Assessment for Mild Cognitive Impairment: Striving for Best Practice

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ASSESSMENT FOR MILD COGNITIVE IMPAIRMENT: STRIVING FOR BEST PRACTICE

by

Julie Leigh Dalmasso

A dissertation submitted to the Graduate College
in partial fulfillment of the requirements
for the degree of Doctor of Philosophy
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This dissertation is a series of three studies aimed at determining the best assessment practices for mild cognitive impairment (MCI) that can employed by speech-language pathologists (SLPs). The first study was non-experimental and descriptive examining whether three commonly used assessment instruments yielded similar categorical results. The data were analyzed to determine whether the Eight-Item Interview to Differentiate Aging and Dementia (AD8), the Mini-Mental State Examination (MMSE), and the Cognitive-Linguistic Quick Test (CLQT) identified the same participants from a neurotypical sample as having cognitive deficits. Very little agreement was found amongst the three tools.

Study two was modified to include two participant groups – one with self-reported MCI or mild dementia, and one neurotypical group. The addition of the disordered group allowed statistical analyses to include measures of sensitivity and specificity using the diagnosed condition as the “gold standard” for analyses. In addition, the MMSE was replaced with the Montreal Cognitive Assessment (MoCA) because it had been show to be more sensitive to mild impairments as compared to the MMSE. The AD8 was also given to close family caregivers of each participant to compare self-report to the report from a different informant. Finally, the Large Allen Cognitive Levels Screen, 5th edition (LACLS-5) was added to this study.
to collect data on participants’ abilities to complete activities of daily living (ADLs). The MoCA and the LACLS-5 identified the most participants across both groups as having cognitive deficits, however the AD8 as completed by another informant was found to have the greatest sensitivity and specificity.

Finally, the third study was qualitative with the purpose of learning more about the experience of being tested, as well as what the experience of being diagnosed with MCI or AD/dementia may be like. Overall the test that was the most preferred was the CLQT, which identified the least number of participants in study two. In contrast, the LACLS-5 was the least preferred tool but identified the greatest number of individuals as having cognitive deficits. Participants in the neurotypical group were further asked questions about whether they would want to be tested if they were referred for a cognitive examination, and whether they would want to learn of a cognitive diagnosis. All participants stated they would want to be informed, however they also voluntarily participated in this study, so they likely had an innate interest in the topic. Reasons for wanting to be informed related to the need for financial planning for the future and advanced care planning for their healthcare wishes.

In conclusion, this series of three separate studies cannot guide practicing SLPs toward or away from any single assessment instrument, either quantitatively or qualitatively. Rather, it may be more clinically appropriate to determine if a combination of tools may provide the most comprehensive look at cognitive function that falls in line with the diagnostic criteria created by the National Institute on Aging and the Alzheimer’s Association (NIA/AA taskforce).
ACKNOWLEDGMENTS

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Julie Leigh Dalmasso
# TABLE OF CONTENTS

ACKNOWLEDGEMENTS................................................................................................. ii

LIST OF TABLES........................................................................................................... vii

LIST OF FIGURES ......................................................................................................... viii

CHAPTER

I. INTRODUCTION .......................................................................................................... 1

   Introduction..................................................................................................................... 1

      Cognitive Assessment ............................................................................................. 2

      Diagnosis of MCI/Dementia ................................................................................. 6

      Purpose ..................................................................................................................... 7

   References ................................................................................................................... 8

II. STUDY ONE ................................................................................................................. 14

   Introduction.................................................................................................................. 14

   Purpose....................................................................................................................... 19

   Methods ....................................................................................................................... 19

      Design ....................................................................................................................... 19

      Participants .............................................................................................................. 20

      Procedures .............................................................................................................. 20

         AD8 Administration and Scoring ................................................................. 20

         MMSE Administration and Scoring ............................................................. 20

         CLQT Administration and Scoring ............................................................. 21
Table of Contents—Continued

IV. STUDY THREE ........................................................................................................................................... 73

   Introduction.................................................................................................................................................. 73
   Framework.................................................................................................................................................. 77
   Methods...................................................................................................................................................... 77
       Participants............................................................................................................................................. 77
   Research Design........................................................................................................................................ 78
   Data Analyses ............................................................................................................................................ 78
   Results........................................................................................................................................................ 80
       Types of Assessments ............................................................................................................................. 80
       Overall Testing Experience .................................................................................................................... 84
   Discussion................................................................................................................................................... 87
   References................................................................................................................................................... 91

V. CONCLUSION ............................................................................................................................................. 96

   References.................................................................................................................................................. 100

APPENDICES

   A. Interview Questions ............................................................................................................................... 103
   B. HSIRB Approval Letter 2016 .................................................................................................................. 104
   C. HSIRB Approval Letter 2017 .................................................................................................................. 105
LIST OF TABLES

1. Gender and Test Scores of All Participants .................................................................23
2. Clinical Diagnostic Criteria for MCI ............................................................................40
3. Assessments Chosen Based on Whether They Are Designed to Detect  
   1 + MCI Criterion ........................................................................................................48
4. Gender, Age, and Test Scores of All Participants .....................................................51
5. Percentages of Fail Rates by Group and Test ................................................................52
6. Sensitivity, Specificity, PPV, and NPV by Assessment/Condition .............................53
7. Themes for Choosing the Test Liked the Best .............................................................81
8. Themes for Choosing the Test Liked the Least ............................................................82
9. Tools That Gave the Best Insight into Thinking Abilities .........................................83
11. Would You Want to Be Tested if You Were Referred for It? .....................................86
12. Suggestions for Clinicians Who Work with This Type of Patient? ............................87
LIST OF FIGURES

1. Number of Participants Per Group Who Failed Each Test ........................................................53
CHAPTER I
INTRODUCTION

Introduction

The population over the age of 65 in the United States is expected to grow to 90 million by the year 2050 (United Bureau of the Census, 2015). Along with aging comes an increased risk for Alzheimer’s disease (AD) or another form of dementia. Mild Cognitive Impairment (MCI) is a known precursor to AD dementia in approximately half of those diagnosed over five or more years, with approximately 10-15% converting to AD dementia within two years (Mitchell & Shiri-Feshki, 2009; Ritchie, 2004). Previous literature highlights the need for early assessment of cognitive skills and diagnosis of mild cognitive impairment (MCI), because 20-40% of individuals diagnosed may recover, and up to 60% maintain their cognitive status through medical or rehabilitative interventions (Breitner, 2014; Matthews et al., 2008, Mitchell & Shiri-Feshki, 2009).

In 2011, the Alzheimer’s Association partnered with the National Institute on Aging to form a taskforce charged with outlining clear criteria for the diagnosis of MCI. Based upon the work of the taskforce, the present criteria for the diagnosis of MCI are: “a) change in cognition noted by the individual or others; b) impairment in one or more cognitive domains (attention, memory, executive function, language, and/or visuospatial skills); c) preserved independence in functional abilities (activities of daily living [ADLs]), but a mild decrease in performance on complex tasks (instrumental activities of daily living [IADLs]); and d) changes that are mild enough so that the patient does not meet diagnostic criteria for dementia” (Albert et al., 2011, pg. 3-4).
Assessment practices for MCI are lacking completeness at the present time despite the above criteria. Professionals across many disciplines are left to interpret the diagnostic criteria and how the criteria fit into their clinical assessments. According to the American Speech-Language-Hearing Association (ASHA; 2005), speech-language pathologists (SLPs) have a responsibility to assess, diagnose, and treat individuals with cognitive deficits that affect their communication. Common areas of deficit fall under the domains of attention, memory, executive function, visuospatial skills, and language. Deficits in any of the above domains may affect communication; thus, communication and cognition are inseparable (ASHA, 2005; Key-DeLyria, 2013).

Although SLPs do not diagnose MCI directly, the information gained from a cognitive-communication assessment by SLPs is often pertinent to physicians, psychologists, or neuropsychologists who do diagnose the condition (Key-DeLyria, 2013). This is often the case for SLPs working in acute care or skilled nursing facilities where family and/or staff caregivers may notice subtle changes in their patients’ cognitive-communicative abilities. A referral is often made for SLP evaluation, which typically must occur in a single session resulting in a decision as to whether a cognitive-communication deficit exists along with appropriate recommendations (Key-DeLyria, 2013).

Cognitive Assessment

Many screening tools and assessments are available to SLPs, leading to questions about evidence regarding which is best relative to the four diagnostic criteria for MCI (listed previously). One of the most commonly used screening tools for global cognitive function is the Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975). Although the MMSE has been long used for the diagnosis of dementia by many healthcare professionals, in more recent years its
usefulness for assessing MCI has been called into question. Several systematic reviews and meta-analyses have found that the MMSE has lower sensitivity for diagnosing MCI compared with other instruments (Lonie, Kalu, & Ebmeier, 2010; Lonie, Tierney, & Ebmeier, 2009; Mitchell, 2009; Tsoi et al., 2015).

In contrast to the MMSE, the Montreal Cognitive Assessment (MoCA, Nasreddine et al., 2005) was developed specifically to detect mild deficits. The MoCA has been found in many of the same systematic reviews and meta-analyses to have a higher sensitivity (87-90%) and specificity (84-89%) for the identification of MCI, especially as compared to the MMSE with a reported sensitivity range of 1-96% and a reported specificity range of 58-100% (Lonie, Kalu, & Ebmeier, 2010; Lonie, Tierney, & Ebmeier, 2009; Mitchell, 2009; Tsoi et al., 2015). In addition, the MoCA and the MMSE have been compared across many studies with specific populations, including those with Parkinson’s Disease, cardiovascular damage, stroke or transient ischemic attack, and Type 2 Diabetes Mellitus. The MoCA was found to be more sensitive to mild impairments across all studies (Alagiakrishnan et al., 2013; Hoops et al., 2009; Mamikonyan et al., 2009; McLennan, Mathias, Brennan, & Stewart, 2011; Nazem et al, 2009; Parashos, Johnson, Erickson-Davis, & Wielinski, 2009; Pendlebury et al., 2010; Zadikoff et al., 2008).

Although both the MMSE and the MoCA are readily available for use by most SLPs, neither provides in-depth information about abilities within each of the multiple cognitive domains, including attention, memory, executive function, language, and visuospatial skills. It has been recommended that if scores fall below a set cut-off score on either the MMSE or the MoCA, indicating a possible change in cognition, further testing should be conducted in order to gather more specific information on cognitive performance (Key-DeLyria, 2013; Lonie, Tierney, & Ebmeier, 2009).
The Cognitive-Linguistic Quick Test (CLQT; Helm-Estabrooks, 2001) is another tool available to SLPs. It has the advantage of providing more detailed assessment of each of five cognitive domains (attention, memory, executive function, visuospatial skills, and language). The CLQT consists of ten subtests that derive weighted scores for the cognitive domains that are involved in task completion. Some of the subtests that make up the CLQT are tasks that have been reported as independent measures of certain aspects of MCI, including clock drawing, story retell, and verbal fluency (Lonie, Tierney, & Ebmeier, 2009). Additionally, the CLQT has been shown to identify language impairments more readily than instruments for global cognitive function, which emphasizes the role of the SLP in cognitive assessment due to the inseparability of cognition and communication (ASHA, 2005; Blythe, Scott, Bond, & Paul, 2012; Fleming, 2013; Key-DeLyria, 2013). The additional qualitative and quantitative information related to each domain on the CLQT can also have important benefits for treatment planning if intervention is recommended (Parashos et al., 2009).

Comparing the MMSE, MoCA, and CLQT with the MCI diagnostic criteria, one can see that the MMSE or MoCA can possibly show decreased global cognitive function, and the CLQT can provide information on the specific domains of cognition to determine if one or more falls below normal. However, none of these instruments gives insight into the third criterion for MCI, which is a person’s abilities to complete activities of daily living (e.g., bathing, dressing, and feeding) or instrumental (complex) activities of daily living (e.g., balancing a checkbook, managing medications, or preparing a meal). Just as there are many options for assessing global cognitive function, there are also many options for assessing ADL/IADL function.

