is met.

Discontinue administration after **six** consecutive scores of 0.

- With more able examinees, after the **first three items administered**, you may simply pronounce the word. Be sure to use the local pronunciation of each word or the pronunciation you believe to be familiar to the participant.
- Record the participant's response verbatim in the appropriate space on the form. Use the sample responses in the WAIS III manual as scoring guidelines.
- Occasionally, the participant's response may be unclear or too vague to be readily scored, or a marginal 0- or 1- point response may indicate that a superior response could be evoked. In such instances, you may say: **"Tell me more about it"** or **"Explain what you mean"** or make a similarly neutral inquiry. However, no other form of questioning may be used. In the case of a clear-cut 0 or 1 point response, no such inquiry should be made. See the sample responses listed after each item for further querying guidelines.
- Sometime, you may have to repeat the word or encourage a guess, but do not provide the correct response. After the participant responds, proceed to the next item.
- All word meanings recognized by standard dictionaries are acceptable (and are scored according to the quality of the definition). Responses that are regionalisms or slng not found in dictionaries are scored 0 points. If such a response is given or your are unsure about the acceptability of a response, ask the participant for another meaning.

Participant ID _____ Date _____ Burst # _____ Session # _____ Room _____

WAIS III – Vocabulary

Reverse rule: Score of 0 or 1 on Item 4 or 5, administer Items 1 – 3 in reverse sequence until two consecutive perfect scores are obtained

Discontinue rule: 6 consecutive scores of 0

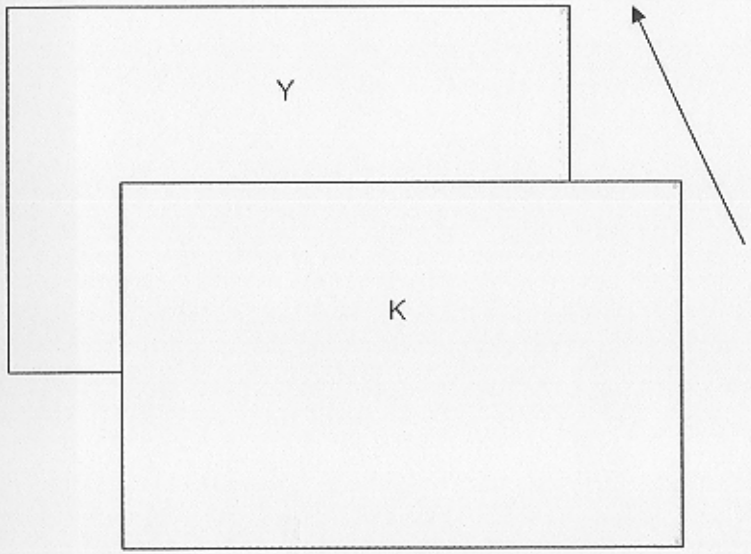
Item		Response	Score 0, 1, 2
1	Bed		
2	Ship		
3	Penny		
4	Winter		
5	Breakfast		
6	Repair		
7	Assemble		
8	Yesterday		
9	Terminate		
10	Consume		
11	Sentence		
12	Confide		
13	Remorse		
14	Ponder		
15	Compassion		
16	Tranquil		

Participant ID _____ Date _____ Burst # _____ Session # _____ Room _____

17	Sanctuary		
18	Designate		
19	Reluctant		
20	Colony		
21	Generate		
22	Ballad		
23	Pout		
24	Plagiarize		
25	Diverse		
26	Evolve		
27	Tangible		
28	Fortitude		
29	Epic		
30	Audacious		
31	Ominous		
32	Encumber		
33	Tirade		
		Total Raw Score (Maxiumum = 66)	

