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THE RELATIONSHIP BETWEEN SUBJECTIVE MEMORY AND OBJECTIVE COGNITION, DEPRESSION, AND ANXIETY BY DEMENTIA STATUS

by

NIA M. REED

Under the Direction of Yong “Tai” Wang

ABSTRACT

This secondary data analysis of the Health and Retirement Study – Aging, Demographics, and Memory Study (ADAMS) examines the relationship between subjective cognition and objective performance, depression, and anxiety in cognitive impairment with no dementia (CIND) and dementia. With a cross-sectional design, this study consists of 480 older adults between ages 72-105. Participants completed the Mini-Mental State Examination. The Wechsler Memory Scale-Revised Logical Memory I/II measured memory. Anxiety and depression were measured by the Neuropsychiatric Inventory. Subjective memory was measured by the HRS Self-report Memory and Informant Questionnaire on Cognitive Decline in the Elderly. Independent *t-tests* and Pearson correlation analysis were employed to determine differences between the dementia and non-dementia groups. Results demonstrated that the CIND group had significantly better general cognition; more severe cognitive/memory problems in the dementia group showed weaker

relationships between general cognition and memory performance; anxiety/depression were weakly related in CIND and moderately related in dementia.

INDEX WORDS: Subjective memory, Objective memory, Memory, CIND, Dementia, Anxiety, Depression, Cognition

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by

NIA M. REED

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of

Master of Arts

in the College of Arts and Sciences

Georgia State University

2010

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by

NIA M. REED

Committee Chair: Yong "Tai" Wang

Committee: Elisabeth O. Burgess

Nancy Kropf

Electronic Version Approved:

Office of Graduate Studies

College of Arts and Sciences

Georgia State University

May 2010

DEDICATION

I would like to dedicate this thesis to my late grandfather, Cornelius Van Reed, Sr. As the one who encouraged my desire to study aging and who loved me unconditionally, my heart is shattered that you are not here to witness the work you inspired. Because of you, I will be relentless in my quest to research and contribute to aging issues. I love you.

ACKNOWLEDGEMENTS

I would like to acknowledge my mother, Marilyn Reed, who so eagerly helped me focus on my studies by encouraging me mentally, emotionally, and financially. I would also like to acknowledge my family, friends, and classmates who supported me during the toughest times. I would like to send a special thanks to Tiffany Young for all of the late-night proofreading and input she contributed, also to Dr. Frank Whittington for always being in my corner. To Mary MacKinnon, your smile and conversations kept me sane. Also, my very best friend Tina Crowell has been an inspiration and source of comfort. Finally, I would like to acknowledge my thesis committee, Nancy Kropf, Elisabeth Burgess, and Yong “Tai” Wang for their guidance and input, with a special thanks to Dr. Wang for guiding me through this process with patience and wisdom.

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CHAPTER 1.

INTRODUCTION

The United States of America, as well as other industrialized countries, faces a growing dilemma with rapidly increasing incidence and prevalence of dementia among the elderly. Although dementia is not exclusive to the elderly, an overwhelming number of the most common dementias (e.g. Alzheimer's disease and vascular dementia) are diagnosed in individuals over the age of 65 (Mendez & Cummings, 2003). With 35 million older adults aged 65 and older, America has the third largest elderly population in the world (Kincannon, He, & West, 2005). Furthermore, demographers have projected that the nation's population of older adults will double in size over the next 30 years (Kincannon et al., 2005). In 2002, 13% (3.4 million) of individuals aged 71 and older were diagnosed with some type of dementia (Plassman, Burke, Welsh-Bohmer, Newman, Drosdick, Ofstedal, et al., 2007). In addition, researchers have shown that the risks of dementia diagnoses become greater with age; older adults in their 70s have a 5% greater risk of a dementia diagnosis and those aged 90 and older have a 37.4% greater risk (Plassman, et al., 2007). Therefore, the combination of the rapid increase in the aging population and higher incidences of dementia in older adults is cause for concern.

One ongoing problem for researchers today is determining factors that may aid in the early detection of dementia in the elderly. There are some evidences that memory self-reporting in the elderly may aid with detection of early dementias (Duchek, Balota, & Cortese, 2006; Plassman, Burke, Welsh-Bohmer, Newman, Drosdick, et al., 2006). While there is no consistent definition of subjective memory complaints (SMC), scientists have collectively indicated that SMC is how one interprets, feels, or thinks about his/her own memory and the reporting (be it

formal or informal) of that memory (Pearman & Storandt, 2004; Simoes, Castro, Ribeiro, Salgado, & Paz, 2009; Wong, Lam, Lui, Chiu, Chan, et al., 2006).

Additional areas of interest are the relationship between SMC and actual cognitive performance (also called objective memory/cognition), as well as the relationship between SMC and anxiety/depression. Objective cognition is memory or cognitive functioning that is not dictated by a state of emotions or personal prejudices of one's own memory (Flicker, E.P., Larrabee, G.J., Sudilovsky, A., & Crook, T.H., III, 1994; Marino, S.E., Meador, K.J., Loring, D.W., Okun, M. S.; Fernandez, et al., 2009). It is materialized cognition that reflects cognitive status, typically based on a variety of performance batteries and tasks measuring actual memory/cognition. Older adults often report memory concerns and are more vulnerable to cognitive impairment and dementia than younger adults (Mendes, T., Ginó, S.., S., Ribeiro, F., Guerreiro, M., de Sousa, G., Ritchie, K., et al., 2008). The current study focuses on the possible predictors of subjective memory. Understanding the meaning and correlates of memory complaints is important for both scientists and clinicians in a rapidly increasing aging population.

CHAPTER 2.

LITERATURE REVIEW

The Aging, Demographics, and Memory Study (ADAMS) is a supplement to the Health and Retirement Study (HRS), a national longitudinal study designed to investigate age-related topics such as retirement, illness, and well-being on a national level. The ADAMS portion of the HRS was designed as a population based study of the prevalence and potential causes of dementia. Following a clinical interview and using established criteria, the ADAMS researchers categorized each of the participants into two groups (CIND or dementia). Participants who met ADAMS study criteria for cognitive impairment with no dementia ("CIND") had both subjective memory complaints and showed objective evidence of impairment but did not meet the criteria for dementia diagnoses. The second group consisted of participants who were examined by a physician and met DSM-IIIR and DSM-IV (see Table 1) criteria for a diagnosis of dementia ("dementia").

Subjective Memory and Objective Cognition in Older Adults with CIND

There are a number of different terms used in both research and practice to define mild memory or cognitive problems in older adults who do not have dementia. Some of these include Age Associated Memory Impairment (AAMI), Mild Cognitive Impairment (MCI), and Cognitive Impairment without Dementia (CIND). Pioggiosi and colleagues (2006) provide a description and criteria for each condition (Table 2).

For the current study, however, CIND will be used to designate participants that score below normal for their age and education on the MMSE, but do not meet the criteria for a dementia diagnosis. Although cognitive decline of some sort is usually evident in these

individuals, this impairment has not reached the severity of being able to receive a dementia diagnosis (Mendez & Cummings, 2003).

Table 1.

Diagnostic Criteria for Dementia in the DSM-III-R and DSM-IV.