The Large Allen Cognitive Level Screen – Version 5 (LACLS-5; Allen et al., 2007) is a standardized, performance-based measure of functional cognition (Wesson et al., 2017).
Functional cognition is a term that relates task performance to the underlying cognitive skills necessary to complete the task (Wesson et al., 2017). The LACLS-5 can serve as an indicator of new learning ability, requiring cognitive skills such as executive function, planning, and problem-solving for completion (Mayer, 1988; Velligan et al., 1998). In previous studies, the LACLS-5 has been found to have a low correlation with the MMSE in a non-disabled population (Roitman & Katz, 1996), but a moderate correlation in a population with dementia (Park et al., 2016). In addition, the LACLS-5 had a significant correlation with the MoCA in a population with MCI due to addiction to drugs and/or alcohol (Rojo-Mota et al., 2016).

Finally, the MCI diagnostic criteria state that there must be a change in cognition as noted by the individual or a close informant. This information could be gained during assessment through a thorough review of the person’s case history, or a common subjective questionnaire could be used. One such tool that is available through the Alzheimer’s Association is the Eight-Item Interview to Differentiate Aging and Dementia (AD8; Galvin et al., 2005). It is a quick screening tool that, while originally created to be completed by an informant other than oneself, has more recently been validated as a self-reporting measure (Galvin et al., 2005; Galvin, Roe, Xiong & Morris, 2006; Galvin, Roe, Coats & Morris, 2007). Although a single study has been done to validate the AD8 as a self-report measure, there is still question over the level of agreement between individuals who are self-reporting and their family caregivers, or significant others, particularly in the mildly impaired population.

With all of the assessment tools available and the limited amount of time in which clinical practitioners must complete a cognitive evaluation, which test should be chosen? The best objective determinant of cognitive impairment is extensive neuropsychological testing, but those in the mild range of impairments are rarely referred for these evaluations. This is a
population that can easily be neglected because of their remaining abilities that help them to still be independent in many areas. In place of neuropsychological testing, perhaps SLPs should be prepared to administer a comprehensive battery of assessments that are quick to administer in order to determine if mild cognitive-communication impairments exist and if there is a need to refer the patient for further testing by a neuropsychologist or a physician (Fleming, 2013; Key-DeLyria, 2013; McKhann et al., 2011).

**Diagnosis of MCI/Dementia**

There is yet another underlying problem related to cognitive assessment for MCI, or even AD dementia. The problem is that nearly half of older individuals do not want to know if they have any of the conditions that underlie cognitive loss (Boustani et al., 2005; United States Preventative Services Task Force [USPSTF], 2014). Consistent with not wishing to be informed of any possible diagnoses affecting thinking or independence, nearly half of those screened for cognitive impairment have declined further testing (Boustani et al., 2005; Boustani et al., 2006). This begs the question as to how healthcare practitioners are to handle these delicate situations.

Two inherent ethical principles could be said to guide this discussion. The ethical principle of autonomy asserts that patients have the right to know and understand any conditions they have, as well as options for treatment or management. However, the ethical principle of beneficence asserts that individuals should not be exposed to more harm than necessary. One could argue that providing unwanted diagnostic information about a dementia or MCI diagnosis may cause undue psychological stress or harm, especially for those who do not want that information despite the potential benefits to early identification. Such benefits include that some patients may benefit from early therapeutic interventions, as well as patient and family education for advanced care planning (Gold, 2004; Teel, 2004).
Purpose

The purpose of this series of three studies is to closely examine the practice of cognitive assessment, particularly in the field of speech-language pathology. First, is a study of whether there is any agreement between commonly used assessment tools, which may show clinicians tools that may have results predictive of other, lengthier instruments. The results of that study informed the design and materials for the second study, which focused on the possibility that a battery of assessments should be used by SLPs in cognitive-communication evaluations to more closely align with the diagnostic criteria for MCI. Sensitivity and specificity measures were computed based upon which participants are identified and which are not. Finally, participants were interviewed in an effort to conclude how professionals should handle instances where patients do not wish to be tested, nor informed of any test results that could potentially tell them they have MCI or AD dementia.
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Hoops, S., Nazem, S., Siderowf, A. D., Duda, J. E., Xie, S. X., Stern, M. B., &


CHAPTER II

STUDY ONE

Introduction

Mild cognitive impairment (MCI) is defined in the literature as a syndrome characterized by cognitive decline that does not interfere with one’s life and activities of daily living, but that is greater than expected for one’s age and educational level (Winblad et al., 2004; Gauthier et al., 2006). MCI has historically been noted to be a transition stage between typical cognition as individuals age and the diagnosis of Alzheimer’s Disease (AD). Up to 50% of individuals with MCI may progress to more disordered cognition indicative of AD dementia, whereas a smaller subset of individuals may remain in a state of MCI for the duration of their lives, or even revert back to normal cognition (Breitner, 2014; Gabryelewicz et al., 2006; Petersen, 2011; Winblad et al., 2004). In those individuals who do progress from MCI to AD, approximately 15% will progress to AD within two years of their initial MCI diagnosis (Ritchie, 2004). Additionally, individuals who revert from MCI back to normal cognitive function are at increased risk for redeveloping signs of MCI, which may or may not progress to AD, at a later time (Roberts et al., 2014). Epidemiological studies have determined that the prevalence rate of MCI in the United States is between 5-29% (Ritchie, 2004). One reason for the wide range is inconsistent practices for assessing and diagnosing MCI (Ritchie, 2004), as well as heterogeneous trajectories for those with confirmed MCI (Clark et al., 2013; Michaud, Su, Siahpush, & Murman, 2017; Roberts & Knopman, 2013; Roberts et al., 2014).

MCI has historically been regarded as a condition that affects memory, but evidence suggests that other cognitive domains can be affected, such as attention, language, visuospatial skills, perceptual speed, and executive function (Winblad et al., 2004). In fact, MCI has been
divided into subtypes. Two broad MCI subtypes with general agreement are amnestic MCI (aMCI), in which there is an impairment in memory and nonamnestic MCI (naMCI), in which there is an impairment of a cognitive domain other than memory, such as executive function (Bondi & Smith, 2014; Clark et al., 2013; Rosenberg, Mielke, Appleby, Leoutsakos, & Lyketsos, 2011). These subtypes have been further refined into four subtypes by cross-referencing them with the number of cognitive domains that are affected as one domain (single-domain MCI) or more than one domain (multiple- or multi-domain MCI; Albert et al., 2011; Bondi & Smith, 2014; Breitner, 2014; Clark et al., 2013; Eliassen et al., 2017; Michaud et al., 2017; Petersen, 2011; Roberts & Knopman, 2013; Roberts et al., 2014; Rosenberg et al., 2011; Sachdev et al., 2015; Salmon & Bondi, 2009;). In single-domain amnestic MCI, memory is the only domain that is affected, while in multiple-domain amnestic MCI, another cognitive domain is impaired in addition to memory. In non-amnestic single-domain MCI, one cognitive domain is affected, but it is not memory, while the multiple-domain non-amnestic subtype includes those individuals with impairment of more than one cognitive domain, none of which are memory. Some investigators have identified additional subtypes, including mixed, dysexecutive, and visuospatial (Clark et al., 2013), executive (Mansbach, Mace, & Clark, 2016; Reinvang, Grambaite, & Espeseth, 2012), dysnomic (Edmonds et al., 2015), and undifferentiated (Mansbach, Mace, & Clark, 2016). Individuals who do not fit into any subtype are sometimes said to have subjective cognitive decline (SCD; Bondi & Smith, 2014).

Despite the research categorizations of MCI and its various subtypes, in its recent position statement on cognitive decline, the European Innovation Partnership for Active and Healthy Ageing (EIPAHA) failed to mention MCI subtypes at all (Apostolo et al., 2016). This lack of agreement regarding subtypes makes MCI diagnosis extremely challenging. In fact,
Saunders and colleagues (2017) have gone so far as to suggest that, because the concept of MCI continues to evolve, it is not at a point where it can be embedded into typical clinical practice. Further complicating matters, the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM–5; American Psychiatric Association, 2013) has added the diagnostic category of mild neurocognitive disorder (mNCD) in an effort to capture the stage of pre-dementia cognitive decline. Although the criteria for the diagnosis of mNCD are similar to those for MCI, they are not identical, and the terms cannot be used interchangeably.

In the search for more objective diagnostic criteria for MCI, multiple studies using neuroimaging and other methods for examining the nervous system have been conducted. These investigations have revealed neuroanatomic and neurophysiologic evidence to support the existence of MCI and its behavioral subtypes (Albert et al., 2011; Bondi & Smith, 2014; Breitner, 2014; Eliassen et al., 2017; Petersen, 2011; Roberts & Knopman, 2013; Roberts et al., 2014; Rosenberg et al., 2011; Salmon & Bondi, 2009); however, a joint taskforce of the National Institute on Aging (NIA) and the Alzheimer’s Association (AA) concluded that the biomarkers are insufficiently characterized to be used in routine clinical practice at this time (Albert et al., 2011). In addition, some of the methods for examining for biomarkers, e.g., positron emission tomography and cerebrospinal fluid analysis (requiring lumbar puncture), are costly and, possibly invasive. Therefore, MCI is diagnosed in clinical settings primarily through behavioral testing.

For the purpose of establishing consistent identification criteria, the NIA-AA taskforce, established four criteria for the diagnosis of MCI: a) change in cognition over time noted by the individual or others; b) impairment in one or more cognitive domains (attention, memory, executive function, language, and/or visuospatial skills) based on a score >1.5 SD below the
mean on a given assessment; c) preserved independence in functional abilities (activities of daily living [ADLs]) with a possible mild decrease in performance on complex tasks (instrumental activities of daily living [IADLs]); and d) changes that are mild enough so that the patient does not meet diagnostic criteria for dementia (Albert et al., 2011). The NIA-AA criteria, while very clear, are still different than traditional and comprehensive neuropsychological testing, which requires that examinees score with >1.5 standard deviation (SD) below the mean on one measure or >1 SD below the mean on at least two measures (Clark et al., 2013). The differences in scoring between the NIA-AA recommendations and traditional clinical practice could potentially lead to confusing or inconsistent diagnostic results.

The behavioral assessment that is used most often for the diagnosis of MCI (and AD) is the Mini Mental State Examination (MMSE; Chapman et al., 2016: Folstein, Folstein, & McHugh, 1975). In a recent review of clinical trials in AD that were active or recruiting, Chapman and colleagues (2016) found that 64 of the 111 trials that they identified (57.7%) were using the MMSE to determine eligibility for the trial. However, in a rapid review of studies reporting the use of cognitive screening instruments in MCI, Diaz-Orueta et al. (2017) identified 153 different instruments. Therefore, while use of the MMSE is very common, it is not the only cognitive assessment tool that is being administered for the purpose of MCI diagnosis, at least in research studies. However, regardless of the instrument that is used, the focus of behavioral testing for MCI has been on cognitive abilities. In a recent systematic review of dementia practice guidelines from around the world, it was found that there was consensus among 8 of the 12 guidelines that cognition be tested (Ngo & Holroyd-Leduc, 2015). This is not surprising, in light of the emphasis on cognitive abilities in the subtyping of MCI (i.e., which cognitive domain and how many domains are affected). However, as noted earlier, there are four criteria for the
diagnosis of MCI, and cognition represents only two of those criteria. Another criterion is preserved independence in ADLs with possible mild impairment in IADLs. Therefore, a screening for MCI should include a measure of functional abilities, as well as cognitive abilities. As with the assessment of cognition, a variety of different assessment tools have been used for this purpose in research studies. In a meta-analysis aimed at examining the relationship between cognition and functional status in MCI, McAlister and colleagues (2016) identified more than 70 tools that have been used for assessing functional abilities. These included direct observation of the individual, self-report, and informant-report tools.