Backward Letter Span

Study Phase

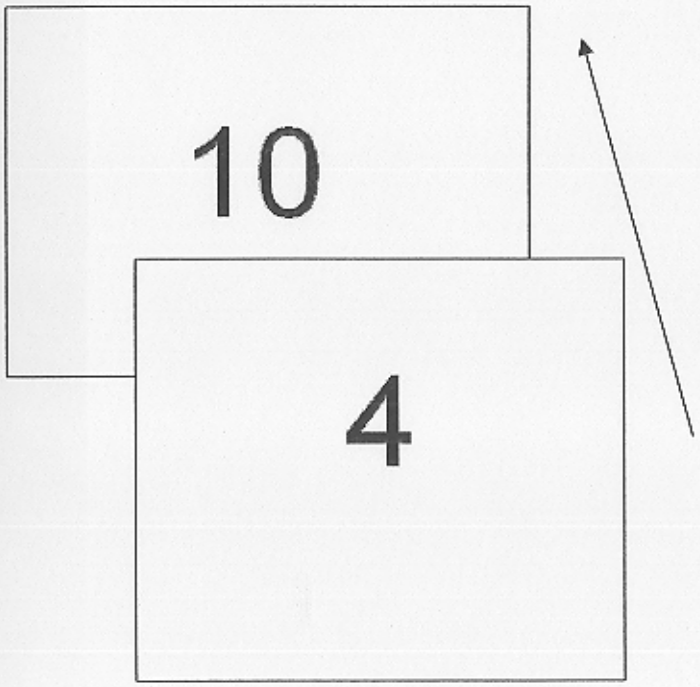


Test Phase

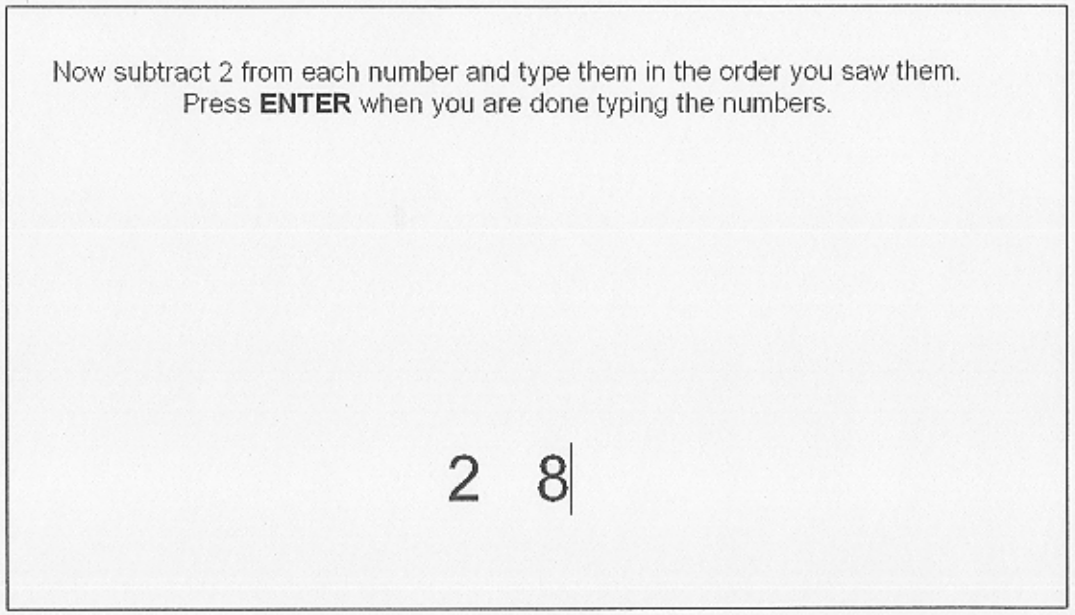
Now type all the letters you saw in reverse order. Press **ENTER** when you are done typing the letters.

Subtract 2 Span

Study Phase



Test Phase



ID _____ **DATE** _____ **SESSION** _____ **ROOM** _____

Letter-Number Sequencing (Instructions)

Say: **I am going to say a group of numbers and letters. After I say them, I want you to tell me the numbers first, in order, starting with the lowest number. Then tell me the letters in alphabetical order. For example, if I say B-7, your answer should be 7-B. The number goes first, then the letter. If I say 9-C-3, then your answer should be 3-9-C, the numbers in order first, then the letters in alphabetical order. Let's practice.**

Administer all practice trials. Say each combination at a rate of one number or letter per second. Allow the participant enough time to respond. If the participant makes an error on any practice trial the research assistant should correct them and repeat the instructions as necessary. Even if the participant fails all of the practice trials, the research assistant should continue with the exercise.

The order in which the items should be read appears in the trials column of the recoding form and the research assistant should record the participant's answer verbatim in the response column. The research assistant should not correct the participant at any time during the actual exercise.

ID _____ DATE _____ SESSION _____ ROOM _____

Letter-Number Sequencing Practice Trials

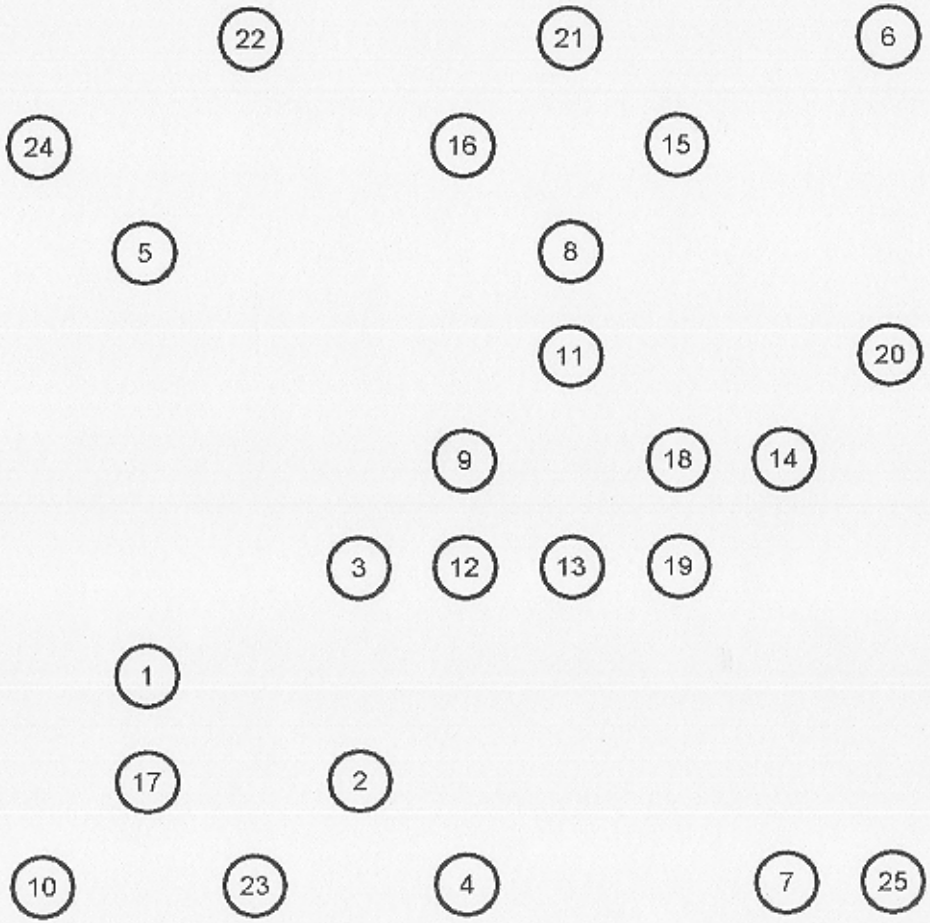
Trials		(Correct Response)/Response		Score (0/1)
Trial 1	6 - F	(6 - F)		
Trial 2	G - 4	(4 - G)		
Trial 1	3 - W - 5	(3 - 5 - W)		
Trial 2	T - 7 - L	(7 - L - T)		
Trial 3	1 - J - A	(1 - A - J)		