Domain	DSM-III-R	DSM-IV
Attention		
Orientation		
Memory functions		
Short-term	3	3
Long-term	3	3
Executive functions	1	1
Aphasia	1	1
Apraxia	1	1
Agnosia	1	1
Personality change	1	
Social function		
Relationships with others	1	
Impairment/decline	3	3
Normal conscious	3	3
Duration >6 months		

[1] One of the domains always required to be present.

[2] At least two of the domains required to be present.

[3] Always required to be present.

Note: Adapted and modified from Pohjasvaara, et al., (1997).

Table 2.

Terminology Used to Describe Mild Cognitive Problems in Older Adults.

Term	**Criteria**
Mild Cognitive Impairment (MCI)	Cognitive decline, cognitive impairment in relation to age and education, normal day-to-day functioning.
Age-Associated Memory Impairment (AAMI)	Memory complaints, scoring 1 SD below young adult norms on memory tests, normal intellectual functioning.
Cognitive Impairment, No Dementia (CIND)	Scoring 1 SD below age and education specific norms on MMSE.
Questionable dementia (CDR .5)	Scoring 0.5 at Clinical Dementia Rating scale.

Note: Adapted and modified from Pioggiosi et al., (2006), p. 228.

a. Positive Relationship

Some researchers have reported a positive relationship between perceived impairment and cognitive performance in CIND and its related classifications (e.g. AAMI). For example, Schofield and colleagues (1997) examined 233 participants diagnosed with CIND and 131 participants with no cognitive impairment in order to compare the validity of memory complaints between the groups across time. Participants (M age = 75.2) completed a battery of memory recall tasks, the MMSE, physician-conducted interviews, and other neuropsychological exams. There were no significant between-group differences on the memory complaint measure at baseline. However, at a one-year follow-up, participants with baseline memory complaints showed a significant decline in memory and cognition compared to participants without complaints. The authors concluded that memory complaints may be a predictor of cognitive decline.

O'Brien and colleagues (1992) came to similar conclusions after assessing 68 participants who presented at a hospital memory clinic. All participants were over 50 years old and were not suffering from dementia or psychiatric disorders at baseline. Despite reporting to a memory clinic, initial testing showed that all participants had normal objective test results with no significant memory problems. However, at a 3-year follow-up, six of the 68 participants were diagnosed with dementia. The retrospective analyses showed that these participants were older than the other participants, had higher levels of self-reported memory problems at baseline, and had presented initially with abnormal CT scans. The rest of the participants who did not develop dementia showed slight, but significant decline in their cognitive performances. As a result, authors concluded that memory complaints from elderly individuals should be considered credible and may possibly alert professionals of early dementia.

b. No Relationship

Contrary to the aforementioned findings, other studies have shown that self-reported memory problems in a partially impaired sample are not related to their actual levels of cognitive impairment. For instance, Barker and colleagues (1994) found that memory problems reported by individuals with possible cognitive impairment were due to variables other than actual impairment. This study sample consisted of three groups of participants: 20 who were referred by a general practitioner's clinic (GPC), 29 who self-referred to a memory clinic, and a control group of 41 participants. Investigators conducted a battery of memory questionnaires, objective tasks, along with neuropsychological tests. There were no significant differences between the GPC-referred group and the self-referred group on an objective memory performance variable. In addition, participants from the self-referral group did not differ on memory performance from the control group. The authors cautioned against diagnosing impairments such as benign

senescent forgetfulness and age-associated memory impairment because of their heavy reliance on self-reported decline.

Using a prospective longitudinal design, Purser and colleagues (2006) assessed cognition and several aspects of memory on a 10-year trajectory in 3,673 elderly participants 65 years and older. In this study, participants were grouped according to cognitive functioning at baseline: (1) cognitively intact (72% of participants), (2) mild cognitive impairment (MCI; 25% of participants), and (3) severely cognitively impaired (3% of participants). MCI diagnoses were based on standard clinical criteria that included normal overall cognitive functioning, problems with objective memory, no known disabilities, and self-reported memory complaints. Follow-ups were completed at 3, 6, and 10 years. Memory was measured using the Short Portable Mental Status Questionnaire and a 20-item word recall test. The results revealed that memory complaints was similar across groups, as was the relationship between complaints and objective impairment.

Clearly, the current findings on the relationship between memory complaints and objective impairment in people with a CIND or similar diagnoses are mixed. The current research will help to clarify the meaning of subjective cognition in this group.

Subjective Memory and Objective Cognition in Older Adults with Dementia

Although some studies have found that participants in the early stages of dementia can be accurate in reporting their own memory ability, including informants is still considered vital by most dementia researchers and clinicians. Because of concern over the validity of self-reported cognition in persons with dementia, many clinicians and researchers use a combination of informants' ratings, actual performance, as well as self-reported complaints in understanding and diagnosing patients (Grut, Jorm, Fratiglioni, Forsell, et al., 1993; Peterson, 2004). For instance,

Frank and colleagues (2006) found that participants with MCI and AD were more reluctant to report memory or cognitive problems than their informants. Informants reported a more severe and detailed version of cognitive decline and forgetfulness. Similarly, Hong and colleagues (2003) proposed that key informants are relevant for dementia research.

a. Positive Relationship

Grut and fellow researchers (1993) examined the correlation between memory complaints, dementia status, and cognitive performance in 2368 older adults 75 years and older. As dementia severity increased, informants reported greater levels of memory impairment. These results suggest that memory complaints may be more frequent in moderately demented participants. Authors found that memory complaints were also linked to depression in participants both with and without dementia.

Wong and colleagues (2006) examined a group of 92 older Chinese participants (age 60+), (35 normal controls, 33 questionable dementia, and 24 mild AD participants). They compared memory complaints and objective memory performance between the three groups by using the memory inventory for the Chinese in order to measure subjective memory complaints, and several other tests to assess cognition (Alzheimer's Disease Assessment Scale-Cognitive subscale, Category Verbal Fluency, and Executive Interview). Between-group comparisons showed that all participants were equally able to accurately report their memory functioning. In fact, the researchers found that the participants with questionable dementia, who reported memory problems, were most accurate in their assessment of their memory performance.

b. No Relationship

There is scant literature on a negative relationship between memory complaints and memory performance in dementia. Some researchers suggest that anosognosia, a symptom

associated with many types of dementia, accounts for this issue (Agnew & Morris, 1998; Hannesdottir, 2007; Pia & Conway, 2008). Anosognosia in dementia is the denial or illusory unawareness of cognitive impairment (Davies, Davies, & Coltheart, 2005). Demented persons who do not acknowledge their condition will unlikely report problems with memory. Derouesné and colleagues (1999) studied anosognosia in 88 older adult patients with mild dementia of the Alzheimer's type. Researchers examined medical history, MMSE scores, administered informant questionnaire, and neuropsychological exam (which included the Wechsler Memory Scale and the Cognitive Difficulties Scale), to confirm diagnoses. Results implied that as age increased, awareness of impairment would decrease, or not exist at all.