It is clear from the above review that there are many issues that need to be resolved regarding the diagnosis of MCI. It is also clear that there are many screening tools that could be used in routine clinical practice for assessing for MCI. Although speech-language pathologists (SLPs) do not diagnose MCI independently, they frequently receive referrals to evaluate older individuals with suspected cognitive impairment who they might then refer to a neurologist for further evaluation and possible diagnosis of MCI or AD. Despite the challenges and controversies surrounding the disorder, SLPs must follow through on these referrals, yet it is unclear which of the many existing tools they should choose in order to screen for a potential problem. One possibility is the Cognitive-Linguistic Quick Test (CLQT; Helm-Estabrooks, 2001). An advantage of the CLQT is that it assesses the five cognitive domains of attention, memory, executive function, visuospatial skills, and language. Thus, information from the CLQT might provide information that could be helpful for the differential diagnosis of MCI subtypes, unlike the MMSE, which provides only a single total score. In addition, the MMSE has been shown to have poor sensitivity for mild impairment (Crum, Anthony, Bassett, & Folstein, 1993; Mamikonyan et al., 2009; Mitchell, 2009; Nazem et al., 2009; O’Bryant et al., 2008; Pendlebury,
Cuthbertson, Welch, Mehta, & Rothwell, 2010; Sikaroodi, Yadegari, & Miri, 2013; Stead & Collins, 2009; Toglia, Fitzgerald, O’Dell, Mastrogiovanni, & Lin, 2011; Tombaugh & McIntyre, 1992; Woodford & George, 2007; Zadikoff et al., 2008), whereas the CLQT might have better sensitivity to mild cognitive impairments because it was designed to accommodate a variety of severity levels.

**Purpose**

The purpose of the current study was to determine if the MMSE and the CLQT identify the same individuals as having possible MCI. In addition, the Eight Item Interview to Differentiate Aging and Dementia (AD8; Galvin et al., 2005) was used as a self-report questionnaire of daily activities to determine whether individuals who demonstrated impaired performance on the cognitive measures demonstrated typical functional abilities, meeting a criterion for the differential diagnosis of MCI from AD (Albert et al., 2011).

**Methods**

**Design**

The current study used a non-experimental, repeated measures design. Participants were assessed by the researcher, who administered all three instruments, the AD8, MMSE, and CLQT, in one session to each participant. The target population included community-dwelling adults aged 70 or older for whom there was a risk for cognitive impairment based upon age alone. Other inclusion criteria included the ability to participate in approximately one hour of testing, the ability to hold and manipulate a pen for the written portions of the MMSE and the CLQT, the ability to independently complete a health history questionnaire and the AD8, and normal or corrected-to-normal vision. Participants were excluded if they had a history of a neurological condition that could have contributed to decreased cognitive abilities.
**Participants**

Participants were recruited from a senior living community. A total of 20 participants consented to participate in the study (2 males; 18 females) ranging in age from 70-90 using procedures approved by the Human Subject Institutional Review Boards of two Midwestern universities where the study was conducted.

**Procedures**

Participants independently completed a health history questionnaire developed by the researcher to identify the presence of any previous neurological condition that had been established as an exclusion factor. The subjective measure, the AD8, also was completed at this time. The order of administration of the MMSE and the CLQT was counterbalanced across participants. Assessments were not scored by the researcher until the full testing session was completed to limit bias.

**AD8 Administration and Scoring.** Participants were given a pen and the AD8 form to complete as a self-report. The researcher asked participants to read each item and mark yes or no in the respective columns, if they had noticed a change in their abilities to complete each task. The total number of items that indicated a change in function by the participant was calculated after the testing session was complete. A cut-off score of 1 was used to indicate likely cognitive decline, which is the cut-off score for participants who are self-reporting according to the most recent literature (Galvin, Roe, Coats, & Morris, 2007; Galvin, Roe, Ziong, & Morris, 2006).

**MMSE Administration and Scoring.** The researcher administered the MMSE (Folstein, Folstein, & McHugh, 1975) to all participants in the pre-determined and counterbalanced order. Most of the test is completed orally, with the exception of writing a sentence and following a direction that involves a piece of paper. All necessary items (i.e., blank piece of paper and a pen)
were provided to the participants. The attention and working memory section of the MMSE allows the clinician (researcher) to either ask the examinee to spell the word “world” backwards or to count backwards from 100 by 7s. This procedure was used consistently across all participants. The total score on the MMSE was calculated after the testing session was complete. A cut-off score of <27 out of 30 was used because most of the participants in the study had a college education, and because only mild deficits were suspected due to the sample of community-dwelling adults. The MMSE can be divided into cognitive domains, although it is often only one question that determines performance in an entire domain. The concern with this is that if participants miss a single item or question, their scores are dangerously close to the MMSE cut-off score leaving little to no room for error.

**CLQT Administration and Scoring.** The CLQT was administered in its entirety of ten subtests by the researcher. Some of the subtests were completed orally, whereas others involved a pen and the CLQT workbook. Testing procedures were completed in accordance with the examiner’s manual. Scores were calculated per the test manual for each of the five cognitive domains (attention, memory, executive function, language, and visuospatial skill), as well as the composite score, after the testing session was complete. Severity ratings then were assigned based on scores and the age of the participant, as prescribed in the testing manual (Helm-Estabrooks, 2001).

**Analysis Methods**

The research question to determine if there was categorical agreement between the three assessment tools was answered using descriptive statistics. This consisted of summarizing the data showing the agreement, or lack thereof, between instruments.
Results

Table 1 displays the participants’ demographic information and test scores. The sample included two men, and 18 women ranging in age from 70-90. Participants reported their education level, with everyone earning at least a high school diploma and 11 participants having some college education. The number of participants who were identified as being at risk for cognitive decline was calculated for each of the three tools.

The AD8 was scored using a cut-off score of 1 based on data reported by the authors of the tool when participants were asked to self-report on their abilities (Galvin et al., 2007). Using this cut-off score, 7 participants were identified as being at risk for cognitive decline with a need for further assessment. The MMSE was scored and analyzed using a cut-off score of <27 out of 30. No participants were identified as possibly having cognitive deficits using the cut-off score of 27. The CLQT identified 3 participants as having a mild impairment based on their composite score. Upon visual inspection of the data, it was found that 6 of the 7 participants who rated themselves as having change on the items on the AD8, scored the highest across all domains on the CLQT and all 6 earned perfect scores on the MMSE. Only one participant was identified by both the AD8 and the CLQT as having possible mild cognitive impairment.

Upon closer inspection of the items most commonly marked by participants as having changed on the AD8, there were three areas that formed a slight trend. Item 2 (“less interest in hobbies or activities”), item 3 (“repeats the same stories over and over again”), and item 4 (“trouble learning how to use a tool, appliance, or gadget”) were each marked three times by the seven participants who reported any change.

The items missed on the MMSE and the CLQT were also examined further. There were four participants whose score was less than perfect (4.0) on the CLQT. Three of the four fell
within the range of mild impairment. Participant 4 (P4) scored in the moderate range for attention and the mild range for visuospatial skills on the CLQT and missed the attention/working memory item on the MMSE of spelling ‘world’ backwards. P12 also missed that item on the MMSE and scored in the mild range of impairment for attention, visuospatial skills, and memory on the CLQT. P19 was unable to spell ‘world’ backward accurately on the MMSE, however, the only domain score below normal on the CLQT was attention. P18 scored 30/30 on the MMSE, but in the mild range for attention, memory, executive function, and language on the CLQT.

Table 1

<table>
<thead>
<tr>
<th>Participant</th>
<th>Gender</th>
<th>Age Range</th>
<th>Highest Level of Education</th>
<th>AD8 Score (0-8)</th>
<th>MMSE Score (0-30)</th>
<th>CLQT Severity (1.0-4.0)</th>
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<tbody>
<tr>
<td>1</td>
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<tr>
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<td>30</td>
<td>4.0</td>
</tr>
</tbody>
</table>

* indicates participants who scored below cut-off score; * indicates participants who were identified as at risk for or with cognitive deficits by one assessment; ** indicates participates who were identified by two assessments. AD8 scoring: 0 = within normal limits; MMSE scoring: 27+ = within normal limits; CLQT scoring: 3.5+ = within normal limits
Discussion

The three tools that were used in the study did not consistently identify the same participants as being at risk for cognitive impairment. Upon closer inspection of the items most commonly marked as having changed on the AD8, there were three areas that formed a slight trend. Item 2 (“less interest in hobbies or activities”), item 3 (“repeats the same stories over and over again”), and item 4 (“trouble learning how to use a tool, appliance, or gadget”) were each marked by three of the seven participants who reported any change. There are reasons why a person may experience less interest in hobbies or activities that may or may not be related to MCI or any of its subtypes, such as depression and stress (Caselli et al., 2014). Furthermore, with the rapid rate of technological advances, it is possible that item 4 was marked due to uncertainty or anxiety regarding new technology, rather than due to a true difficulty in learning to use these items. Using the recommended cut-off score of 1 for self-report (Galvin et al., 2007), if participants marked a single item as having changed, their scores classified them as being at risk for cognitive impairment. Perhaps this is why the authors continue to recommend a cut-off score of 2 in the version of the AD8 they make publically available.

The 2007 study conducted by the authors of the AD8 and cited above revealed that the cut-off scores that provided the best sensitivity and specificity differed based on whether the tool was completed by the person him/herself (cut-off of 1) or an informant (cut-off of 2; Galvin et al., 2007). However, the current, publically available version of the tool does not specify a different cut-off score based on who completes the tool (Galvin et al., 2005). If the AD8 cut-off is raised to 2 to be consistent with guidelines described in the publically available version of the tool, 4 of the 20 participants, rather than 7, would be identified as having possible MCI. Those
participants who would no longer be categorized as impaired on the AD8 based a cut-off of 2 also demonstrated normal MMSE and CLQT scores.

Previous literature has been conflicting regarding the use of self-report tools for the diagnosis of cognitive decline. While some studies have shown that self-report tools are necessary and quite accurate, particularly for input on IADL function (Helmes & Klinger, 2017; Martyr & Clare, 2018), there is often inherent bias from the self-reporter related to demographic factors, mental health, and simply their perceived competence (Kempen, Steverink, Ormel, & Deeg, 1996). Other studies have shown that input from another informant, such as a close family member or caregiver, is more highly correlated with scores on neuropsychological tests than the information from the patients themselves (Gavett, Dunn, Stoddard, Harty, & Weintraub, 2011). Furthermore, Howland and colleagues (2017) reported that while patients and their informants often agree on ADL function, they do not share as much agreement on cognitive function (domains) overall. Martyr and Clare (2018) reported that self-reports of cognitive function are actually more accurate than information provided by someone other than the individual suggesting that individuals with impairments may actually be quite aware of their status. This information leaves researchers and clinicians with the lingering problem of uncertainty surrounding the usefulness of self-reported information for the purpose of diagnosis of cognitive decline.

Surprisingly, participants who self-reported the most negative changes on the AD8 were the individuals who had the highest composite scores on the CLQT. Evidence has shown that even in its earliest stages, individuals are aware and notice the subtle differences in their abilities (Kalbe et al., 2005). In fact, individuals with MCI may even overestimate their changes in cognitive function in comparison to their caregivers’ assessment, whether the changes are simply
age-related, or fall in the range of abnormal (Kalbe et al., 2005). Conversely, individuals with Alzheimer’s disease are often described as having anosognosia, or a denial of illness (Vogel et al., 2004). While that is not the population investigated in this study, it is of interest if MCI is considered a transition phase leading to Alzheimer’s disease. Clinicians should question whether individuals who rate themselves as having noticed the most change in cognitive abilities and ADLs are entering the mildest stage of cognitive decline, because these earliest changes may not be identified through objective measures administered by the clinician. It is also important to note that individuals who do score in the range of cognitive impairment on objective measures, but are showing a lack of awareness of their deficits, may have transitioned beyond the mildest stage of decline. These findings indicate that clinicians should consider using a combination of subjective and objective measures to gain a more holistic picture of function. Future research could employ a longitudinal design in order to more accurately determine if the AD8 can truly predict early decline that may not be detected by other measures until a later time.