ID _____ DATE _____ SESSION _____ ROOM _____

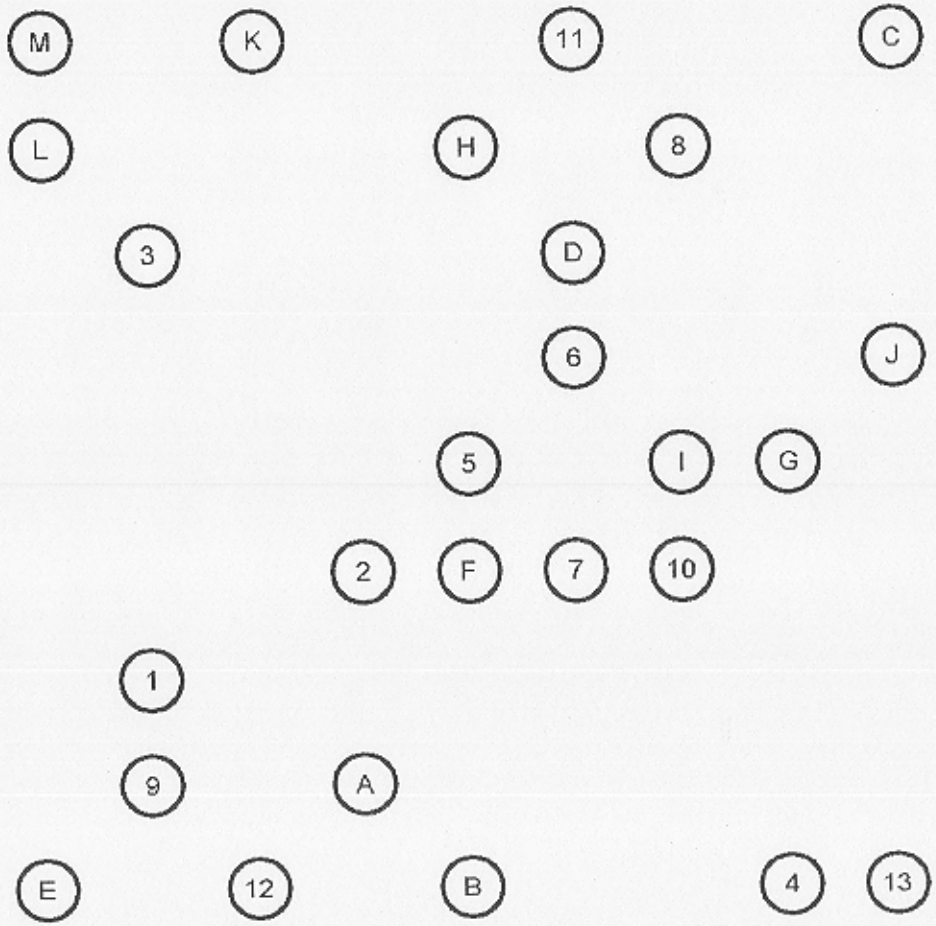
Letter-Number Sequencing (Recording form)

Trials		(Correct Response)/Response		Score (0/1)
Trial 1	L - 2	(2 - L)		
Trial 2	6 - P	(6 - P)		
Trial 3	B - 5	(5 - B)		
Trial 1	F - 7 - L	(7 - F - L)		
Trial 2	R - 4 - D	(4 - D - R)		
Trial 3	H - 1 - 8	(1 - 8 - H)		
Trial 1	T - 9 - A - 3	(3 - 9 - A - T)		
Trial 2	V - 1 - J - 5	(1 - 5 - J - V)		
Trial 3	7 - N - 4 - L	(4 - 7 - L - N)		
Trial 1	8 - D - 6 - G - 1	(1 - 6 - 8 - D - G)		
Trial 2	K - 2 - C - 7 - S	(2 - 7 - C - K - S)		
Trial 3	5 - P - 3 - Y - 9	(3 - 5 - 9 - P - Y)		
Trial 1	M - 4 - E - 7 - Q - 2	(2 - 4 - 7 - E - M - Q)		
Trial 2	W - 8 - H - 5 - F - 3	(3 - 5 - 8 - F - H - W)		
Trial 3	6 - G - 9 - A - 2 - S	(2 - 6 - 9 - A - G - S)		
Trial 1	R - 3 - B - 4 - Z - 1 - C	(1 - 3 - 4 - B - C - R - Z)		
Trial 2	5 - T - 9 - J - 2 - X - 7	(2 - 5 - 7 - 9 - J - T - X)		
Trial 3	E - 1 - H - 8 - R - 4 - D	(1 - 4 - 8 - D - E - H - R)		
Trial 1	5 - H - 9 - S - 2 - N - 6 - A	(2 - 5 - 6 - 9 - A - H - N - S)		
Trial 2	D - 1 - R - 9 - B - 4 - K - 3	(1 - 3 - 4 - 9 - B - D - K - R)		
Trial 3	7 - M - 2 - T - 6 - F - 1 - Z	(1 - 2 - 6 - 7 - F - M - T - Z)		

Trails A



Trails B



ID _____ **DATE** _____ **SESSION** _____ **ROOM** _____

Letter Series (Instructions)

Say: **On this page, you will see a sequence of letters that follows a specific pattern.**

On the blank line to the right of the letters enter the letter that you think should come next in the sequence. If there is no solution to the sequence, circle NA.

Remember to look for the pattern in the letters.

Let's start with some practice.

The research assistant should work through the practice problems with the participant. After the practice problems are complete read the following instructions.

Say: **Please try hard to find an answer to each question. Do not leave a problem without writing an answer or circling NA. Do the problems in order. Do not go back to a problem once you have finished it.**

Research assistants should allow the participant to work quietly. At no time during the task should they offer advice or help on any of the problems. If the participant has a question, the research assistant can indicate that there is no penalty for guessing.