In a study conducted by Sevush and Leve (1993) on anosognosia in AD, 128 probable AD patients were diagnosed according to the National Institute of Neurological and Communicative Disorders and Strokes, as well as the Alzheimer's Disease and Related Disorders Association. Researchers measured cognition with the Assessment of Cognitive Abilities in Dementia scale, which correlated with MMSE scores. Affect and mood were determined by respondents, informants, and research investigators. Interviews with respondents were also conducted to determine their awareness of their own memory problems. Multiple regressions were used to analyze relationships between anosognosia, affect, and mood in dementia participants. Results revealed that 103 respondents displayed mild to moderate denial of their impairment (mild: n=69, moderate: n=34) and only 25 showed no denial. Findings implied that as severity levels of AD increased, so did denial claims from AD participants.

Subjective Memory, Depression, and Anxiety

Several other variables also have been shown to be related to memory complaints in older adults both with and without cognitive impairment. Many researchers have reported findings

which indicate that memory complaints are more related to affective and personality variables than to actual memory impairment (see Kahn, Zarit, Hilber, & Niederehe, 1975; Pearman & Storandt, 2004). Even in anosognosia cases, some researchers have found that dementia patients' denial of impairment was influenced by depression and anxiety instead of actual cognitive impairment (Derouesné, et al., 1999).

a. CIND

Studies have revealed that anxiety and depression may affect memory complaints and perceived impairment in people with CIND or similar diagnoses. Archer and colleagues (2006) examined 21 MCI patients, 37 participants with symptoms of memory impairment but no cognitive impairment (SNCI), and 33 cognitively intact participants. Participants completed clinical evaluations, neuroimaging, memory tests, and neuropsychological exams. Results showed that anxiety was significantly related to memory complaints in participants with MCI and to neuropsychological performance in participants with SNCI. In the aforementioned qualitative research conducted by Frank and colleagues (2006) also found that patients reported that anxiety influenced both their impairment and their complaints.

Barker and colleagues (1994), who found no relationship between subjective and objective memory by referral type, reported that subjective memory was related to both personality and depression. This study sample consisted of three groups of participants: 20 who were referred by a GPC, 29 who self-referred to a memory clinic, and a control group of 41 participants. Investigators conducted a battery of memory questionnaires, objective tasks, along with neuropsychological tests. There were no significant differences between the GPC-referred group and the self-referred group on objective memory performance. In addition, participants from the self-referral group did not differ on memory performance from the control group. The

authors cautioned against diagnosing impairments such as benign senescent forgetfulness and age-associated memory impairment because of their heavy reliance on self-reported memory decline, and concluded that SMC in this sample was influenced by personality and depression.

Wong and colleagues (2006) also found that depression influenced subjective memory complaints in participants with questionable dementia and those with mild AD. Investigators examined a group of 92 older Chinese participants (age 60+), (35 normal controls, 33 questionable dementia, and 24 mild AD participants). They compared memory complaints and objective memory performance between the three groups by using the memory inventory for the Chinese, as well as other tests to assess cognition (Alzheimer's Disease Assessment Scale-Cognitive subscale, Category Verbal Fluency, and Executive Interview). Between-group comparisons showed that all participants were able to appreciate and report their memory difficulties, but the questionable dementia and mild AD groups were influenced by depression.

b. Dementia

Not only have anxiety and depression been found to be related to memory complaints in people with no dementia and those with some cognitive impairment, these affective factors have been found to influence subjective memory in people with dementia. Campbell and colleagues (2008) completed a secondary analysis of data from the Dementia Research: Informed Proxy and Advance Consent project focusing on three areas: awareness of cognitive impairment of those with dementia; the participant's recall of a physician's diagnostic disclosure and recollection of dementia diagnosis; and whether awareness of cognitive impairment or recall of diagnostic disclosure is affiliated with poorer self-rated health. The researchers suggested that anxiety and depression preceded dementia diagnoses and that it is likely that either, or both, influence negative self-reports of memory and health status in patients.

Understanding subjective memory in cognitively normal older adults and CIND, results have been mixed. There are ample findings that support implications that there are both positive and negative relationships between subjective memory and objective cognition in normal cognition and CIND. In dementia, literature supports implications of an association between memory complaints and objective cognition. However, a search on a negative relationship between subjective and objective memories produced no literature. Subjective memory was found to be positively correlated to depression and anxiety in normal cognition, CIND, as well as dementia. Literature on a negative relationship between subjective memory and objective performance in dementia was menial. Some dementia patients reportedly deny cognitive impairment, seemingly due to the impairment itself. In short, previous literature produces mixed results on subjective memory and objective performance in normal cognition and CIND; a positive correlation between memory complaints and dementia; suggests that affect is associated with memory complaints in all three cognitive groups; and implies anosognosia accounts for the lack of findings on a negative relationship between memory complaints and performance in dementia.

Understanding subjective memory in cognitively normal older adults and CIND, results have been mixed. For CIND and dementia, some findings suggest that there is a positive relationship between subjective and objective memory/cognition while other findings have implications of no relationship. In addition, subjective memory has also been shown to be positively correlated to both depression and anxiety in CIND, as well as in dementia. The findings from this study will assist in the comprehension and meaning of subjective memory loss in the CIND and dementia. This research will also help determine predictors of memory complaints, which may prove to be helpful in establishing criteria for early detection of dementia.

CHAPTER 3.

PURPOSE OF RESEARCH, RESEARCH DESIGN, AND HYPOTHESES

Purpose of Research

The purpose of this study is to examine the relationship between subjective memory/cognition and objective performance, depression, and anxiety in older adults (70+ years) with two levels of cognitive functioning: cognitive impairment with no dementia and dementia. Findings from this study will aid in understanding the meaning of subjective memory loss in different groups, as well as determine predictors of memory complaints, which may be helpful in establishing criteria for early detection of dementia.

Research Design

This cross-sectional study entails a secondary analysis of the Health and Retirement Study: Aging, Demographics, and Memory Supplement (ADAMS) project. The ADAMS supplement was a sample of 856 older adults aged 72-105, who were previously categorized into three groups (normal, CIND, dementia) by ADAMS researchers (Plassman, B.L., Langa, K.M., Fisher, G.G., Heeringa, S.G., Weir, D.R., et al., 2007). The “normal” group was not free of cognitive improvement and thus not an effective control or comparison to the other groups. As a result, the relationship between subjective memory and objective performance, depression, and anxiety between the CIND and dementia groups were investigated. In addition, there were also a number of partially finished initial assessments in essential areas of observation in both the CIND and dementia groups, which dictated the use of only those participants who completed batteries used to measure the selected variables of the current research. These participants were grouped as follows: CIND (n=257) and dementia (n=223), totaling 480 participants included for analyses.

Hypotheses

The present study investigated the nature of correlations between subjective memory impairment and objective performance and affect by cognitive status. The specific hypotheses tested are as follows:

Hypothesis 1: For the CIND group, subjective memory complaints will be correlated to both objective performance and affect (depression and anxiety). Memory and cognition scores will indicate actual memory/cognitive problems in CIND participants with subjective memory complaints. Also, affect (depression and anxiety) is likely to result in a positive correlation to SMC.

Hypothesis 2: For the dementia group, self-rated subjective memory complaints will have a positive relationship with affect (depression and anxiety). Objective memory/cognition performance will not be related to SMC in this group.

CHAPTER 4.