Our participants’ scores on the MMSE and the CLQT revealed that there may be some evidence for MCI subtypes. Three of the four participants who were unable to spell ‘world’ backward also demonstrated impairments in attention on the CLQT, which might suggest a non-amnestic form of MCI. However, one of those participants also scored in the mild range of impairment on memory. Saunders and Summers (2010) found that approximately one-third of individuals who subjectively self-reported a form of MCI experienced deficits with attention and working memory without an objective deficit in short- or long-term memory. The authors suggested that perhaps a non-amnestic form of MCI (naMCI) could be, in fact, a precursor to aMCI, or perhaps it is altogether different and a prodromal phase of a separate neurodegenerative condition. Consequently, a diagnosis is still not clear due to the lack of clarity or agreement in
the literature over the nature of MCI or the possibility of subtypes. The participants mentioned above may be considered to have non-amnestic MCI (naMCI), multi-domain MCI, or perhaps subjective MCI. However, this statement should be interpreted with caution due to the low number of participants in this study.

The results of this study cannot be interpreted as directing clinicians toward or away from any of the instruments used because of the differences in the types of information that is learned from each. Rather, clinicians should realize the differences in the information provided through each type of assessment in order to appropriately interpret the results. This could be even more of value if clinicians move more toward referring patients to their physicians or neurologists based upon signs of the specific MCI subtypes (e.g., aMCI, naMCI, exMCI). It is possible that different tools should be chosen based upon not only the prospect of having MCI, but also which subtype is suspected if the clinical field follows the current trends in the research of defining subtypes (Saunders et al., 2017). Some measures, such as the MMSE, do not provide detailed scores about specific cognitive domains due to the limited number of test items, which may lead clinicians to a premature diagnosis of an MCI subtype. Clinicians must also understand that there is some disagreement in the literature with regard to overall cut-off scores, particularly for the MMSE. Another concern with the MMSE is that the item of spelling ‘world’ backward comprises a possible 5 out of 30 points or 17% of the total score. As a result, someone could be classified as having MCI based on a single item on the MMSE, which does not account for the potential for academic difficulty in the person’s history.

There were several weaknesses to this study that should be addressed in future research. First, the sample was a small convenience sample, and it was predominantly female. More males should be recruited to portray the aging population more accurately. Also, while the AD8 has
been studied as a self-report instrument, there is always the potential for bias when participants are asked to report on themselves or their level of function. There are two items that can be exchanged on the MMSE, spelling ‘world’ backwards and counting backward by 7 from 100. It has been shown that participants typically perform more poorly on the counting task than on the spelling task (Hawkins, Corner, Piotrowski, & Pearlson, 2011), so if that task had been chosen rather than the spelling task, perhaps the MMSE scores would have turned out differently.

A weakness of the study is that the true cognitive status of the participants was unknown. The participants were community-dwelling and independently completed a health history questionnaire; however, some of them could have been in the earliest stages of MCI despite these factors. Compounding this problem is that data collection involved a one-time assessment. It has been shown that adults vary in their test performance from day to day (Darby, Maruff, Collie, & McStephen, 2002); thus, had the participants been tested multiple times at multiple time points throughout the day, the scores they earned might have moved them in and out of the impaired/normal classification with each administration. These weaknesses limit the ability to draw firm conclusions about both the utility of the tools for detecting MCI and how well the tools agree.

The strengths of the study included that the sample was unique compared to previous research that has compared the MMSE and the CLQT in populations with existing clinical diagnoses. This study focused on participants without such diagnoses with the hypothesis that researchers would still see variation of scores in community-dwelling, older adults. This type of study is needed to investigate identification of MCI in its earliest stages. In addition, although it was a one-time observation, this is how typical clinical evaluations are conducted, so it
represented real-world procedures. Finally, this was the first study to compare the CLQT to a self-report or informant-report measure, the AD8.

Future research could include a larger sample size with a more diverse clinical population. Consideration should also be given to include a caregiver report using the AD8, along with independent self-report, to determine the level of agreement or difference between individuals with MCI who may or may not be sensitive to the changes they are experiencing and the perspectives of their significant others. Cut-off scores for the AD8 should be examined using previous recommendations in the literature, but should also be examined for sensitivity and specificity of slightly altered cut-off scores. In fact, future research could include sensitivity and specificity measures for each instrument used to determine the most optimal cut-off scores for identification of individuals with mild cognitive deficits. Additionally, a further examination of ADL and IADL abilities through the use of a more objective assessment should be included to determine the relationship between a person’s self-reported level of function and results from an objective tool (Helmes & Klinger, 2017). Assessment scores should also be examined in a more clinical population where there could be more variance in scores to determine if there are relationships between the different types of cognitive measures.

In conclusion, this study provided evidence that the AD8, MMSE, and CLQT are not consistently identifying the same individuals as being risk for or having mild cognitive impairment. Caution should also be used when making clinical recommendations based on the results of just one assessment tool due to the overall lack of agreement. Consideration should be given to scoring the AD8 using a cut-off score of 2, rather than the most recent recommendation of 1 (Galvin et al., 2005). The AD8 scoring of 2 appears to be more consistent with the CLQT in
the small sample of participants in this study. Overall, the problem of lacking strong assessment evidence for MCI continues.
References


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McAlister, C., Schmitter-Edgecombe, M. & Lamb, R. (2016). Examination of variables that may


CHAPTER III

STUDY TWO

Introduction

Speech-language pathologists (SLPs) employed in skilled nursing facilities (SNFs) often receive referrals to evaluate residents for suspected cognitive deficits. Because SLPs frequently are limited in the amount of time they can spend in evaluation, they need a quick, comprehensive assessment to evaluate cognition. However, it is also important that they be able to distinguish cognitive changes that might be a product of benign normal aging from changes indicative of mild cognitive impairment (MCI). One reason for this is that MCI can be a pre-cursor to Alzheimer’s Disease, or other forms of dementia.

As the population of the United States ages, healthcare professionals face the ongoing challenge of providing services for MCI. In 2011 the National Institute on Aging (NIA) and the Alzheimer’s Association (AA) established a workgroup to revise the past diagnostic criteria from 1984. The diagnostic criteria were formulated so that they are general enough for healthcare practitioners to diagnose without access to medical imaging, testing cerebrospinal fluid, or neuropsychological testing, as well as for medical researchers who do have access to specialized imaging or laboratory tests (Albert et al., 2011; McKhann et al., 2011).

MCI is sometimes described as a transition phase between “normal” cognition and Alzheimer’s disease (AD)/dementia with approximately 10-15% of individuals with MCI progressing to a dementia diagnosis within 1-2 years (Mitchell & Shiri-Feshki, 2009; Ritchie, 2004; Roberts & Knopman, 2013). Although variability exists between studies, it has also been found that nearly 20% of individuals with MCI recovered to a “normal” level of cognition, and approximately 60% of individuals did not improve or deteriorate (Matthews et al., 2008;
Mitchell & Shiri-Feshki, 2009). This indicates that those with MCI are a heterogeneous group with a spectrum of possible outcomes following identification. The MCI diagnostic criteria, as determined by the NIA/AA workgroup (Albert et al., 2011), are: “a) change in cognition noted by the individual or others; b) impairment in one or more cognitive domains (attention, memory, executive function, language, and/or visuospatial skills); c) preserved independence in functional abilities (activities of daily living [ADLs]), but the possibility for mildly decreased in performance on complex tasks (instrumental activities of daily living [IADLs]); and d) changes are mild enough that the patient does not meet diagnostic criteria for dementia” (Albert et al., 2011, pg. 3-4). See Table 2 for a comparison between MCI and AD/dementia criteria.

Table 2  
*Clinical Diagnostic Criteria for MCI*  
MCI (Albert et al., 2011)  
1- Concern over change in cognition by the patient or someone close to the patient  
2- Impairment in 1+ cognitive domains  
3- Preserved ADL function with possible mild impairments in IADL function  
4- Cognition slightly below normal, but not diagnosed with dementia

Beyond the clinical diagnostic criteria, attempts have been made to subcategorize MCI. Other categories that have been proposed include amnestic MCI (aMCI), nonamnestic MCI (naMCI), executive dysfunction MCI (exMCI), and versions that were not clearly categorized into one of the above groupings (Eliassen et al., 2017; Rosenberg et al., 2011). Individuals who do not fit into any group are often said to have subjective cognitive decline (SCD; Eliassen et al., 2017). Each subtype has been examined through the measurement of specific biomarkers in MRI, however in standard clinical practice, detailed MRIs and tests for cerebrospinal fluid are rarely possible due to the costly nature of the testing. Therefore, all MCI subtypes are diagnosed
primarily through neuropsychological or cognitive testing; however, when multiple or lengthy assessments are given, there is an increased likelihood of false positives on at least one instrument (Eliassen et al., 2017). This fact further highlights the need for clear and consistent recommendations pertaining to the most appropriate screening instruments.

The assessments and screening instruments that are used most frequently by SLPs to assess cognition do not examine all four criteria that must be met for an MCI diagnosis, nor do they point toward a specific MCI subtype. In addition to traditional cognitive tests, the criterion of ADL and/or IADL performance should be considered during the assessment process. ADLs are defined as basic tasks including eating, bathing, dressing, and toileting, while IADLs are more complex tasks, such as cooking or managing finances (Alzheimer’s Association, 2017). Studies of functional abilities have shown them to decline throughout the course of AD dementia (Suh, Ju, Yeon, & Shah, 2004). While the rate of cognitive change is less in individuals with MCI or mild dementia as compared to AD/dementia, changes in ADL or IADL performance have been reported in the literature (Binegar, Hynan, Lacritz, Weiner, & Cullum, 2009; Farias et al., 2009; Suh et al., 2004). Binegar and colleagues (2009) found that individuals with MCI scored lower in IADL assessment when compared to a normal control group. Decline in IADL function has been seen with impairment of just one cognitive domain, thus the greater number of domains affected and the worse the severity, the greater the possible impairment on IADL function, and eventually ADL function (Farias et al., 2009). The two cognitive domains most commonly associated with decreased IADL abilities are memory and visuospatial skills (Helmes & Klinger, 2017).

The current research team reported results of a previous study (see Chapter 2 of this dissertation) that involved administration of three screening instruments, the Mini-Mental Status
Examination (MMSE), the Eight-Item Instrument to Differentiate Alzheimer’s and Dementia (AD8), and the Cognitive-Linguistic Quick Test (CLQT), to 20 individuals who presented as having “normal” cognition. Of these 20, one participant scored below the cut-off for typical performance on two screening measures, whereas eight participants scored below the cut-off on one of the three screening measures. Two of these instruments, the MMSE and the CLQT, assessed the MCI criterion of the presence of cognitive deficits. Despite measuring similar theoretical domains, the MMSE and the CLQT did not identify the same individuals as having a cognitive impairment using the previously recommended cut-off scores for those instruments. In fact, there were no participants who failed the MMSE. It has been shown that the MMSE lacks sensitivity (Mitchell, 2009; Nazem et al., 2009; O’Bryant et al., 2008; Pendlebury, Cuthbertson, Welch, Mehta, & Rothwell, 2010; Sikaroodi, Yadegari, & Miri, 2013; Stead & Collins, 2015; Toglia, Fitzgerald, O’Dell, Mastrogiovanni, & Lin, 2011; Tombaugh & McIntyre, 1992; Woodford & George, 2007; Zadikoff et al., 2007), and our results appear to support that finding. Alternatively, the Montreal Cognitive Assessment (MoCA) has been shown in the literature to be more sensitive to mild impairments (Nazem et al., 2009; Pendlebury et al., 2010; Sikaroodi, Yadegari, & Miri, 2013). The MoCA will replace MMSE in the current study.

Also in the previous study, participants who rated themselves as having the most difficulty when completing the AD8 actually scored the highest on the CLQT. This is possibly indicative of the AD8 lacking specificity, or the ability to rule out a diagnosis of cognitive impairment, when used as a self-report measure. It also might indicate that people who are high functioning are more sensitive to cognitive changes associated with typical aging.