ID _____ DATE _____ SESSION _____ ROOM _____

Letter Series (EXAMPLE ONLY)

START HERE:

ANSWERS

1) J I H G F E D __ _____ NA

2) I W I J W J K W K L W __ _____ NA

3) D E F S T U G H I S T U J __ _____ NA

4) K L L M M M N N N N O O O O __ _____ NA

5) W X Y W X Z W X A W X B __ _____ NA

6) Z I Y Z I X Y Z I W X Y Z I __ _____ NA

7) C E H L Q W __ _____ NA

8) X E D C E D Y B A Z B A Z Y X __ _____ NA

9) G S H R I Q __ _____ NA

10) B C D B C E B C F B C G __ _____ NA

11) S T S T Q R U V U V Q R __ _____ NA

12) Q S T U T U W X Y X Y A B C B C __ _____ NA

13) J V U T S K L R Q P M N O __ _____ NA

14) F W E X D Y __ _____ NA

ID _____ **DATE** _____ **SESSION** _____ **ROOM** _____

15) K K L L M N N O O P Q Q R __ _____ NA

16) L M N L L M N M L M N N L __ _____ NA

17) W X Z C G K N P __ _____ NA

18) C D E C F G H I H J K L J M N O P __ _____ NA

19) V E V W E W X E X Y E __ _____ NA

20) D E F U V W G H I T U V J K L __ _____ NA

21) Q T R U S __ _____ NA

22) D F C E B D A C __ _____ NA

23) L F K J G H I H G I J K __ _____ NA

24) F G H T U __ _____ NA

25) U D W U E W U F W U __ _____ NA

26) O R U P S V Q T __ _____ NA

27) X H J Z L N B P R __ _____ NA

28) B T S C D E R Q P O F G H I J __ _____ NA

29) D W D D V D D U D D T D D __ _____ NA

30) H W G H W F G H W E F G H W __ _____ NA

ID _____ **DATE** _____ **SESSION** _____ **ROOM** _____

31) T U V S T U V R S T U V __ _____ NA

32) A C A F H F K M K P R P __ _____ NA

33) H I J K K L M N O N P Q R S Q T U V W __ _____ NA

34) D T D U E T E U F T F U __ _____ NA

35) J K L J K L M N O M N O P __ _____ NA

36) D P E F P G H I P J K L M __ _____ NA

37) Z B Y Z A Y Z Z Y Z Y Y Z __ _____ NA

38) K L M N K K O P Q R P P S T U V __ _____ NA

- STOP HERE -

ID _____ **DATE** _____ **SESSION** _____ **ROOM** _____

Raven's Progressive Matrices (Instructions)

Say "**For this task you will see a picture with a piece missing.**" (Point to missing piece.)

"You will be asked to choose which of the choices at the bottom (point to choices) **best fit in the missing piece in the picture at the top."**

"You should choose the piece that best completes the pattern in the picture on the top."

"You will have twenty minutes to work through the pictures."

"Any questions?" (Answer all questions prior to proceeding.)

"You may begin." (Set timer for twenty minutes. Stop subject when time has elapsed, if they have not already completed the task.)

Research assistants should allow the participant to work quietly. At no time during the task should they offer advice or help on any of the matrices. If the participant has a question, the research assistant can indicate that there is no penalty for guessing.

ID _____ DATE _____ SESSION _____ ROOM _____

RPM-O

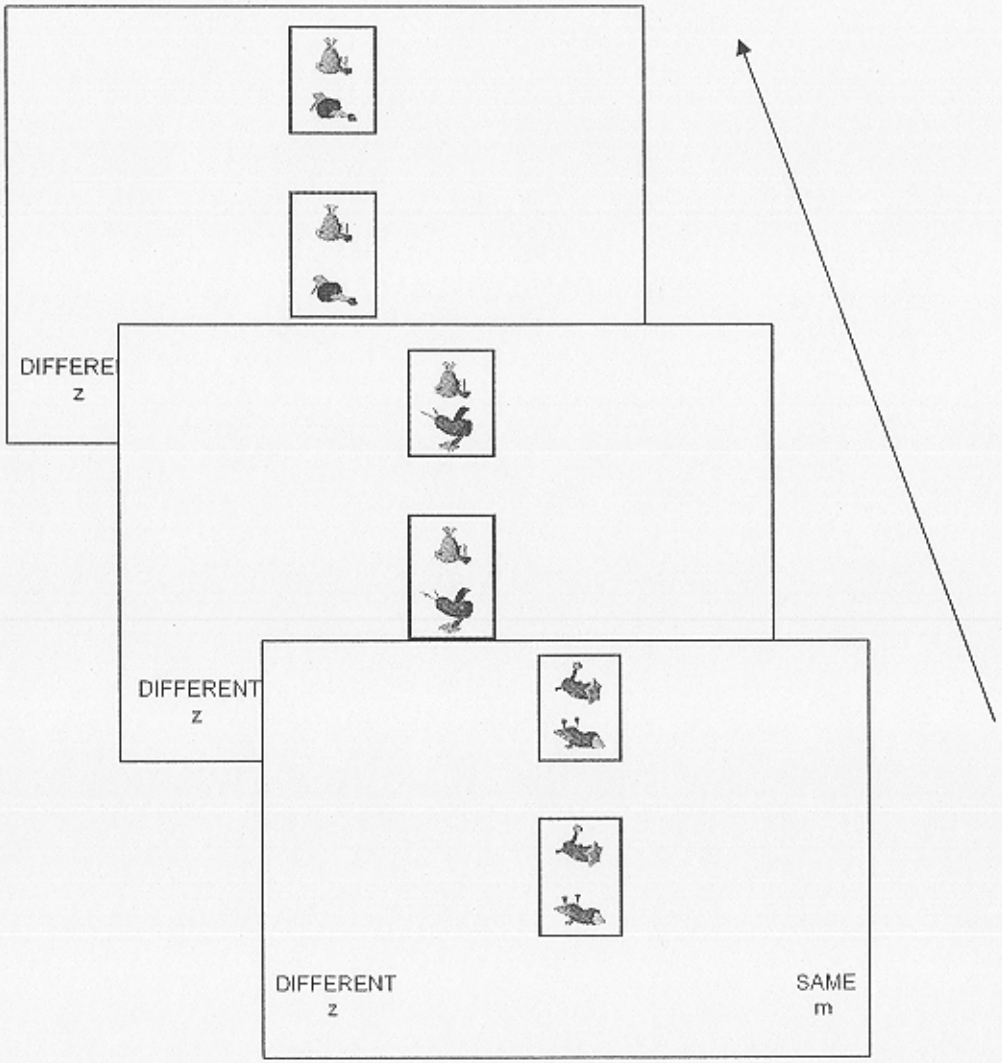
Set A	Set B	Set C
A1_____	B1_____	C1_____
A3_____	B3_____	C3_____
A5_____	B5_____	C5_____
A7_____	B7_____	C7_____
A9_____	B9_____	C9_____
A11_____	B11_____	C11_____