METHOD

Design

The current research is based on The Health and Retirement Study (HRS) conducted by Plassman and colleagues (2007). This HRS is a national longitudinal study intended to furnish health, economics, and demography of aging data for scientists in corresponding fields. With a sample of over 20,000 participants over the age of 50, researchers interview participants every two years and enroll a new birth cohort every six years. The Aging, Demographics, and Memory Study (ADAMS) is a supplemental to the Health and Retirement Study (HRS). A cross-sectional, secondary analysis focusing on subjective cognition in two predetermined groups of participants (CIND and dementia) was conducted.

Participants

Plassman and other investigators (2007) in ADAMS selected 1,770 participants from the HRS sample. These respondents were70 and older and were chosen from a follow-up wave based on their self- or informant-cognitive scores. Only 856 respondents completed the initial assessments (227 died and 687 opted not to complete assessment or were ineligible to complete assessment). To make sure that all cognitive groups were adequately represented, researchers stratified participants across five layers, scaling from “low functioning” to “high normal”. Cognitive assessment scores and informant questionnaires determined which group participants were assigned. Once the initial assessments were completed, participants who were diagnosed with CIND, mild dementia, or borderline normal cognition, were contacted for follow-up visits. Authors concluded that these participants would benefit from completing follow-up assessments due to the uncertainty of their diagnoses and the idea that studying their conditions over time

would result in clear diagnoses. Of the 333 of these respondents who were selected for follow-ups, 36 died before completing the follow-up visit, and 45 did not complete follow-up assessments for other reasons (e.g. illness or ineligibility due to not having an informant).

Respondents and informants completed clinical and medical history interviews, neuropsychological battery, and physical exam with certified nurses and psychometricians. After assessment, geropsychologists gave each participant a categorical diagnosis using CIND and dementia criteria from the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders-III-Revised* (DSM-III-R) and the *Diagnostic and Statistical Manual-IV* (DSM-IV) (2000) (see Table 2). Due to incomplete initial assessments in vital areas of observation, only participants who completed batteries used to measure the selected variables of this study were chosen for analysis. These participants were grouped as follows: CIND (n=257) and dementia (n=223).

Measures

1. *General cognition*

    a. *MMSE*. General cognition was measured with the commonly used MMSE (Appendix A). The MMSE is commonly used for measuring gross function (Folstein, & McHugh, 1975; Halpern & O'Connor, 2000). This questionnaire consists of 22 items that examines several cognitive domains, including, orientation, language, registration, memory, and construction. Total scores range from 0-30 with lower scores indicating cognitive impairment.

    b. *Modified TICS.* A modified version of the Telephone Interview of Cognitive Status (modified TICS: Brandt, Spencer, & Folstein, 1988) was also used to assess cognition. Participants were asked to count in reverse chronological order

from 20 and 86. Participants also completed a serial 7s subtraction task and an object naming task, and were asked to name the president and vice president of the United States. In addition to these tasks, participants were asked several orientation (time and place) questions as part of this battery. Higher scores on the modified TICS indicate worse cognition.

2. *Memory*

   a. *Wechsler Memory Scale – Revised Logical Memory I and II*. The Logical Memory test (both Immediate and Delayed) from the Wechsler Memory Scale – Revised (Wechsler, 1987) was used to measure objective memory. In this battery, investigators read two brief stories to participants, and participants are asked to recount as much of the stories as possible. Scores are based on the accuracy of the participant's recall and can range from 0-37 for both Logical Memory I and Logical Memory II. Lower scores in both tests indicate worse memory.

   b. *HRS Self-Report of Memory Problems Questionnaire.* The HRS Self-Report of Memory Problem Questions (Appendix B). Respondents answered four questions about the condition of their memory on a 5-point Likert-type scale. High scores indicate worse perceived memory. Scores on the 4 items were combined to form a subjective memory composite score.

   c. *Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE)* (Jorm, 1994). Informants were asked 17 questions (Appendix C) about the participant's memory. Response choices were given on 5-point Likert-type scale with higher scores indicating worse memory. Scores on the 17 items were calculated to form a composite informant subjective memory composite score.

3. *Anxiety and depression*

a. *The Neuropsychiatric Inventory* (NPI; Cummings, Mega, Gray, Rosenberg-Thompson, Carusi, & Gornbein, 1994) was used to identify behavioral and psychiatric issues in persons with AD or other dementias. For the purpose of the current study, I will only use the NPI scales measuring anxiety and depression. In this scale, questions were posed to informants by study nurses, who ask if the participant has engaged in certain behaviors or show certain symptoms during the previous month. Modifications to the NPI were made in order to adequately assess if participants met DSM-IV standards of major depression. These changes were simply adding items that were not included in the original version of the NPI (see Appendix D, questions D1, D5, D6, D7, D11, D13, and D15). The typical NPI fields each start with a screening question to establish if behavioral symptoms were existent or nonexistent. If the informant answers the question negatively, the nurse moves to the next field. If the informant answers the question positively, the nurse would move to a series of follow-up questions. The study nurse decided frequency and severity of a presenting behavior by the use of interviews, testing, and questionnaires. When compared to the Behavioral Pathology in Alzheimer's Disease Rating Scale (Behave-AD) and the Hamilton Rating Scale for Depression, NPI has sound concurrent validity, sufficient test-retest reliability, and good interrater reliability (Cummings, 1994; Kaufer, Cummings, Ketchel, Smith MacMillan, Shelley, Lopez, & DeKosky, 2000). Cummings and colleagues (1994) investigated the validity and reliability of NPI in several domains, including anxiety. Researchers examined 85 caregivers of 56-90-year old respondents with dementia. Along with dementia subjects,

researchers studied 30 established normal controls as well. Findings suggest high internal consistency and reliability. There are 13 items in the NPI measuring anxiety (see Appendix D, questions G, G1, G2, G3, G4, G5, G6, G7, G7(2), G8, G9, G10, G11). Participants in the current study will have both an anxiety score and a depression score, calculated from the NPI.

Procedure

In the HRS sample, Plassman and colleagues (2007) included a population of over 30,000 older adults over the age of 50, who were screened in over 69,330 households. The HRS was conducted by the Institute for Social Research at the University of Michigan. Over 1770 participants were given additional testing in the ADAMS. The sample used in the present study had 856 participants who completed the initial assessment of ADAMS tests and questionnaires. As mentioned earlier, only the participants in the CIND and dementia groups were included the data analysis.

Verbal informed consent was obtained before each HRS interview and written informed consent was collected from every ADAMS participants. The Institutional Review Board (IRB) of the University of Michigan approved research for the HRS, and the University of Michigan and Duke University IRBs authorized ADAMS. Georgia State University IRB approval was granted for this secondary data analysis.

Data Analyses

For analyses, the previously established groups based on cognitive status by ADAMS researchers were used in the current study. Descriptive analysis was used to describe demographics (race, gender, age, informants' relationship to participant, and marital status) of each group. Independent *t-tests* were used to determine differences of all variables (subjective

memory, objective memory/cognition, and depression/anxiety) between the CIND and dementia groups, and Pearson r and Mann U Whitney correlation analyses were employed to determine the relationship between the aforementioned variables in each group.

CHAPTER 5.