One weakness of the study reported in Chapter 2 was that the assessment tools that were investigated did not address all four of the criteria required for the diagnosis of MCI. That is,
that study did not include an instrument that assessed the third criterion of changes in IADLs, or complex daily tasks. Another weakness was that, although all participants in the study were living independently and self-reported typical cognition, there was a lack of a gold standard measure of their cognitive status. Thus, we could not assess the sensitivity or specificity of the assessment tools or any other aspects of clinical validity.

**Purpose**

The purpose of the current study was to determine if four commonly used assessment instruments, selected so as to address all four of the criteria required for a diagnosis of MCI, each would identify the same individuals as having mild cognitive deficits. The four assessments that were included were: the Eight-Item Interview to Differentiate Aging and Dementia (AD8) as a self-report and a caregiver/family-report, the Montreal Cognitive Assessment, (MoCA), the Cognitive Linguistic Quick Test, (CLQT), and the Large Allen Cognitive Level Screen – Version 5, (LACLS-5). The assessments chosen for this study are hypothesized to more closely, and in combination, assess the four diagnostic criteria required for a diagnosis of MCI. As in the prior study (see Chapter 2), there were two assessments that purported to measure cognition. However, the MoCA was chosen to replace the MMSE, because of its greater sensitivity for mild cognitive impairments (Nazem et al., 2009; Pendlebury et al., 2010; Sikaroodi, Yadegari, & Miri, 2013). The CLQT was retained because it analyzes participant performance into different cognitive domains. The LACLS-5 was added to this study, because it addresses the criteria of IADLs and ADLs. Another modification for the current study was to include a participant group who had been previously and independently diagnosed as having a mild impairment of their cognitive abilities. This permitted an analysis of the sensitivity and specificity of the assessment tools, along with other measures of clinical validity.
To accomplish purpose, the study addressed the following two research questions:

1. Do individuals who have been previously diagnosed as having a mild impairment of their cognitive abilities meet all four criteria for a diagnosis of mild cognitive impairment as determined collectively by the MoCA, the CLQT, the AD8, and the LACLS-5?

2. What are the sensitivity and specificity and positive and negative likelihood ratios of each assessment for the purpose of diagnosing cognitive impairments using the gold standard of an existing diagnosis from a physician?

Methods

Design

This study employed a within- and between-subjects repeated measures design wherein participants underwent a total of four different assessments during data collection. The testing order was counterbalanced across sessions to control for a possible order effect. Individually, each of the four assessments addresses one MCI diagnostic criterion as displayed in Table 2. Participants were divided into a control group of neurotypical (non-MCI) adults, and an experimental group of adults with a diagnosis of dementia or MCI. The primary outcome measure was concordance among the results of these measures, or the combination of all four tools that may closely align with the NIA/AA criteria.

Instruments

Four assessment instruments were chosen for this study. The instruments were selected based on findings of the previous study (see Chapter 2 of this dissertation), as well as to test the hypothesis that these tools, in combination, will examine the four diagnostic criteria of MCI within the same participants. In order for participants to be identified as having MCI, scores across the instruments will need to be in agreement, because each assesses a different criterion.
**AD8 Administration and Scoring.** The Eight Item Informant Interview to Differentiate Aging and Dementia (AD8; 2005) was chosen due to the self-report, or informant-report, format as suggested in the first of the MCI diagnostic criteria. In this study, AD8 scores were collected from both the participant and a close caregiver as an external informant. If the external informant was unavailable or not present during the data collection session, stamped envelopes addressed to the researcher were left with the participant along with instructions for completion for the other informant. Participants were asked to read each item and mark yes or no if they had noticed a change in their abilities to complete each task. The instrument was scored by counting the number of ‘yes’ responses. A cut-off score of 2 was considered a “fail” to indicate possible cognitive impairment was used for both the self-report and the other informant-report in alignment with the instructions on the published instrument (Galvin et al., 2005).

**MoCA Administration and Scoring.** The Montreal Cognitive Assessment (MoCA; 2005) was chosen for this study due to the fact that it has better sensitivity and specificity compared to the Mini-Mental State Exam (MMSE), especially for mild impairments (Alagiakrishnan et al., 2013; Lonie, Kalu, & Ebmeier, 2010; Nazem et al., 2009; Tsoi, Chan, Hirai, Wong, & Kwok, 2015; Zadikoff et al., 2007). It takes a short time to administer, at ten minutes or less, and is a frequent choice among health care professionals as a measure of global cognition subdivided into visuospatial/executive skills, naming, memory, attention, language, abstraction, delayed recall, and orientation (Nasreddine et al., 2005). The researcher administered the instrument according to the published instructions. The total score out of 30 was calculated following the session. The recommended cut-off score of <26 was considered a “fail” and was an indicator of possible cognitive impairment.
**CLQT Administration and Scoring.** The Cognitive-Linguistic Quick Test (CLQT; 2001) is reported to be an in-depth assessment of cognition. It takes longer to administer, at up to 35 minutes, but provides more information about each of five cognitive domains (attention, memory, language, executive function, and visuospatial skills). This relates to the second diagnostic criterion of MCI where individuals must be impaired in one or more cognitive domains. The CLQT was administered in accordance with the examiner’s manual (Helm-Estabrooks, 2001). Scoring was completed following the session, and criterion-referenced severity ratings were assigned based upon the scores and the age of the participants. Participants who were determined below “within normal limits” based on their severity ratings were considered a “fail” for the purpose of data analysis.

**LACLS-5 Administration and Scoring.** Finally, the Large Allen Cognitive Level Screen-Version 5 (LACLS-5; 2007) assesses the third MCI diagnostic criterion of impairment in IADL function. It is a standardized, performance-based measure of functional cognition (Wesson et al., 2017). The LACLS-5 has been found to be predictive of functional success upon discharge from a medical facility (Velligan et al., 1998), as well as performance on complex, functional tasks (Wesson et al., 2017). The LACLS-5 consists of three visual-motor tasks in the form of leather-lacing. The three tasks increase in difficulty of the demand. Patients are assessed on their abilities to notice mistakes and self-correct, and follow the examiner’s verbal and demonstrated instructions (Allen et al., 2007). The leather-lacing task serves as an indicator of new learning ability, thus cognitive skills such as executive function, planning, and problem-solving are necessary for completion (Mayer, 1988; Velligan et al., 1998).

The researcher instructed and demonstrated each of the three stitches on the leather-lacing task one at a time before asking participants to attempt their stitches per the assessment
manual (Allen, et al., 2007). Scoring is done through observation for whether each stitch was completed correctly, and whether participants were able to self-correct errors. The scores for each stitch were determined immediately during the testing session to accurately account for differences observed during task completion, particularly to account for subtle differences in the correction of errors that may or may not have been apparent later. Scores that fell below 5.0/6.0 were indicative of requiring 22% cognitive assistance (Allen, Blue, & Earhart, 1998), primarily with new tasks, and were considered a “fail” for the purpose of data analysis.

**Participants**

Inclusion criteria for the neurotypical group included: at least 70 years of age, no diagnosis or suspicion of MCI or dementia, the ability to independently complete a health history questionnaire and the AD8, the ability to participate in approximately one hour of testing, the ability to hold and manipulate a pen for the written portions of the MoCA and the CLQT. The other participant group included people who were: at least 70 years of age, who had a diagnosis of MCI or mild dementia, and who met all of the other criteria for both groups. Individuals with mild dementia were included along with MCI to account for the fact that dementia is a more routinely diagnosed condition in the geographical area where the study took place. Many physicians diagnose patients with dementia even if the symptoms are more closely matched to MCI (Knopman & Petersen, 2014). This group was used in lieu of a gold standard of neuropsychological testing for statistical analysis because of their established diagnosis. Exclusion criteria included: having a neurological condition, such as history of a stroke or Parkinson’s disease; dementia beyond a mild severity level; and an inability to complete the study protocol. Finally, individuals who were not their own legal representatives with decision-
making capacity would not have been able to provide informed consent, therefore they were not included in the study.

Table 3  
**Assessments Chosen Based on Whether They Are Designed to Detect 1+ MCI Criterion**

<table>
<thead>
<tr>
<th>Test</th>
<th>Areas of Assessment</th>
<th>MCI Criterion</th>
<th>Examples of Assessment Questions/Subtests</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD8: Self-report or other informant report</td>
<td>Change in thinking over time</td>
<td>1-Concern over change in thinking</td>
<td>“Repeats the same things over and over (questions, stories, or statements)”; “Trouble handling complication financial affairs (e.g., balancing checkbook, income taxes, paying bills)”</td>
</tr>
<tr>
<td>CLQT</td>
<td>Attention Memory Executive Function Language Visuospatial Skills</td>
<td>2-Impairment in 1+ cognitive domains</td>
<td>10 subtests: Personal Facts Symbol Cancellation Confrontation Naming Clock Drawing Story Retelling Symbol Trails Generative Naming Design Memory Mazes Design Generation</td>
</tr>
<tr>
<td>LACLS-5</td>
<td>ADLs/IADLs</td>
<td>3-Preserved ADL performance; mild impairments in IADL function</td>
<td>Leather-lacing stitches</td>
</tr>
<tr>
<td>MoCA</td>
<td>Global cognition</td>
<td>4-Cognition below normal, but not diagnosed with dementia</td>
<td>8 sections: Visuospatial/Executive Naming Memory Attention Language Abstraction Delayed Recall Orientation</td>
</tr>
</tbody>
</table>

*AD8 = Eight Item Informant Interview to Differentiate Aging and Dementia (Galvin et al., 2005)*  
*MoCA = Montreal Cognitive Assessment (Nasreddine et al., 2005)*  
*CLQT = Cognitive Linguistic Quick Test (Helm-Estabrooks, 2001)*  
*LACLS-5 = Large Allen Cognitive Level Screen (Allen et al., 2007)*
Participants were recruited from a senior living community, and from the community. A power analysis using G*Power software (Faul, Erdfelder, Lang, & Buchner, 2007), was conducted to inform the decision about sample size and verified by the detailed sample size table in Cohen (1992), it was determined that 12 participants were needed in each group ($N=24$) for 80% power with a .05 significance criterion ($\alpha$), and a medium effect size (ES). Recruitment flyers were distributed at a senior living community, as well as amongst a group of retirees, and via word of mouth. The examiner was unaware of which group participants would fall into until the session began and the participant completed the health history questionnaire. Based on the power analysis, we were aiming for two groups of 12. At the point during data collection when 24 participants had been tested, the groups were not equal with 11 typical participants and 13 participants with MCI. Recruitment continued until the two groups were equal with 13 in each. All participants lived independently in their homes or in a senior living community.

Each participant completed a health history questionnaire with information about current medical diagnoses, whether any chronic conditions such as hypertension and diabetes were controlled, and any current medications. The medication list served to verify information provided regarding medical diagnoses. In particular, if participants stated they did not have a diagnosis of MCI or dementia, it would have been unexpected for them to be prescribed a cognition-enhancing medication. In addition, hearing thresholds were obtained for each participant and they were asked whether or not they wore hearing aids.

This study protocol was approved by the Human Subjects Institutional Review Boards of two Midwestern universities where the study was conducted. All participants provided informed consent for participation in the study.
Analysis Methods

Descriptive statistics were computed to describe and summarize the data. The number and proportion of participants who failed each assessment was calculated. The data were then visually inspected to determine whether the participants who had been previously diagnosed with a cognitive impairment met all four criteria for the diagnosis of MCI as determined by the assessment tools.

Results

Table 4 displays demographic information, as well as test scores for each participant. The sample included 18 females and 8 males ranging in age from 70-90. Out of 26 total participants, 13 had a previous diagnosis of MCI or mild dementia, while the other 13 reported no existing cognitive impairment. Hearing thresholds were obtained for each participant. In total, 8/13 participants in the non-MCI group had a hearing loss and 4/8 wore hearing aids, and 10/13 participants in the MCI group had a hearing loss and 4/10 wore hearing aids.