Set D	Set E
D1_____	E1_____
D3_____	E3_____
D5_____	E5_____
D7_____	E7_____
D9_____	E9_____
D11_____	E11_____

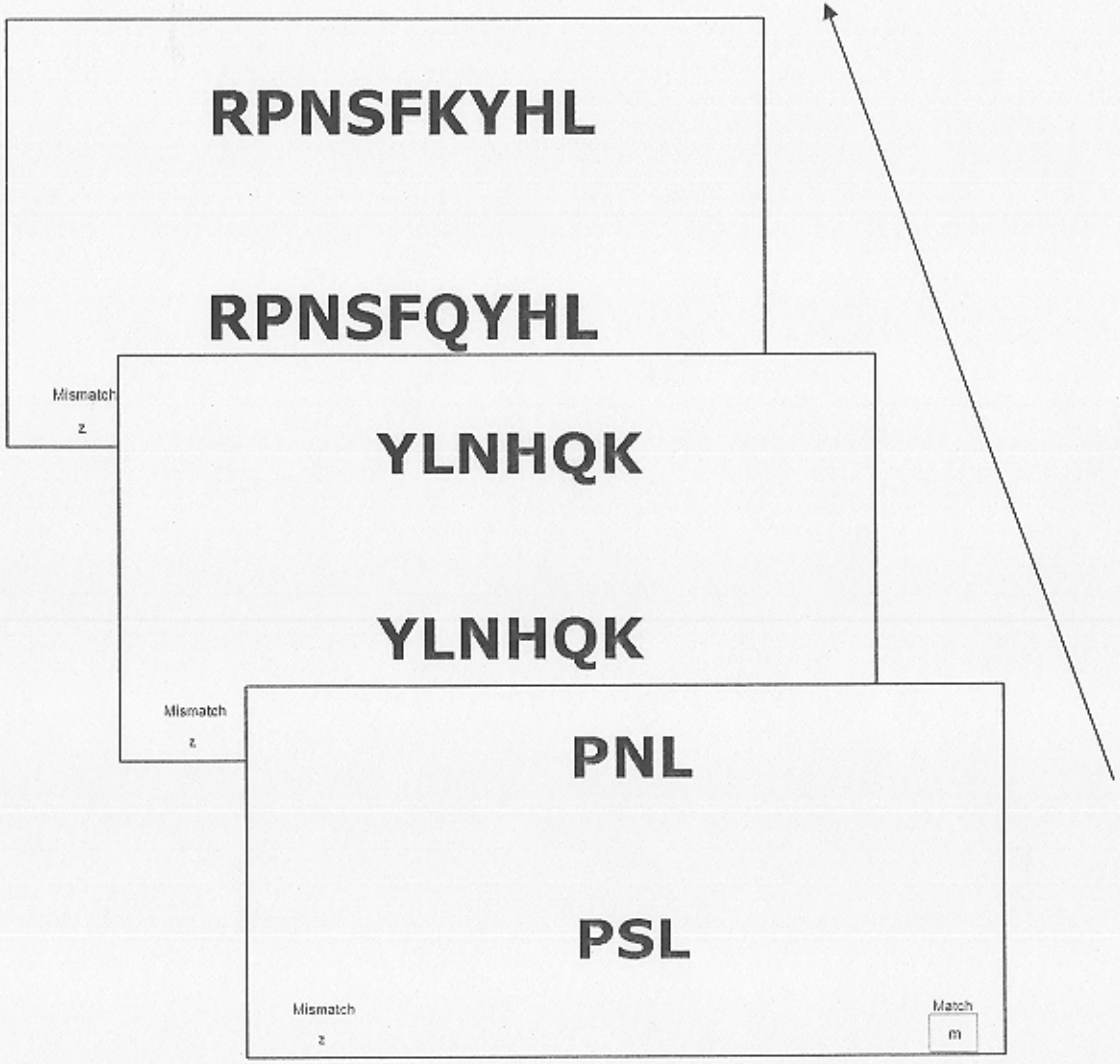
Total Correct Responses

Set A _____ Set B _____ Set C _____ Set D _____ Set E _____ Total _____

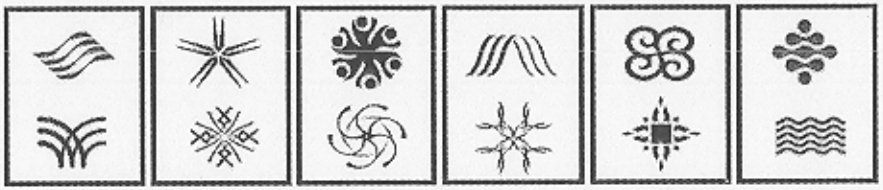
Object Match



Letter Match



Symbol Search



NO MATCH
Left Click

MATCH
Right Click

Appendix F

Beeped Schedules

5am Profile: This alarm schedule is used for participants who report typically waking up on weekdays between 4:00 am and 5:00 am.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
6:45 am	6:15 am	7:25 am	5:55 am	7:00 am	6:40 am	7:40 am
9:05 am	8:50 am	9:30 am	8:25 am	9:10 am	8:55 am	10:10 am
11:30 am	11:05 am	12:25 pm	10:55 am	12:05 pm	11:10 am	12:35 pm
2:25 pm	1:50 pm	3:05 pm	1:30 pm	2:55 pm	2:00 pm	3:20 pm
5:15 pm	4:25 pm	5:45 pm	4:10 pm	5:40 pm	4:35 pm	5:55 pm