RESULTS

General Description of Demographic Data

Demographic information of participants is presented in Table 3. Comparison analyses revealed that participants in the CIND weighed more overall than the dementia group in all age groups. Comparison analyses also revealed that the 90+ age group were more likely to be widowed than 70-79 year olds and 80-89 year olds. Results concluded that marital status and gender were significantly different between CIND and dementia groups. Finally, descriptive statistics revealed that a higher percentage of the sample was widowed. Additionally, whites made up over 74% of the sample, while blacks made up a little over 20% of the sample.

Comparisons of Continuous Variables between CIND Group and Dementia Group

Independent t-tests were conducted to determine the difference between the CIND and dementia groups among the continuous variables, which include: MMSE, self memory, informant questionnaire, Wechsler Logical Memory I and Wechsler Logical Memory II in Table 4. The results revealed that participants with CIND had significantly higher scores on MMSE, Wechsler Logical Memory I, and Wechsler Logical Memory II. However, the dementia group showed higher scores for the informant questionnaire. No significant difference was found on self reported memory between the two groups.

Comparisons of Categorical Variables between CIND Group and Dementia Group

Mann-Whitney U tests were conducted to analyze the comparison of categorical variables between the CIND and dementia groups in Table 5. Categorical variables include Informant Relationship to Participant, Depression, Anxiety, Serial 7 test, TICS Count-back, TICS Object Naming, and TICS VP/President Naming. Analysis revealed that participants with

CIND had overall higher scores than dementia participants on all variables. Higher scores in depression and

Table 3. Participants' General Information in Demographics

Demographic Variable	CIND Frequency (%)	Dementia Frequency (%)
Race		
White/35 6(74.2)	195 (75.9)	161 (72.2)
Black/104 (21.7)	51 (19.8)	53 (23.8)
Other/20 (4.2)	11 (4.3)	9 (4.0)
Marital Status		
Single/12 (2.5)	5 (1.9)	7 (3.1)
Married-CL/175 (36.5)	113 (44.0)	62 (27.8)
Divorced/16 (3.3)	13 (5.1)	3 (1.3)
Separated/6 (1.3)	3 (1.2)	3 (1.3)
Widow/270 (56.3)	122 (47.5)	148 (66.4)
Gender		
Male/201 (41.9)	125 (48.6)	76 (34.1)
Female/279 (58.1)	132 (51.4)	147 (65.9)
	Mean (SD)	**Mean (SD)**
Weight (lbs)		
70-79	175.84 (40.163) n = 126	157.33 (34.391) n = 45
80-89	161.11 (33.016) n = 110	142.98 (25.552) n = 94
90+	141.21 (31.377) n = 28	134.36 (27.572) n = 42
Height (inches)		
70-79	66.19 (4.255) n = 126	65.73 (4.726) n = 45
80-89	65.73 (4.360) n = 110	63.72 (4.004) n = 94
90+	63.43 (4.509) n = 28	63.81 (5.237) n = 42
Age		
70-79	74.82 (2.717) n = 126	75.33 (2.820) n = 45
80-89	83.40 (2.672) n = 110	84.55 (2.827) n = 98
90+	93.46 (4.203) n = 28	92.33 (2.601) n = 42

Table 4. *T-test* Results of MMSE, Self-Memory, Informant Questionnaire, Wechsler Logical Memory I and II score differences between CIND and Dementia groups

Measures	CIND Mean (SD)	Dementia Mean (SD)
Objective Measures		
MMSE	23.61** (4.25) n = 256	15.69** (9.95) n = 221
Wechsler Logic Memory I	14.49* (7.05) n = 252	5.41* (8.20) n = 186
Wechsler Logic Memory II	10.22* (9.25) n = 248	3.29* (12.65) n = 178
Subjective Measures		
Self-Memory	3.80 (0.52) n = 247	3.69 (0.55) n = 183
Informant Questionnaire	57.35** (9.98) n = 237	74.92** (14.27) n = 199

* --- $p < 0.05$, ** --- $p < 0.01$.

anxiety result in more depression and anxiety. Higher scores in all other variable scores result in higher functioning in the variable. However, no statistical significance was found among the comparisons between two groups.

Correlation of Continuous Variables in CIND Group and Dementia Group

Pearson's product correlation analysis was used to analyze the relationships between aforementioned continuous variables in the CIND group in Table 6. Results revealed several significant relationships between MMSE and Wechsler Logical Memory I (0.476**) & II

(0.455**), Self memory and Wechsler Logical Memory II (-0.182*), and Wechsler Logical Memory I and Wechsler Logical Memory II (0.870**).

Table 5. Mann- Whitney U-tests Results Comparing Informant Relationship, Affect, and Cognitive Task Measures between CIND and Dementia Groups

Measures	CIND Mean (SD)	Dementia Mean (SD)
Informant Relationship		
Inf. Relationship to Participant	3.63* (4.15) n = 257	3.47* (3.52) n = 223
Affect		
NPI-Depression	4.17* (1.62) n = 256	3.79* (1.84) n = 219
NPI-Anxiety	4.64** (1.14) n = 256	4.18** (1.62) n = 219
Cognitive Task		
Serial 7	2.40** (1.88) n = 256	.87** (1.32) n = 219
TICS Countback	1.43** (.75) n = 249	1.01** (1.32) n = 184
TICS Object Naming	1.84** .36 n = 229	1.55** .63 n = 130
TICS VP/President Naming	1.71** .52 n = 126	1.07** .85 n = 43

* --- $p < 0.05$, ** --- $p < 0.01$

Table 6. Pearson Correlation Coefficients of Cognition and Memory Measure for CIND Group

	SM	IQ	WLMI	WLMII
MMSE	0.041	-0.029	0.476**	0.445**
SM		0.073	0.097	-0.182*
IQ			0.013	-0.046
WLMI				0.870**

* --- p < 0.05, ** --- p < 0.01, N ranged from 227 to 252,

The correlation coefficients between the aforementioned continuous variables in the dementia group are presented in Table 7. The results revealed several significant relationships among variables between MMSE and Wechsler Logical Memory I (.297*) & II (.184*), Informant questionnaire and Wechsler Logical Memory II -.212**), and Wechsler Logical Memory I and Wechsler Logical Memory II (.709**).

Pearson's product correlation analysis was used to analyze the relationships between aforementioned categorical variables in the CIND group (Table 8). Results revealed several significant relationships, including those between Informant Questionnaire and depression (-.150*) & Serial 7 (.142*), Depression and Anxiety (.244**), Serial 7 and TICS Count-back (.417**) & TICS Object-naming (.294**) & TICS VP/President-naming (.332*), and TICS Count-back and TICS Object-naming (.133*).

Pearson's product correlation analysis was used to analyze the relationships between aforementioned categorical variables in the dementia group in Table 9. Results revealed several significant relationships, including those between Depression and Anxiety (.380**) & Serial 7(-.141*). Serial 7 scores were positively correlated to TICS Count-back (.290**) & TICS Object-naming (.358**) & TICS VP/President-naming (.318*). TICS Count-back was positively

correlated to TICS VP/President-naming. Finally, results indicated a significant relationship between TICS Object-naming and TICS VP/President-naming (.456**).