The AD8 was administered and analyzed in two separate conditions as a self-report measure, and also as reported by another informant (e.g., close family member). The AD8 was first scored using a cut-off score of 2 per the recommendations on the tool (Galvin et al., 2005). Based on this cut-off score, only 38% (n = 5) of participants in the MCI group were identified as being at risk for cognitive decline, but 85% (n = 11) of those in the non-MCI group met the criteria for passing. Sensitivity and specificity measures for the AD8-self report were .38 and .85, respectively, demonstrating poor sensitivity but adequate specificity. The second condition using the AD8 involved completion of the AD8 by a close family member. The other informants’ ratings indicated that 92% (n = 12) of participants in the MCI group were identified as being at risk for cognitive decline, and only 23% (n = 3) of the non-MCI group failed when rated by
others. The AD8-other report, thus, was the closest to meeting the standard of at least .80 for both sensitivity and specificity with values of .92 and .77, respectively.

Table 4

Gender, Age, and Test Scores of All Participants

<table>
<thead>
<tr>
<th>Participant</th>
<th>Diagnosis</th>
<th>Gender</th>
<th>Age Range</th>
<th>AD8 Self</th>
<th>AD8 Other</th>
<th>MoCA</th>
<th>CLQT</th>
<th>LACLS-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MCI</td>
<td>F</td>
<td>76-80</td>
<td>P</td>
<td>F</td>
<td>F</td>
<td>P</td>
<td>F</td>
</tr>
<tr>
<td>5</td>
<td>MCI</td>
<td>F</td>
<td>86-90</td>
<td>F</td>
<td>P</td>
<td>F</td>
<td>P</td>
<td>F</td>
</tr>
<tr>
<td>6</td>
<td>MCI</td>
<td>F</td>
<td>76-80</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>9</td>
<td>MCI</td>
<td>F</td>
<td>86-90</td>
<td>P</td>
<td>F</td>
<td>F</td>
<td>P</td>
<td>F</td>
</tr>
<tr>
<td>10</td>
<td>MCI</td>
<td>F</td>
<td>76-80</td>
<td>P</td>
<td>F</td>
<td>F</td>
<td>P</td>
<td>F</td>
</tr>
<tr>
<td>11</td>
<td>MCI</td>
<td>F</td>
<td>76-80</td>
<td>P</td>
<td>F</td>
<td>F</td>
<td>P</td>
<td>F</td>
</tr>
<tr>
<td>12</td>
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<td>76-80</td>
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<td>F</td>
<td>P</td>
<td>F</td>
</tr>
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<td>F</td>
<td>F</td>
<td>P</td>
<td>F</td>
</tr>
<tr>
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<td>MCI</td>
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<td>86-90</td>
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<td>F</td>
<td>P</td>
<td>F</td>
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<td>F</td>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>21</td>
<td>MCI</td>
<td>F</td>
<td>81-85</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>22</td>
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<td>86-90</td>
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<td>P</td>
<td>F</td>
</tr>
<tr>
<td>24*</td>
<td>MCI</td>
<td>F</td>
<td>81-85</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>F</td>
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<td>P</td>
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<td>F</td>
<td>70-75</td>
<td>P</td>
<td>P</td>
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<td>P</td>
<td>P</td>
</tr>
<tr>
<td>8</td>
<td>none</td>
<td>F</td>
<td>81-85</td>
<td>P</td>
<td>F</td>
<td>P</td>
<td>P</td>
<td>F</td>
</tr>
<tr>
<td>13</td>
<td>none</td>
<td>F</td>
<td>76-80</td>
<td>P</td>
<td>F</td>
<td>P</td>
<td>P</td>
<td>F</td>
</tr>
<tr>
<td>17</td>
<td>none</td>
<td>M</td>
<td>70-75</td>
<td>P</td>
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<tr>
<td>19*</td>
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<td>M</td>
<td>70-75</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>20*</td>
<td>none</td>
<td>F</td>
<td>70-75</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>23</td>
<td>none</td>
<td>F</td>
<td>86-90</td>
<td>P</td>
<td>F</td>
<td>P</td>
<td>P</td>
<td>F</td>
</tr>
<tr>
<td>25*</td>
<td>none</td>
<td>M</td>
<td>76-80</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>26</td>
<td>none</td>
<td>F</td>
<td>70-75</td>
<td>F</td>
<td>F</td>
<td>F</td>
<td>P</td>
<td>P</td>
</tr>
</tbody>
</table>

F = fail per the recommended test score cut-off; P = pass per the recommended test score cut-off; * indicates all five measures were failed; + indicates all five measures were passed

The MoCA was scored and analyzed using a cut-off score of <26 per the scoring guidelines (Nasreddine, 2010). This cut-off score identified 92% (n = 12) of participants in the MCI group as having cognitive deficits, but 46% (n = 6) of the non-MCI group also were identified by the MoCA as being at risk. Sensitivity and specificity measures were calculated to be .92 and .54,
respectively, suggesting good sensitivity but problems with specificity. The sensitivity and specificity measures for the CLQT were .23 and .92, respectively, showing inadequate sensitivity. The CLQT identified 23% (n = 3) of MCI participants as having a mild impairment; however one participant was in the non-MCI group. The LACLS-5 scores were analyzed using a cut-off score of 5.0 as indicative of impairment. This correlates to a need for 22% cognitive assistance according to Allen, Blue, and Earhart (1998). Measures of sensitivity and specificity for LACLS-5 were deemed to be .85 and .62, respectively. Cut-off scores at this level identified 85% (n = 11) of the MCI group as having cognitive decline that was significantly affecting ADL and/or IADL function. There were also 38% (n = 5) non-MCI participants who fell below the score of 5.0 falling in line with the lower specificity on this instrument.

Table 5
Percentages of Fail Rates by Group and Test

<table>
<thead>
<tr>
<th></th>
<th>AD8-self</th>
<th>AD8-other</th>
<th>MoCA</th>
<th>CLQT</th>
<th>LACLS-5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MCI</strong></td>
<td>5/13 (38%)</td>
<td>12/13 (92%)</td>
<td>12/13 (92%)</td>
<td>3/13 (23%)</td>
<td>11/13 (85%)</td>
</tr>
<tr>
<td><strong>Non-MCI</strong></td>
<td>2/13 (15%)</td>
<td>3/13 (23%)</td>
<td>6/13 (46%)</td>
<td>1/13 (8%)</td>
<td>5/13 (38%)</td>
</tr>
</tbody>
</table>

A post-hoc analysis of the MoCA and the CLQT scores were examined for agreement between the two based on the fact that both are measures of global cognitive function. Overall, the two tools agreed on only 11/26 (42%) total participants, with the MoCA identifying 12/13 (92%) in the MCI group and the CLQT identifying 3/13 (23%) in the MCI group. The MoCA, however, also identified 6/13 participants in the non-MCI group, which is a problem.
Table 6
Sensitivity, Specificity, PPV, and NPV by Assessment/Condition

<table>
<thead>
<tr>
<th>Assessment/Condition</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>PPV</th>
<th>NPV</th>
<th>LR+</th>
<th>LR-</th>
</tr>
</thead>
<tbody>
<tr>
<td>AD8 – self-report</td>
<td>.38</td>
<td>.85</td>
<td>.71</td>
<td>.58</td>
<td>2.53</td>
<td>.73</td>
</tr>
<tr>
<td>AD8 – other-report</td>
<td>.92</td>
<td>.77</td>
<td>.80</td>
<td>.91</td>
<td>4.00*</td>
<td>.10**</td>
</tr>
<tr>
<td>MoCA</td>
<td>.92</td>
<td>.54</td>
<td>.67</td>
<td>.88</td>
<td>2.00</td>
<td>.15</td>
</tr>
<tr>
<td>CLQT</td>
<td>.23</td>
<td>.92</td>
<td>.75</td>
<td>.57</td>
<td>2.88</td>
<td>.84</td>
</tr>
<tr>
<td>LACLS-5</td>
<td>.85</td>
<td>.62</td>
<td>.69</td>
<td>.80</td>
<td>2.24</td>
<td>.24</td>
</tr>
</tbody>
</table>

* indicates a moderately positive LR+; ** indicates an extremely negative LR-

Statistical analyses included determining sensitivity and specificity for each instrument, as well as positive and negative predictive values (PPV and NPV, respectively) for all assessments. Sensitivity and specificity indicate the number of true positive and negatives the test can identify, but clinically, it is often of more value to know the likelihood that those who test positive truly have the condition (PPV) and that those who test negative truly do not have the condition (NPV). In addition, positive and negative likelihood ratios (LR+ and LR-, respectively)
were calculated for all assessments. Likelihood ratios were derived after sensitivity and specificity were measured to control for the effects of base rate (percentage of people with the condition out of a given sample; Dollaghan, 2011). The likelihood ratios show how likely a person is to have a disease or condition. The higher the value, the more likely a person is to have the condition. A low ratio means they likely do not have the condition. The LR+ and LR- values account for both true positives or negatives, as well as false positive or false negatives. Table 6 includes all values for sensitivity, specificity, PPV, NPV, LR+, and LR-. The AD8 as reported by a close family member had the strongest sensitivity, specificity, PPV, and NPV, as well as the strongest LR+ and LR-.

**Discussion**

There was some agreement as to whether participants passed or failed each assessment, but rarely across all five tests. Only two participants in the impaired group were identified as having cognitive deficits by all five instruments. It was hypothesized that this combination of assessments would work in tandem to ensure that participants being tested for possible MCI were examined for each of the MCI diagnostic criteria established by the NIA/AA. In order for participants to meet the criteria for a diagnosis of MCI, they should fail the LACLS-5 (ADL function intact with possible mild declines in IADL function). In addition, they should fail an assessment of global cognition (either the MoCA or the CLQT), and have a subjective complaint themselves or from a close informant (AD8). However, if only the data from the AD8-other report, MoCA, and LACLS-5 are used (which would meet the criteria for the diagnosis of MCI) then 10/13 (77%) of those previously diagnosed would be correctly identified as having MCI, 6/13 (46%) of the non-MCI group would be correctly identified as not experiencing cognitive decline.
Although subjective measures like the AD8 should always be questioned for inherent or personal bias, the results from the close family members of participants in this study were found to have the strongest positive and negative likelihood rations of any instrument used. In previous literature, close informant reports of cognitive function were highly correlated with neuropsychological testing (Gavett, Dunn, Stoddard, Harty, & Weintraub, 2011). The sensitivity for the AD8-other report was .92, and the specificity was .77. Typically, instruments with sensitivity and specificity values of at least .80 are considered to be valid. This result shows that if close family members are not noticing subtle changes in the function of their loved ones, it is likely that they are accurate in the information they are providing. However, for participants in the impaired group, family members may have rated their loved ones as having more overall difficulty because they were aware of the existing diagnosis of dementia. Most subjective assessments rely on the self-reporting of information, but it has been deemed that it is best practice to ask a close family member to report, as well, to verify the information (Helmes & Klinger, 2017). In this study, participants and their close informants agreed 61% of the time (16/26). Because there is still nearly 40% lacking agreement, and because the sensitivity and specificity values were the strongest for the AD8-other report, strong consideration should be given to the inclusion of a close family member of caregiver during the clinical interview. The AD8-other report, for the purposes of this study, could capture the criterion of “subjective complaint by someone close to the patient” from the NIA/AA workgroup (Albert et al., 2011).

Our results from the AD8 when used as a self-report measure may also be in line with the previous literature. One participant met the criteria for MCI for all measures except for the AD8 completed using self-report, which could be explained by previous literature which found that individuals with advancing cognitive decline often display anosognosia, or a denial of deficits
(Vogel et al., 2004). That is not the case for everyone, however, as eight participants with reported cognitive impairment did self-identify at least one change in their cognitive function. Conversely, it is also of interest, that four participants who did not report a diagnosis of MCI or mild dementia indicated that they have experienced some degree of change. This finding could be consistent with literature regarding persons with the mildest impairments being very aware, perhaps even more aware than their caregivers, of the subtle changes they are beginning to experience (Kalbe et al., 2005; Vogel et al., 2004). Additionally, it has been shown that individuals who self-report on their cognitive abilities are often influenced by combinations of age, demographic factors, depression, and even their own perceived competence completing functional activities, such as IADLs (Kempen, Steverink, Ormel, & Deeg, 1996). The wide variability in individuals’ abilities to show awareness of their deficits and to self-report cognitive changes supports the use of the AD8-other report form of the assessment, rather than self-report.