6am Profile: This alarm schedule is used for participants who report typically waking up on weekdays between 5:01 am and 6:00 am.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
7:45 am	7:15 am	8:25 am	6:55 am	8:00 am	7:40 am	8:40 am
10:05 am	9:50 am	10:30 am	9:25 am	10:10 am	9:55 am	11:10 am
12:30 pm	12:05 pm	1:25 pm	11:55 am	1:05 pm	12:10 pm	1:35 pm
3:25 pm	2:50 pm	4:05 pm	2:30 pm	3:55 pm	3:00 pm	4:20 pm
6:15 pm	5:25 pm	6:45 pm	5:10 pm	6:40 pm	5:35 pm	6:55 pm

7am Profile: This alarm schedule is used for participants who report typically waking up on weekdays between 6:01 am and 7:00 am.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
8:45 am	8:15 am	9:25 am	7:55 am	9:00 am	8:40 am	9:40 am
11:05 am	10:50 am	11:30 am	10:25 am	11:10 am	10:55 am	12:10 pm
1:30 pm	1:05 pm	2:25 pm	12:55 pm	2:05 pm	1:10 pm	2:35 pm
4:25 pm	3:50 pm	5:05 pm	3:30 pm	4:55 pm	4:00 pm	5:20 pm
7:15 pm	6:25 pm	7:45 pm	6:10 pm	7:40 pm	6:35 pm	7:55 pm

8am Profile: This alarm schedule is used for participants who report typically waking up on weekdays between 7:01 am and 8:00 am.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
9:45 am	9:15 am	10:25 am	8:55 am	10:00 am	9:40 am	10:40 am
12:05 pm	11:50 am	12:30 pm	11:25 am	12:10 pm	11:55 am	1:10 pm
2:30 pm	2:05 pm	3:25 pm	1:55 pm	3:05 pm	2:10 pm	3:35 pm
5:25 pm	4:50 pm	6:05 pm	4:30 pm	5:55 pm	5:00 pm	6:20 pm
8:15 pm	7:25 pm	8:45 pm	7:10 pm	8:40 pm	7:35 pm	8:55 pm

9am Profile: This alarm schedule is used for participants who report typically waking up on weekdays between 8:01 am and 9:00 am.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
10:45 am	10:15 am	11:25 am	9:55 am	11:00 am	10:40 am	11:40 am
1:05 pm	12:50 pm	1:30 pm	12:25 pm	1:10 pm	12:55 pm	2:10 pm
3:30 pm	3:05 pm	4:25 pm	2:55 pm	4:05 pm	3:10 pm	4:35 pm
6:25 pm	5:50 pm	7:05 pm	5:30 pm	6:55 pm	6:00 pm	7:20 pm
9:15 pm	8:25 pm	9:45 pm	8:10 pm	9:40 pm	8:35 pm	9:55 pm

10am Profile: This alarm schedule is used for participants who report typically waking up on weekdays between 9:01 am and 10:00 am.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
11:45 am	11:15 am	12:25 pm	10:55 am	12:00 pm	11:40 am	12:40 pm
2:05 pm	1:50 pm	2:30 pm	1:25 pm	2:10 pm	1:55 pm	3:10 pm
4:30 pm	4:05 pm	5:25 pm	3:55 pm	5:05 pm	4:10 pm	5:35 pm
7:25 pm	6:50 pm	8:05 pm	6:30 pm	7:55 pm	7:00 pm	8:20 pm
10:15 pm	9:25 pm	10:45 pm	9:10 pm	10:40 pm	9:35 pm	10:55 pm

11am Profile: This alarm schedule is used for participants who report typically waking up on weekdays between 10:01 am and 11:00 am.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
12:45 pm	12:15 pm	1:25 pm	11:55 am	1:00 pm	12:40 pm	1:40 pm
3:05 pm	2:50 pm	3:30 pm	2:25 pm	3:10 pm	2:55 pm	4:10 pm
5:30 pm	5:05 pm	6:25 pm	4:55 pm	6:05 pm	5:10 pm	6:35 pm
8:25 pm	7:50 pm	9:05 pm	7:30 pm	8:55 pm	8:00 pm	9:20 pm
11:15 pm	10:25 pm	11:45 pm	10:10 pm	11:40 pm	10:35 pm	11:55 pm

The schedules above must be entered into Palm Desktop so that they can then be downloaded to individual palmtop computers. Signals are scheduled by creating "Profiles" in the calendar on Palm Desktop. A profile is used to schedule the beeps because it can be downloaded to many different PDAs with different ID numbers. Creating a profile is similar to creating a Palm ID number (as you did in Section 2.1), but the specific procedures are slightly different. Below are instructions for creating the profiles needed for CHAP:

1. Open Palm Desktop on the computer by clicking on the Palm Desktop icon on the computer desktop or by going to Start → All Programs → Palm Desktop.
2. In the top right corner of the screen, click the drop down menu next to "User" (A in Figure 2.1) and select "Edit users…"
3. Click on the "Profiles" button on the right of the Users screen (see Figure 2.4). A window will open that lists all of the profiles you create.

Appendix G

Missed Activities Checklist

Memory Failures Checklist

Cognitive Interference Questionnaire

Uncompleted Activities:

The next several questions ask about things that you wanted to do today.

Which of these things did you want to accomplish today but were unable to complete? (check all that apply)

Meet/talk with some	Self-care task
Leisure activity	Household chores
Physical activity	Other
School task	None of the above
Work task	

<u>For each category selected</u>:

Why did you not **[insert name of activity]**?

Ran out of time	Something more important came up
Was interrupted	Started, but forgot to finish
Forgot to start it	Decided to avoid it
Not feeling well	It was too difficult
Couldn't concentrate	Other
Too tired	

<u>Follow-up questions for each activity selected:</u>

Question	Response Options
How much does not **[insert name of activity]** bother you now?	1= not at all, 7=very much
How much did not doing this interfere with your daily routine?	1= not at all, 7=very much
Do you think not **[insert name of activity]** will have consequences beyond today?	1= not at all, 7=very much
Is this activity part of your daily routine?	1= not at all, 7=very much

Memory Failures:

During the day today, which of the following things did you forget?
(Mark all that apply)

Taking medicine	Directions
An errand	Appointment
Household chore	Personal date
Where you put something	A name
Important information	Other
	None of the above

<u>For each category selected</u>:

Question	Response Options
How much does forgetting **[insert name of task]** bother you now?	1= not at all, 7=very much
How much did forgetting interfere with your schedule?	1= not at all, 7=very much
Do you think forgetting **[insert name of task]** will have consequences beyond today?	1= not at all, 7=very much
Is **[insert name of task]** part of your daily routine? * for medication, errand, appointment, chore	1= not at all, 7=very much
Is this **[insert name of task]** something you: * for important information, directions, personal date, name, location	just recently learned, have known for a while

Strategy Use:

On the next few pages are different things people do to try to remember.