Table 7. Correlation Coefficients of Cognition and Memory Measures for Dementia Group

	SM	IQ	WLMI	WLMII
MMSE	0.161	-0.060	0.297*	0.184*
SM		0.117	0.002	0.120
IQ			0.048	-0.212**
WLMI				0.709**

* --- p < 0.05, ** --- p < 0.01, N ranged from 161 to 198,

Table 8. Correlations of Informant Relationship, Affect, and Cognitive Task in CIND Group

	Depression	Anxiety	Serial 7	TICS CB	TICS ON	TICS VP/P
Inf. Rel.	-.150*		-.034	.142*	.084	.016	.067
Depression		.244**	-.010	-.036	-.037	-.166
Anxiety			-.008	-.068	.029	-.099
Serial 7				.417**	.294**	.332*
TICS CB					.133*	.156
TICS ON						.169

* --- p < 0.05, ** --- p < 0.01

Table 9. Correlations of Informant Relationship, Affect, and Cognitive Task in the Dementia Group

	Depression	Anxiety	Serial 7	TICS CB	TICS ON	TICS VP/P
Inf. Rel.	-.076	-.120	.090	.027	.057	.243
Depression		.380**	-.141*	-.112	-.125	-.185
Anxiety			.056	-.043	-.100	-.101
Serial 7				.290**	.358**	.318*
TICS CB					.136	.377**
TICS ON						.456**

* --- $p < 0.05$, ** --- $p < 0.01$

CHAPTER 6.

DISCUSSION

The findings of this study revealed moderate relationships between Serial 7 and TICS Count-back, TICS Object-naming, and TICS Vice-president/President naming in the CIND group, when applying Pearson's product correlation. Depression scores in this group showed a mild positive correlation with anxiety. As for the dementia group, Pearson's product correlation revealed a mild relationship between TICS Count-back and TICS Vice-president/President naming. Depression scores in the dementia group showed a moderately positive correlation with anxiety. Using an Independent *t-test*, the CIND group had significantly better general memory and cognition than the dementia group. Pearson's product correlation also revealed moderate relationships between MMSE and Wechsler Logical Memory I and II in CIND group, but a weak relationship in the dementia group.

Results supported hypothesis for the CIND group, in that SMC was mildly related to memory/cognitive performance, and anxiety and depression were moderately related to subjective memory. Additionally, findings supported hypothesis for the dementia group, revealing that anxiety and depression were moderately related to SMC, and that SMC was not related to memory/cognitive performance.

General Cognition/Memory between CIND and Dementia groups

General cognition was measured by the MMSE and TICS in both CIND and dementia groups, whereas memory was determined by WLM I & II. There were significant differences in MMSE, WLM I, and WLM II scores, between the CIND and dementia groups as shown by results in the independent t-test in Table 4. Participants in the CIND group had significantly higher scores on the MMSE (23.61**), WLM I (14.49*), and WLM II (10.22*) than those in the

dementia group. Lower scores recorded among the dementia group on the MMSE (15.69**), WLM I (5.41*), and WLM II (3.29*) indicate worse memory.

Using Pearson's product correlation, analysis revealed moderate relationships between MMSE and WLMI (0.476**) and WLMII (0.445**) in CIND participants in Table 6. Whereas in the dementia group, the relationships between MMSE and WLMI (0.297*) and WLMII (0.184) had weak relationships in Table 7. Other significant results were the moderate relationships between Serial 7 and TICS CB (0.417**), TICS ON (0.294**), and TICS VP/P (0.332*) in the CIND group (Table 8). Aside from TICS ON (0.358**), results on the TICS CB (0.290**) and the TICS VP/P (0.318*) were less significant in the dementia group as they relate to the Serial 7 than in the CIND group (see table 9). Also, results revealed a mild relationship between TICS CB & TICS VP/P (0.377**), and a moderate relationship between TICS ON & TICS VP/P (0.456**) in the dementia group (Table 9). The CIND group results among the same variables did not indicate significance.

These findings indicate that those with more severe cognitive/memory problems show weaker relationships between general cognition (measured by MMSE) and memory performance (measured by WLMI & WLMII). Dementia is also believed to be strongly related to age (the older you get the higher the risk of a dementia diagnosis). Since the majority of CIND participants are younger than those in the dementia group, it is believed that dementia participants show weaker cognition/memory relationships because they are generally older and likely to have more dementia symptoms. The data show that 70-79 year-old age group has 126 CIND participants and only 45 in the dementia group. However, in the 90+ age groups, CIND participants are numbered at 28 and the dementia group holds 42 participants. Dobbs and Rule

(1987) examined age differences in prospective memory and the relationship between metamemory and actual performance on memory tasks and conclude that perceived memory problems increased with age, and the prospective memory task performance decreased with age. Dobbs and Rule (1987) also pointed out that age was a reliable predictor of prospective memory, whereas perceived impairment was not. The results of the present study support the statements of Dobbs and Rule (1987).

Additionally, variables WLMI and WLMII were highly correlated with the coefficient being 0.870** in Table 6 in the CIND group and being 0.709** in Table 6 in the dementia group. The results of this relationship demonstrated that these cognitive memory performances are similar in these memory challenged older adults. Supporting aforementioned studies, including that of Jorm and colleagues (2001), these results indicate that CIND participants have significantly better memory than participants with dementia. In understanding subjective memory in CIND and dementia groups, results have been mixed. There are ample findings that support implications that there are both positive and negative relationships between subjective memory and general cognition/memory in CIND. In dementia, Pearman and Storandt (2004), Cutler and Grams (1989), as well as other aforementioned research, support implications of an association between memory complaints and cognitive performance. Literature produced mixed results when searching for the relationship between general cognition and subjective memory in CIND and dementia participants.

Comparison of Subjective Memory between CIND and Dementia groups

Subjective memory was measured by both the Self Memory test and the Informant Questionnaire. The self memory test was administered to CIND and dementia participants

directly. This test measured what participants thought about their own memory. The informant questionnaire was not given directly to the participant, but instead, to the participants' informants (family members or caregivers). Informants were asked what they thought about the participants' memory. Self memory scores were relatively equal in CIND (3.80) and dementia (3.69) groups, with no significant differences found in Table 4. However, informant questionnaire scores were significantly higher in the dementia group (74.92) than the CIND group (57.35) in Table 4. Higher scores indicate worse memory found the dementia group. Frank and colleagues (2006) found that participants with CIND and Alzheimer's disease were more reserved about reporting memory problems than their informants. Informants reported a more severe and intricate version of cognitive and memory issues in respondents.

Although studies reveal positive results in finding that memory reporting by respondents or their informants are as important to research as objective performance, other studies have found that respondent reporting is inconsequential. Scientists have been skeptical about the accuracy of memory reporting in dementia patients because of the severity of cognitive/memory decline associated with the disease. Along with self-reported memory complaints, researchers have since used informant reporting to assist in diagnoses.

Anxiety/Depression between CIND and Dementia groups

Anxiety and depression were measured by the NPI. This battery was not administered directly to participants but to their informants. NPI-depression scores in the CIND group showed a mild positive correlation with anxiety (0.244*) (see table 8) whereas in the dementia group, scores were more moderately correlated (0.380**) (see table 9). This supports the idea that the positive correlation between anxiety and depression grows stronger with age (older participants

are likely grouped in the dementia group). These findings indicate that CIND participants generally had less anxiety/depression than dementia participants did. Participants with dementia scored lower on anxiety and depression items (lower scores indicate higher levels of anxiety and depression). The results from the present study demonstrated that dementia respondents showed more anxiety/depression in subjective memory than CIND participants.