The CLQT was found to have the lowest combined sensitivity and specificity, as well as PPV and NPV out of the objective assessments used. While this finding was surprising, it can perhaps be explained when looking back at the sample for the CLQT validation studies. The CLQT was validated on a clinical population of 38 individuals with neurological dysfunction; eight had Alzheimer’s Disease (CLQT Examiner’s Manual, 2001). While the severity of the participants was not described, their mean scores on each subtest were lower than the mildly impaired population who participated in this study. In addition, in order to score in the mild severity range on the CLQT, one must fall below the normal range in two domains of cognition. The NIA/AA MCI diagnostic criteria the requires that only one domain may be impaired for a diagnosis of MCI. If just one domain of impairment is considered, participants 1, 14, and 22 would also “fail”, which would alter the sensitivity, specificity, PPV, and NPV of the CLQT. It
is possible that the CLQT does have utility for identifying more severe levels of cognitive
decline, beyond the very mild stage, but as shown in this study, it may be lacking sensitivity for
the mildly impaired population by requiring that two or more domains must fall below the range
of normal in order to be classified as anything other than “within normal limits”.

The finding of only 42% agreement between the MoCA and the CLQT was interesting,
since both tools are theoretically measures of global cognitive function. It may be that the length,
or the number of questions, of the assessment is a possible factor to account for the differences
between the two measures. The MoCA includes only one or two items for each cognitive domain
or skill, while the CLQT has different combinations of multiple subtests to compute each
cognitive domain score. Different cognitive domains are assessed in multiple, different ways, so
participants may have the opportunity to use their relative strengths to bolster their overall
domain score. For example, if attention is assessed via the auditory modality and the visuospatial
modality, a relative strength in visuospatial tasks may increase the overall attention score. It is
possible that the MoCA may be inaccurately capturing non-MCI participants as having cognitive
decline, based on its lower specificity in this study, although it was highly sensitive. Despite this
notion, the MoCA has been found in multiple studies to be quite sensitive to MCI (Nazem et al.,
2009; Pendlebury et al., 2010; Sikaroodi, Yadegari, & Miri, 2013; Toglia et al., 2011; Zadikoff et
al., 2007), which may enhance its credibility as a measure of “cognitive domains” as outlined by
the NIA/AA workgroup’s MCI diagnostic criteria.

The LACLS-5 does not have a set cut-off score out of the maximum score of 6.0,
however each cognitive level is thoroughly described in terms of expected ADL function and the
need for assistance expressed as a percentage (Allen, Blue, & Earhart, 1998). For the purposes of
the study, a cut-off score of 5.0 was used which is indicative of the need for 22% cognitive
assistance. Scores greater than 5.0 pertain to a learning novel task, but routine ADL performance likely remains intact at this level (Allen, Blue, & Earhart, 1998). At scores lower than 5.0, ADLs begin to be impaired. Thus, the LACLS-5 results can address the two MCI criteria of “preserved ADL function” and “possible mild impairments in IADL function” based on the individual’s score. All participants, across both groups, scored high enough to suggest that basic ADL function (e.g., bathing, dressing, grooming) should be unaffected. However, it appears that 10/13 participants in the MCI group may have some difficulty with IADLs, or performing activities where new learning is required.

When examining the scoring trends across all five assessments, it was found that eight participants in the typical functioning group were identified as having a cognitive impairment by at least one measure, often the MoCA and/or the LACLS-5, although only one met the criteria of MCI by failing all the measures. It is plausible that many older adults are able to lead regular, functional lives without extensive or noticeable difficulty when they are still in the mild stages of decline, even though they may have difficulty with some structured test items (Farias et al., 2010). Without great noticeable change in everyday function, some individuals may still be unaware that slight changes are beginning to occur.

It could be argued that while the MoCA and the LACLS-5 identified more participants, even those who self-reported their cognition as being normal, each test could be lacking in specificity. Often sensitivity and specificity have an inverse relationship meaning that instruments with high sensitivity often have decreased specificity (Parikh, Mathai, Parikh, Sekhar, & Thomas, 2008). It is possible that participants who self-reported as being normal may have been falsely identified by the MoCA and/or the LACLS-5 as having cognitive difficulties, or perhaps they are experiencing very early cognitive changes that they are not aware of yet.
Furthermore, while standard practice is that individuals can be diagnosed with MCI when they show impairment on just one instrument, there is evidence to show that this practice is inclined to false positives (Bondi & Smith, 2014; Eliassen et al., 2017). This line of research further supports the notion that the use of more than one form of assessment may be best practice for the diagnosis of MCI.

In this research, 10/13 participants would truly have MCI as determined by this battery of assessments in accordance with the criteria established in 2011 by the NIA/AA. While this indicates 77% agreement between our combination of instruments and a previous diagnosis, this leaves questions about the remaining three participants. Many physicians rely minimally on standardized tests and more heavily on medical history for MCI diagnosis (Knopman & Petersen, 2014), which is different from what rehabilitation professionals, such as SLPs, are required to do in clinical practice. Therefore, it is important for SLPs to understand that their assessment results may not match physician diagnoses in terms of severity of the cognitive problem. Professionally, this could present an opportunity for rehabilitation professionals to work more closely with physicians for the purposes of determining accurate cognitive diagnoses based on a wider variety of factors. SLPs could administer and interpret the results of cognitive assessments, while physicians could use their clinical judgment to incorporate test results with extensive medical history.

This study had several strengths setting it apart from previous research. This is the first study to our knowledge to compare an assessment widely used by speech-language pathologists (CLQT) and one widely used by occupational therapists (LACLS-5) to determine if they identify the same individuals as having cognitive impairment. Based on these results, there is very little agreement between these two measures. It also incorporated a subjective questionnaire as
recommended in much of the MCI and AD/dementia literature, as well as from the NIA/AA recommendations. The questionnaire (AD8) was used not only with the participants, but also a close family member in order to determine a level of validation. In addition, this study incorporated design elements that decreased the potential testing bias or order effects. Importantly, this is the first study that we are aware of in which all of the NIA/AA diagnostic criteria for MCI were assessed.

Despite the strengths of the study, there were also limitations that should be addressed in future research. First, it is not clear what methods were used by the diagnosing physicians to determine if MCI or mild dementia was present in the impaired group. Most importantly, because there is no gold standard for the diagnosis of MCI beyond extensive neuropsychological testing, the existing physician diagnosis was used as the gold standard for the purpose of determining sensitivity and specificity. Furthermore, the presence or absence of a previous diagnosis of cognitive impairment was based upon participant report only. In the future, it would be helpful to have access to the participants’ medical records to verify the diagnoses and learn more about the evaluation(s) they underwent. Future investigators could also consider the use of a different battery of assessments, especially in light of the fact that participants did not enjoy the LACL-S5 (see Chapter 4 of this dissertation).

**Conclusion**

SLPs often use a single cognitive assessment to determine whether an individual could be demonstrating MCI. However, this approach addresses only one of the four criteria required by the NIA/NAA for such a diagnosis. With the exception of the AD8 completed by a family member, all four instruments were administered in one session within a maximum of 45 minutes. This is a realistic timeframe for a typical evaluation in most healthcare settings, including
inpatient, outpatient, and skilled nursing/rehabilitation facilities. Although the other tests could be administered in a timely enough manner to gather results, the AD8 reported by someone who knows the patient well was the most sensitive and specific test in this study. An examination of the patient’s or a significant other’s perspective on cognitive function, as well as an objective assessment of cognition and of IADL and ADL function, provides a more holistic picture of the patient, which is in line with the existing diagnostic criteria.
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CHAPTER IV
STUDY THREE

Introduction

The biggest risk factor for developing dementia is increasing age (Prince et al., 2013). According to He, Goodkind, and Kowal (2016), the aging of the baby boomer populations in Europe and the United States, along with the accelerated growth of older populations in Asia and Latin America, will lead to an increase of 236 million people aged 65 and older throughout the world. As a result of the increase in older adults, there is likely to be a concomitant increase in the number of people who develop dementia, and/or what is frequently viewed as a precursor to dementia, mild cognitive impairment (MCI). Prince et al. (2013) estimated that, worldwide, 35.6 million people were living with dementia in 2010 and that number would more than triple to 115.6 million by 2050. Healthcare professionals, including speech-language pathologists (SLPs), will be responsible for assessing and treating individuals with suspected MCI and/or dementia (Harada, Natelson Love, & Triebel, 2013). SLPs have a role in the assessment of individuals with cognitive decline or disorders such as MCI and dementia due to their knowledge of “normal and abnormal development, brain-behavior relationships, pathophysiology, and neuropsychological processes as related to the cognitive aspects of communication” (American Speech-Language Hearing Association [ASHA], 2005).

One work setting in which SLPs frequently receive referrals to evaluate individuals for suspected cognitive deficits is the skilled nursing facility (SNF), where up to 40% of new admissions have at least a mild cognitive impairment (Downer, Thomas, Mor, Goodwin, & Ottenbacher, 2017). A 2011 survey by the MetLife Foundation revealed that the only disease that Americans fear more than dementia is cancer (Cutler & Bragaru, 2015; MetLife Foundation,
2011), and the same is true of citizens of other countries (Prince et al., 2013). In a 2012 survey of 4276 individuals conducted in the United Kingdom by YouGov, the Alzheimer’s Society, and Saga Homecare, it was found that dementia had supplanted cancer as the most feared diagnosis. That survey also found that 60% of respondents would visit their physician if they experienced physical symptoms of a disorder, while only 2% would visit the physician if they experienced a non-physical disorder, such as memory loss or confusion. Thus, being referred for cognitive testing which could lead to a diagnosis of dementia is likely to be extremely stressful. Previous studies in the U.S. reveal that nearly half of older adults wish to know if they have cognitive decline, and they may be inclined to pursue treatment (Boustani et al., 2006; United States Preventative Services Task Force [USPSTF], 2014). However, the other half prefer not to know if their thinking skills are deteriorating, due to a fear of the diagnosis of Alzheimer’s Disease (AD)/dementia (Boustani et al., 2006; United States Preventative Services Task Force [USPSTF], 2014).

Despite personal concerns from patients, however, the value of accurate and timely diagnosis has been well researched (Dhedhi, Swinglehurst, & Russell, 2014; Knopman, Donohue, & Gutterman, 2000; Prorok, Horgan, & Seitz, 2013; Robinson et al., 2011; Teel, 2004). When the diagnosis is made early in the disease progression, the patient may benefit from therapeutic interventions, as well as patient and family education for advanced care planning (Gold, 2004; Teel, 2004). SLPs along with other rehabilitation professionals can play an important role in the treatment and management of dementia symptoms (Clare et al., 2009; Gitlin & Earland, 2010; Jean, Bergeron, Thivierge, & Simard, 2010; Kurz, Pohl, Ramsenthaler, & Sorg, 2008; Thivierge, Jean, & Simard, 2014). In addition, SLPs may be able to recommend further medical evaluation to rule out reversible, drug-induced from pharmaceuticals, (e.g.,
cardiovascular agents), or medically induced (e.g., UTI or infection) cognitive impairment in individuals who demonstrate impaired cognition (Marvanova, 2016). The ethical principle of patient autonomy implies that patients should be informed of all of their medical conditions, as well as options for treatment or management, in order to make informed decisions about their own care. This means healthcare providers may be obliged to present the findings from assessments that suggest the presence of cognitive deficits along with possible treatment options (Abbaszadeh et al., 2014). The question remains regarding how to approach the situation when patients who still have decision-making abilities may not want to know that they have a cognitive impairment.