How often did you do each of these things TODAY?

Question	Response Options
TODAY, did you: Make lists of things you needed to do? Write yourself reminder notes? Keep an appointment book updated in order to remember to do things? Plan your daily schedule in advance so you would not forget things? Have someone else remind you to do things? Rehearse things in your mind so you would not forget to do them?	yes, no

On the next several pages are statements that describe different thoughts that people sometimes have. For each one, choose the response that best describes the thoughts you had TODAY.

Today, how often did you:

Questions	Response Options
Think about personal worries? Think about something you didn't mean to think about? Have trouble concentrating? Have thoughts that kept jumping into your head? Try to avoid certain thoughts? I have thoughts that you could not stop? Try to put problems out of your mind? Do things to distract yourself from your thoughts? Stay busy just to keep thoughts from entering your mind?	1=none, 4=a few times, 7=very often

Appendix H

Ecological Momentary Assessment Questions

Stress (beeped assessment):

The next several pages are going to ask questions about stressful events or experiences SINCE THE LAST ASSESSMENT.

Did anything stressful occur since the last assessment? (yes/no)

If they report that something stressful has occurred:

Which of the following types of stressors have you experienced since the last assessment?

Argument/disagreement/conflict	Health or accident
Work/school related event	Event that happened to others
Home related event	Other stressor

Which specific type(s) of **[insert name of stressor category here]** did you experience? (select all that apply)

Argument/disagreement/conflict

General disagreement	Value differences	
Work related	Family issues	
Financial issues	Other	
Miscommunication		

Work/education

Work overload/demand	Job security	Other
Mistakes	Technical breakdown	

Home

Home overload/demand	Home or car repairs	Financial concerns
Pet event	Neighborhood concerns	Other

Health/accident

Accident	Visit/contact with	Other
Illness	healthcare provider	

Events that happen to others

Others' health or medical problems	Social concerns
Financial problems	Other

Other

Traffic or transportation	Weather	Other
News	Mistakes	

For each category of stressors:

How stressful or unpleasant was this **[insert category name]** <u>when it occurred</u>?	1=not at all, 7=extremely
How stressful or unpleasant is it now?	1=not at all, 7=extremely
Is this **[insert category name]** resolved?	yes, no
How much have you thought about it since it happened?	1=not at all, 7=a great deal
How much have you tried to stop thinking about this **[insert category name]** since it happened?	1=not at all, 7=a great deal

<u>If they report that nothing stressful occurred since last assessment:</u>

On the next page is a list of some experiences. Which of these happened to you (even if you did not find them stressful), SINCE THE LAST ASSESSMENT?

Which of these happened to you since the last assessment? (mark all that apply)

Argument, disagreement or conflict
Difficulties involving work/school
Difficulties at home
Health issue or accident
A negative event that happened to others
None of the above

<u>For each category selected:</u>

How unpleasant was this **[insert category name]** when it occurred?	1= not at all, 7= extremely
How unpleasant is it now?	1= not at all, 7= extremely
Is this **[insert category name]** resolved?	yes, no

<u>If "none of the above" is selected:</u>

Why do you think nothing stressful happened to you <u>since the last assessment</u>?

I just got lucky.
Stressful things don't usually happen to me.
I avoided stressful situations.
I handled situations before they became stressful.
Another reason

Anticipating future stress:

Do you think that you will have anything STRESSFUL happen in the next few hours?
Response Options: **yes/no**

If yes: How unpleasant or stressful do you expect it to be? (1= not at all, 7= extremely)

Affect (beeped assessment):

On the following pages are descriptions of feelings. Rate how you feel right now.

Question	Response Options
Which of these best describes how you feel right now?	1=sleepy, 7=active/alert
Which of these best describes how you feel right now?	1=unpleasant, 7=pleasant
Which of these best describes how you feel right now?	1=depressed, 7=excited
Which of these best describes how you feel right now?	1=relaxed, 7= stressed

Question	Response Options
How happy do you feel right now?	1=not at all **happy**, 4=moderately, 7=extremely **happy**
How tense do you feel right now?	1=not at all **tense**, 4=moderately, 7=extremely **tense**
How enthusiastic do you feel right now?	1=not at all **enthusiastic**, 4=moderately, 7=extremely **enthusiastic**
How sad do you feel right now?	1=not at all **sad**, 4=moderately, 7=extremely **sad**
How content do you feel right now?	1=not at all **content**, 4=moderately, 7=extremely **content**
How upset do you feel right now?	1=not at all **upset**, 4=moderately, 7=extremely **upset**
How excited do you feel right now?	1=not at all **excited**, 4=moderately, 7=extremely **excited**
How disappointed do you feel right now?	1=not at all **disappointed**, 4=moderately, 7=extremely **disappointed**

Affect (waking assessment):

On the following pages are descriptions of feelings. Rate how you feel right now.

Question	Response Options
Which of these best describes how you think you will feel today?	1=sleepy, 7=active/alert
Which of these best describes how you think you will feel today?	1=unpleasant, 7=pleasant
Which of these best describes how you think you will feel today?	1=depressed, 7=excited
Which of these best describes how you think you will feel today?	1=relaxed, 7= stressed

Question	Response Options
How happy do you think you will feel today?	1=not at all **happy**, 4=moderately, 7=extremely **happy**
How tense do you think you will feel today?	1=not at all **tense**, 4=moderately, 7=extremely **tense**
How enthusiastic do you think you will feel today?	1=not at all **enthusiastic**, 4=moderately, 7=extremely **enthusiastic**
How sad do you think you will feel today?	1=not at all **sad**, 4=moderately, 7=extremely **sad**
How content do you think you will feel today?	1=not at all **content**, 4=moderately, 7=extremely **content**
How upset do you think you will feel today?	1=not at all **upset**, 4=moderately, 7=extremely **upset**
How excited do you think you will feel today?	1=not at all **excited**, 4=moderately, 7=extremely **excited**
How disappointed do you think you will feel today?	1=not at all **disappointed**, 4=moderately, 7=extremely **disappointed**

Affect (bedtime assessment):

On the following pages are descriptions of feelings. Rate how you feel right now.