Large bodies of literature suggest that depression and anxiety are associated with memory complaints in CIND and dementia groups. As previously mentioned, along with Wong and colleagues (2006), other researchers have found that anxiety and depression are related to memory complaints in CIND and dementia groups. For instance, Campbell and colleagues (2008) conducted a secondary analysis that revealed anxiety and depression preceded dementia diagnoses and it is likely either, or both, influence negative self-reports of memory in participants. This gives credibility to the current results which indicate that subjective memory was found to be positively correlated to depression in both CIND and dementia groups. Subjective memory in CIND participants as it relates to memory/cognition are as follows: based on previous research, CIND participants have reported a positive relationship between subjective memory and cognitive performance (O'Brien, J.T., Beats, B., Hill, K., Howard, R., & Sahakian, B., 1992; Schofield, P.W., Marder, K., Booneief, G., Jacobs, D.M., Sano, M., *et al*., 1997). The current research finding supports these indications.

Anxiety and depression are also found to be predictors of subjective memory, which parallels prior research. Aforementioned studies conducted by Barker and colleagues (1994) and Wong and colleagues (2006) suggest that depression influenced subjective memory in CIND participants. Research conducted by Campbell and colleagues (2008) suggests that anxiety and depression influenced subjective memory in dementia participants.

Limitations

It is important to note the selection process of the ADAMS authors for participants in the ADAMS study. The “normal cognitive” group, which was excluded from the present study, was initially selected by authors because initial observation led to suspicions that these participants demonstrated mild levels of cognitive problems. Therefore, these participants could not be considered as controls or a credible “normal cognitive” group. The conclusion by the authors was that these participants would benefit from completing follow-up assessments due to the uncertainty of their diagnoses and the idea that studying their conditions over time would result in clear diagnoses, confirming the uncertainty of categorizing them as “normal”. Therefore, for the purpose of the current research, the “normal” group did not qualify as “normal”, that is, participants without suspected cognitive issues during initial assessment. Excluding participants for incomplete assessments could possibly give an incomplete analysis of CIND and dementia participants.

Data collection was considered a limitation for this study as well. Depression and anxiety data were collected from informants only, not respondents. This could possibly reflect stressors that informants/caregivers have regarding respondents and not an accurate depiction of respondent’s anxiety and depression. Also, TICS batteries were conducted over the telephone and not in person. It was also noted that global technology is advanced and leads to less use of addition and subtraction without the use of electronic support. The TICS batteries required respondents to complete subtraction tasks on the spot, when it is rarely used in daily activities (especially without a calculator).

Another limitation is the fact that there were different levels of access for ADAMS/HRS data (public, sensitive, and restricted). Public access includes general data, sensitive access

required special permission from ADAMS/HRS board of researchers at the University of Michigan, and restricted data is only allotted to grant-funded (present or former) primary investigators. I had access to public and sensitive data, not restricted data.

Despite these limitations, the study's findings provide some initial indications that predictors of subjective memory complaints in CIND and dementia are associated with memory/cognitive problems. The results from this study provide valuable information which can inform researchers, physicians, clinicians and caregivers on memory complaints and its relationship to memory problems. To further understand how subjective memory complaints, cognition, depression and anxiety in CIND and dementia, researchers should continue to utilize a longitudinal design with multiple waves of data. Researchers should also examine the severity of memory/cognition once memory complaints are made by individuals. This may help to determine cognitive status.

Future Directions

Findings from this study also illustrate the importance of considering age as it relates to dementia diagnoses, depression and anxiety-propelled memory complaints. It is important for researchers, physicians, caregivers and treatment specialists to determine whether complaints are caused by depression, anxiety or actual memory/cognitive decline that lead to dementia. This attention to predictors of SMC may aid professionals in early detection of memory/cognitive decline. It may also help in the detection of anxiety or depression in older adults. Research has shown that early treatment in dementias such as Alzheimer's disease can help maintain a healthy level of memory/cognitive performance and aid in slowing the progression of the deadly disease.

The present study was to investigate the nature of correlations between subjective memory complaints and objective performance, as well as affect, according to cognitive status.

Clarification in this area could benefit caregivers, physicians, gerontologists, researchers, and impaired individuals. With the rapid growth of older adults in the United States, frequent reporting of memory complaints will increase and professionals and caregivers who are not informed about what factors predict subjective complaints could potentially have patients or loved-ones who may be subject to unclear or misdiagnosis of memory or affective problems associated with memory complaints. Although cognitive decline and dementia are not a part of the normal aging process, all cognitive changes between the CIND group and dementia group may be related to age. More in-depth research examining the aging processes of the brain is needed however, it is speculated that memory drugs and exercises may delay the process of general cognition deterioration and memory loss in non-dementia related aging, as well as in mild memory/cognitive problems.

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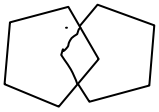
APPENDIX A: MINI-MENTAL STATE EXAMINATION

Score	
	Orientation
(_)/5	What is the (year) (season) (month) (date)?
(_)/5	Where are we? (state) (county) (town) (hospital) (floor)
	Registration
(_)/3	Name three objects (ball, flag, tree) at 1/sec. Then ask the patient to repeat all Three after you have said them. 1 point for each correct. Then repeat them Until he learns them. Count trials and record _____.
	Attention and Calculation
(_)/5	Serial 7's. 1 point for each correct. Stop at 5 answers. OR spell "world" backwards. (Number correct equals letters before first mistake, i.e., d l o r w = 2 correct.)
	Recall
(_)/3	Ask for the objects above. 1 point for each correct.
	Language Tests
(_)/2	Name: pencil, watch.
(_)/1	Repeat: no ifs, ands or buts.
(_)/3	Follow a three-stage command: "Take the paper in your right hand, fold it in half, and put it on the floor."
(_)/1	Read and obey the following: CLOSE YOUR EYES.
(_)/1	Write a sentence spontaneously below.
(_)/1	Copy design (intersecting pentagons). 
(_)/30	TOTAL SCORE

APPENDIX B: HRS SELF-REPORTED MEMORY QUESTIONNAIRE

1. How would you rate your memory at the present time? Would you say it is excellent, very good, good, fair, or poor?

2. Compared to two years ago, would you say your memory is much better now, better now, about the same, worse now, or much worse now than it was then?

3. How is your memory compared to that of other people? Would you say excellent, very good, good, fair, or poor?

4. How often do memory problems interfere with your daily activities? Would you say rarely, occasionally, sometimes, often, or all of the time?