Question	Response Options
Which of these best describes how you felt in general during the day today?	1=sleepy, 7=active/alert
Which of these best describes how you felt in general during the day today?	1=unpleasant, 7=pleasant
Which of these best describes how you felt in general during the day today?	1=depressed, 7=excited
Which of these best describes how you felt in general during the day today?	1=relaxed, 7= stressed

Question	Response Options
How happy did you feel today?	1=not at all **happy**, 4=moderately, 7=extremely **happy**
How tense did you feel today?	1=not at all **tense**, 4=moderately, 7=extremely **tense**
How enthusiastic did you feel today?	1=not at all **enthusiastic**, 4=moderately, 7=extremely **enthusiastic**
How sad did you feel today?	1=not at all **sad**, 4=moderately, 7=extremely **sad**
How content did you feel today?	1=not at all **content**, 4=moderately, 7=extremely **content**
How upset did you feel today?	1=not at all **upset**, 4=moderately, 7=extremely **upset**
How excited did you feel today?	1=not at all **excited**, 4=moderately, 7=extremely **excited**
How disappointed did you feel today?	1=not at all **disappointed**, 4=moderately, 7=extremely **disappointed**

Physical Symptoms (beeped assessment):

The next several pages are going to ask questions about your physical activities and symptoms since the last assessment.

Question	Response Options
Overall, how have you felt physically since the last assessment?	1=extremely unhealthy, 7=extremely healthy
How much did physical symptoms interfere with your daily routine or restrict your activities since the last assessment?	0=not at all, 3=moderately, 6=extremely

Physical Symptoms (bedtime assessment):

Question	Responses
Which symptoms did you have today? (Mark all that apply.)	Headache Backache Joint pain Dizziness Nausea Allergy symptoms Poor appetite Congestion Sore throat Muscle soreness Menstrual pain Cold/flu Chest pain or tightness Constipation or diarrhea Trouble breathing Heart pounding Hot/cold flashes Trembling or shaking Other symptom None of these symptoms

For each selected physical symptom:

Question	Responses
What do you think caused [physical symptom]?	Chronic illness Acute illness Exercise Poor self-care Diet or food Alcohol Aging Stress

	Reproductive issues Medication/side effects Injury Other cause
How much did it interfere with or restrict your daily activities during the day today?	1 = not at all to 7 = extremely
How often did you have [physical symptom] today?	1 = rarely to 7 = all day
Overall, how bad was your [physical symptom] today?	1 = not at all to 7 = extremely

Sleep Quality (waking assessment):

Question	Response Format and Options
When did you go to bed last night (that is, get into bed with the intention of sleeping)?	separate drop down menus for hours and minutes
How long did it take you to fall asleep last night?	drop down menus with the options less than 15 mins, 15-30 mins, 31-60 mins, more than 60 mins
When did you get up this morning?	separate drop down menus for hours and minutes
How many hours of actual sleep did you get last night? (this may be different than the number of hours you spent in bed)	drop down menu with the options more than 7, 6-7 hours, 5-6 hours, less than 5 hours
Last night, how many times did you have trouble sleeping because you: Woke up in the middle of the night or early morning? Had to get up to use the bathroom? Could not breathe comfortably? Coughed or snored loudly? Felt too cold? Felt too hot? Had bad dreams? Had pain? Had other thing(s) disturbing sleep?	drop down menu with the options 0 times, 1 time, 2 times, 3+ times
Last night, did you take medicine (prescribed or over the counter) to help you sleep?	yes/no
Overall, how would you rate your sleep quality last night?	1=very good, 4=very bad

Current Activity (beeped assessment):

Question	Responses
What were you doing when you were beeped?	Chores Daily self-care Eating/drinking/smoking Physical activity Recreational School related Work related
Where were you doing this activity?	Home Work School Other person's home Community center Religious center Restaurant/bar Vehicle Outside Medical office Other

All Social Interactions (beeped assessment):

Question	Responses
Since the last assessment how many social interactions have you had?	0-10 or more
Overall, how often were these interactions pleasant or positive?	1 = none of the time to 7 = all of the time
Overall, how often were these interactions unpleasant or negative?	1 = none of the time to 7 = all of the time
Overall, how often were these interactions with a person or people important to you?	1 = none of the time to 7 = all of the time
Overall, how often were these interactions about topics that were important or meaningful to you?	1 = none of the time to 7 = all of the time

Most Recent Social Interaction (beeped assessment):

Question	Responses
Who was this interaction with?	Spouse/partner Children Parent Sibling Other family member Acquaintance Stranger Friend Roommate Coworker Classmate Therapist Healthcare practitioner Other
Overall, how important are the people or person to you?	1 = not at all to 7 = extremely
How important or meaningful was this interaction to you?	1 = not at all to 7 = extremely
Overall, how pleasant or positive was this interaction?	1 = not at all to 7 = extremely
Overall, how unpleasant or negative was this interaction?	1 = not at all to 7 = extremely

Question	Responses
Right now, are you with other people?	Yes, no
Approximately how many people are you with now?	1 person 2-3 people 4-10 people 11-25 people More than 25 people
Who are you with now?	Spouse/partner Children Parent Sibling Other family member Acquaintance Stranger Friend Roommate Coworker Classmate Therapist Healthcare practitioner Other

Functioning (bedtime assessment):

Question	Responses
Today, how many times did you have trouble staying awake while driving, eating meals, working, or engaging in social activities?	0 times 1 time 2 times 3 or more
Today, how many times was it a problem for you to keep up enthusiasm to get things done?	0 times 1 time 2 times 3 or more