APPENDIX C: IQCODE (MODIFIED)

11. How would you rate your friend or relative's memory at the present time?
 Excellent
 Very good
 Good
 Fair
 Poor

14. Compared with two years ago, how is your friend or relative at remembering things about family and friends, such as occupations, birthdays and addresses?
 Much better
 A bit better
 Not much change
 A bit worse
 Much worse

15. Compared with two years ago, how is your friend or relative at remembering things that have happened recently?
 Much better
 A bit better
 Not much change
 A bit worse
 Much worse

16. Compared with two years ago, how is your friend or relative at recalling conversations a few days later?
 Much better
 A bit better
 Not much change
 A bit worse
 Much worse

17. Compared with two years ago, how is your friend or relative at remembering his/her address or phone number?
 Much better
 A bit better
 Not much change
 A bit worse
 Much worse

18. Compared with two years ago, how is your friend or relative at remembering what day and month it is?
 Much better
 A bit better
 Not much change
 A bit worse

☐ Much worse

19. Compared with two years ago, how is your friend or relative at remembering where things are usually kept?
☐ Much better
☐ A bit better
☐ Not much change
☐ A bit worse
☐ Much worse

20. Compared with two years ago, how is your friend or relative at remembering where to find things that have been put in a different place than usual?
☐ Much better
☐ A bit better
☐ Not much change
☐ A bit worse
☐ Much worse

21. Compared with two years ago, how is your friend or relative at knowing how to work familiar machines around the house?
☐ Much better
☐ A bit better
☐ Not much change
☐ A bit worse
☐ Much worse

22. Compared with two years ago, how is your friend or relative at learning to use a new gadget or machine around the house?
☐ Much better
☐ A bit better
☐ Not much change
☐ A bit worse
☐ Much worse

23. Compared with two years ago, how is your friend or relative at learning new things in general?
☐ Much better
☐ A bit better
☐ Not much change
☐ A bit worse
☐ Much worse

24. Compared with two years ago, how is your friend or relative at following a story in a book or on TV?
☐ Much better

 A bit better
 Not much change
 A bit worse
 Much worse

25. Compared with two years ago, how is your friend or relative at making decisions on everyday matters?
 Much better
 A bit better
 Not much change
 A bit worse
 Much worse

26. Compared with two years ago, how is your friend or relative at handling money for shopping?
 Much better
 A bit better
 Not much change
 A bit worse
 Much worse

27. Compared with two years ago, how is your friend or relative at handling financial matters, that is, the pension or dealing with the bank?
 Much better
 A bit better
 Not much change
 A bit worse
 Much worse

28. Compared with two years ago, how is your friend or relative at handling other everyday arithmetic problems, such as, knowing how much food to buy, knowing how long between visits from family or friends?
 Much better
 A bit better
 Not much change
 A bit worse
 Much worse

29. Compared with two years ago, how is your friend or relative at using his/her intelligence to understand what's going on and to reason things through?
 Much better
 A bit better
 Not much change
 A bit worse
 Much worse

APPENDIX D: NPI (MODIFIED)

D. In the last month, did (NAME) seem sad or depressed? Does (NAME) say that (HE/SHE) feels sad or depressed?

1. Yes
5. No

6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. RF (Refused)

D1. Is (NAME) currently being treated for clinical depression?
1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D2. Does (NAME) have periods of tearfulness or sobbing that seem to indicate sadness?
1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D3. Does (NAME) say or act as if (HE/SHE) is sad or in low spirits?
1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D4. Has that been for more than 2 weeks?
1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D5. Has (HE/SHE) been irritable?
1. Yes
5. No
6. Invalid

96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D6. Has that been for more than 2 weeks?

1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D7. Does (NAME'S) mood change a lot from day to day?

1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D8. Does (NAME) put (HIM/HER) self down or say that (HE/SHE) feels like a failure?

1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D9. Does (NAME) say that (HE/SHE) is a bad person or deserves to be punished?

1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D10. Does (NAME) seem to be discouraged or say that (HE/SHE) has no future?

1. Yes
5. No

6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D11. Does (HE/SHE) feel that life is not worthwhile?
1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D12. Does (NAME) say that (HE/SHE) is a burden to the family or that the family would be better off without (HIM/HER)?
1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D13. Does (HE/SHE) feel worthless?
1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D14. Does (NAME) express a wish for death or talk about killing (HIM/HER) self?
1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D15. Has (HE/SHE) tried to commit suicide in the past six months?
1. Yes
5. No

6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D16. (If the screening question is confirmed, determine the frequency and severity of the depression.)

1. Occasional (less than once per week)
2. Often (about once per week)
3. Frequently (several times/week; less than daily)
4. Very frequently (once or more per day)
6. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D17. (If the screening question is confirmed, determine the frequency and severity of the depression.)

1. Mild
2. Moderate
3. Marked
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

D18. Do these problems represent a change from the way (HE/SHE) has always been?

1. Yes
2. Exaggeration of previous problems
5. No
96. Skipped (Not applicable)
97. Not assessed/Not asked
98. DK (Don't Know)
99. RF (Refused)

D19. How emotionally distressing do you find this behavior?

0. Not at all
1. Minimally
2. Mildly
3. Moderately
4. Severely
5. Very severely or extremely
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)

98. DK (Don't Know)
99. Not applicable/not assessed for this item

G. In the last month, has (NAME) been very nervous, worried, or frightened for no apparent reason? Does (HE/SHE) seem very tense or fidgety? Is (NAME) afraid to be apart from you?

1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. RF (Refused)

G1. Does (NAME) say that (HE/SHE) is worried about planned events?

1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

G2. Does (NAME) have periods of feeling shaky, unable to relax, or feeling excessively tense?

1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

G3. Does (NAME) have periods of [or complain of] shortness of breath, gasping, or sighing for no apparent reason other than nervousness?

1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

G4. Does (HE/SHE) complain of butterflies in (HIS/HER) stomach, or of racing or pounding of the heart in association with nervousness? (Symptoms not explained by ill health).

1. Yes

5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

G5. Does (HE/SHE) avoid certain places or situations that make (HIM/HER) more nervous such as riding in the car, meeting with friends, or being in crowds?
1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

G6. Does (NAME) become nervous and upset when separated from you [or (HIS/HER) care giver]? [Does (HE/SHE) cling to you to keep from being separated?]
1. Yes
5. No
6. Invalid
6. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

G7. Does (HE/SHE) show any other signs of anxiety? (If YES, specify)
1. Yes
5. No
6. Invalid
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

G7(2). Does (HE/SHE) show any other signs of anxiety? (If YES, specify)

G8. (If the screening question is confirmed, determine the frequency and severity of the anxiety.)
1. Occasional (less than once per week)
2. Often (about once per week)
3. Frequently (several times/week; less than daily)
4. Very frequently (once or more per day)
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)

98. DK (Don't Know)
99. Not applicable/not assessed for this item

G9. (If the screening question is confirmed, determine the frequency and severity of the anxiety.)

1. Mild
2. Moderate
3. Marked
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item

G10. Do these problems represent a change from the way (HE/SHE) has always been?

1. Yes
2. Exaggeration of previous problems
5. No
96. Skipped (Not applicable)
97. Not assessed/Not asked
98. DK (Don't Know)
99. Not applicable/not assessed for this item

G11. How emotionally distressing do you find this behavior?

0. Not at all
1. Minimally
2. Mildly
3. Moderately
4. Severely
5. Very severely or extremely
96. Skipped (Not applicable)
97. Not assessed/Not asked (NPI not completed)
98. DK (Don't Know)
99. Not applicable/not assessed for this item