Previous research shows that patients do not always experience negative reactions, such as anxiety or fear, when receiving negative diagnoses, but instead the experience may strengthen the patient-provider relationship (Abbaszadeh et al., 2014; Gold, 2004). Furthermore, after the initial shock of the diagnosis, many individuals with mild cognitive impairment (MCI) or Alzheimer’s dementia (AD) continue to lead meaningful lives (Harris, 2008). The ethical principle of autonomy asserts that patients should be fully informed of any conditions related to physical or mental health if it is in their best interest, which would include MCI or AD dementia (Abbaszadeh et al., 2014); however, MCI can be transient with approximately 20% of patients improving, and approximately 50% not showing either improvement or decline over time (Matthews et al., 2008; Mitchell & Shiri-Feshki, 2009). If the condition is transient, the ethical principle of beneficence is called into question, because learning of the diagnosis could actually cause more psychological harm than if the patient was never informed (Abbaszadah et al., 2014). The principles of autonomy and beneficence are in conflict in these situations.
From a clinical perspective, the uncertainty surrounding the nature of MCI poses challenges for SLPs in terms of how to explain the rationale for testing for it, potential deficits that may be identified, and possible treatment options. Rehabilitation professionals, including SLPs, often have limited education or training in the realm of counseling patients, particularly with regard to presenting news that comes as a surprise to patients and their families (Phillips & Mendel, 2008). Taking the time to listen to a patient describe his or her emotions and perspectives can be a valuable skill for a professional in the position to deliver bad news, but not all professionals are comfortable using such skills, nor do they have the time for the deeper interactions required. When the healthcare professional in the dialogue takes over the conversation, patients often feel minimized, or as though their thoughts, feelings, and lives do not matter (Kovarsky, Snelling, & Meyer, 2005). Furthermore, there is question as to how and when findings of MCI should be addressed clinically, due to the potential stability of the condition and the uncertainty surrounding future decline (Matthews et al., 2008; Mitchell & Shiri-Feshki, 2009). This presents a problem for SLPs who assess cognitive function on how to proceed clinically in terms of providing diagnostic information and/or intervention.

The purpose of this study was to learn more about the experience of being assessed on one’s own thinking ability, as well as to gain perspective on how older individuals feel about the possibility of learning they are experiencing cognitive decline or even have a need to undergo cognitive testing. Individuals who were participating in a study comparing different cognitive assessments were provided with the opportunity to discuss how they felt during the testing. The motivation for the study was to try to find ways to improve patient experiences both during cognitive testing and when the patient is informed of the results of that testing.
**Framework**

The qualitative framework that guided this research was an interpretive phenomenological approach. This approach aims to explore how individuals make sense of their personal and social world and was used to understand participants’ interpretations of what the experience of cognitive testing was like (Crist & Tanner, 2004). Topics surrounding the desire, or lack thereof, to be evaluated for and informed of a potentially life-changing condition were also explored. Specifically, phenomenology was used to learn more about the lived experience, or essence of being a patient who is asked to undergo cognitive testing and to learn from the non-MCI participants how it might feel to receive a diagnosis of cognitive impairment. This framework goes beyond just explaining the experiences of participants, but aims to understand the meaning of cognitive testing for the participants and the interpretations, or subjective realities, of those meanings for each individual (Crist & Tanner, 2004; Green & Thorogood, 2014).

**Methods**

**Participants**

A total of 26 participants were included in the study. All were between the ages of 70 and 89 and had previously taken part in a study in which they had undergone cognitive testing. They were divided into two groups. One group of participants had a known diagnosis of MCI or mild AD dementia, whereas the other group had with no existing diagnosis affecting cognition (see Chapter three for details). Participants were recruited via informational recruitment flyers distributed to three groups of retirees, as well as residents at an assisted living facility and skilled nursing facility. Participants were offered the choice to come to a building on the campus of a Midwestern university or the researcher traveled regionally to meet with participants at a quiet location that was accessible.
Research Design

The cognitive assessments that had been administered to the participants prior to conducting the interview were the Eight Item Interview to Differentiate Aging and Dementia (AD8), the Montreal Cognitive Assessment (MoCA), the Cognitive-Linguistic Quick Test (CLQT), and the Large Allen Cognitive Levels Screen-5th ed. (LACLS-5). The interviews for the current study took place immediately following the cognitive testing session, so the experience was current in participants’ minds. After the testing was completed, all participants were asked the same questions about the assessment protocols in a semi-structured interview format. The session concluded with an open-ended question where participants explained their views on cognition, the impact of potential changes in cognition, and the process of being tested for potential cognitive deficits. Participants in the non-MCI group were asked to imagine what it might be like if they were suspected of having a cognitive impairment. This was to get a sense of whether they would want to be tested for that impairment and whether they would want to know the results of that testing. In addition, they were asked for their thoughts on how the testing process could be made more comfortable for people. Follow-up questions were added when the need for clarification or expansion of responses arose. Despite the follow-up questions, however, not all participants provided answers to all questions. The interview questions are presented in the Appendix. The interviews were recorded for later transcription.

Data Analyses

Qualitative data from the structured interviews were transcribed by a trained graduate assistant. A sample of five transcripts were then checked for reliability to ensure responses were recorded accurately. The researcher transcribed the five randomly selected interviews, and also compared them for accuracy. Data were analyzed from a deductive approach in a thematic analysis (Green
The researcher initially read all participant responses without looking for any particular type of response. Then the responses were read again as the researcher began to recognize patterns in the responses. The patterns that were established were based upon the interview questions, particularly those that were more closed-ended, (e.g., “Which assessment was the most enjoyable for you?”). Emergent, or more idiosyncratic, responses were those that were unexpected by the researcher, but were present nonetheless during analysis.

The analysis process looked for recurring or repeated topics, participant descriptions of terms or experiences, complex language used, such as metaphors or analogies, and similarities and differences across participant responses within the themes of “assessment preferences” and “testing experience”. At this point, transcripts were reviewed again, this time searching for familiar, mismatched, or duplicated responses. Data coding and identification of themes were conducted as iterative process, constituting further rigor in the analysis (Hefferon & Gil-Rodriguez, 2011). Ultimately, this process pulled together similar types of responses to examine them closer in a horizontal manner. Patterns were identified by the researcher to extract the most meaning and understanding of the participants’ experiences (Green & Thorogood, 2014; Vaismoradi, Turunen, & Bondas, 2013). Some of the identified themes did not necessarily present as patterns from multiple participants. However, because the IPA framework aims to look at individual responses to understand individual perceptions, some themes could be presented as unique, and coming from just one participant. This process allowed the researcher to examine data not only based upon responses to specific questions, but also based upon the patterns that were determined in the analysis process.
Results

Two overarching themes emerged based on the questions asked during the interview. The first pertained to the assessments themselves, whereas the other pertained more to the overall experience of being tested and what it could be like for those who are referred for testing.

Types of Assessments

Participants were first asked which assessment they liked the best and why. A summary of the themes and sample comments is presented in Table 7. Five themes were identified as the guiding reasons why an assessment was chosen as a favorite out of the four administered. One person chose the AD8 because there was “no fear of failure”, since the questions were about the individual without “right” or “wrong” answers. Another theme arose from five participants who preferred the tools that were the “easiest” or the “quickest.” Five other participants chose their favorite tool based on those where they felt the most “challenged.” Similar to enjoying feeling challenged, six participants chose their favorite tool based on the ones that they felt were enjoyable, or even fun, like “puzzles, crosswords, and games.” Finally, four participants reported that the “lengthier” battery (CLQT) was the best in their opinion.

Next, participants were asked which assessment they liked the least and why. Twenty-four participants provided responses about the assessment that was the least preferred. Table 8 provides a summary of the five themes and sample responses. The majority of participants’ responses were identified into two themes of the test being “too difficult” or “frustrating.” Some responses could potentially overlap between these two categories, but they were ultimately separated based upon the emotion behind the responses. Responses that were identified as “difficult” were spoken in a straightforward manner as though simply reporting the facts, however those that were grouped into the “frustrating” theme were presented with a tone of
voice that could be described as annoyed or upset indicating more emotion behind the response. Another theme that emerged was that some of the tools were “too quick” leaving participants a bit confused about what they had just completed. Similarly, two participants reported that the assessment they favored the least was due to an “uncertainty about what the assessment results would show.” These participants seemed very clear in knowing what the test was, but were questioning the purpose of the tool. Finally, two participants felt that some of the assessments were “childish” and not appropriate for adults.

Table 7
Themes for Choosing the Test Liked the Best

<table>
<thead>
<tr>
<th>Theme</th>
<th>Participants / Group</th>
<th>Sample Comments</th>
</tr>
</thead>
</table>
| Like a game        | 6 / 4 non-MCI; 2 MCI | “I like puzzles”  
                        | “Some of them were kind of fun”  
                        | “Anything that is like reading or crosswords is fun for me, so I like the ‘word games’” |
| Easy, quick        | 5 / 2 non-MCI; 3 MCI | “It was quick and pretty basic”                                                |
| Level of challenge | 5 / 3 non-MCI; 2 MCI | “Made me think”  
                        | “I like to be challenged”  
                        | “Pushed me to think”                                               |
| Length             | 4 / 2 non-MCI; 2 MCI | “Seemed more thorough than those short ones. What can those tell you?”  
                        | “The battery seemed more comprehensive”                                       |
| No fear of failure | 1 / 1 non-MCI        | “It was about me, so I didn’t feel like I could flunk”                        |

Non-MCI = non-MCI participants; MCI = participants with mild cognitive impairment
Finally, participants were asked to place aside their preferences for each assessment, and describe which one they felt gave the most insight into how a person thinks. This question was more difficult for participants to answer, and many needed reassurances that there was no correct or incorrect response. Participants were reminded that learning about the process of assessment from their perspective was one of the purposes for the study. Overall, five themes were identified from participant responses, which are presented in Table 9 along with sample responses. The most common response was categorized into a theme that the tests that gave the most insight were those that were the “most challenging.” Others felt that the tools that were the “most comprehensive” were probably the best at providing high-quality information to clinicians.
Three participants believed that because they “know themselves the best”, the questions directly asking about their own performance of daily activities most likely gave the most insight into their cognitive performance. Finally, there were two more themes with responses that did not fit well with any other pattern. One participant felt that choosing one tool that gave the best information was not possible because the process is too “individualized” based on the examinee’s experiences, strengths, and weaknesses. Another participant stated that anything that tested “memory” would be the best because that is the trademark symptom of AD/dementia. See Table 9 for a list of present themes regarding which tools were perceived to provide the most insight into how an examinee thinks.

Table 9

<table>
<thead>
<tr>
<th>Theme</th>
<th>Participants / Group</th>
<th>Sample Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Most challenging</td>
<td>12 / 5 non-MCI; 7 MCI</td>
<td>“Those were tough – you really had to pay attention.” “Took a lot of concentration.”</td>
</tr>
<tr>
<td>Most comprehensive</td>
<td>5 / 3 non-MCI; 2 MCI</td>
<td>“A holistic viewpoint is important if you believe in multiple intelligences.” “Lots of variety is important.”</td>
</tr>
<tr>
<td>Know myself the best</td>
<td>3 / 2 non-MCI; 1 MCI</td>
<td>“The questions about myself were much more realistic. I don’t do mazes or connect dots everyday.”</td>
</tr>
<tr>
<td>Tested memory</td>
<td>1 / 1 non-MCI</td>
<td>“I think the memory parts would tell you more than anything else.”</td>
</tr>
<tr>
<td>Unsure – too individualized</td>
<td>1 / 1 non-MCI</td>
<td>“Not sure – it would depend on the individual… what they know… what they can do…”</td>
</tr>
</tbody>
</table>

Non-MCI = non-MCI participants; MCI = participants with mild cognitive impairment
Overall Testing Experience

Participants who were in the non-MCI group were then asked to take on the perspective of those who have been referred for cognitive testing for MCI or AD dementia due to concerns about their cognitive abilities and consider what that process might be like as opposed to volunteering for a research study as they had done. Themes and sample responses are presented in Table 10. Most responses were categorized into the emotional aspects of the process with themes addressing the “difficulty” or the “stressfulness” that may be felt by those being tested. The responses for these two themes could easily overlap, however as previously explained, responses that had more emotional description, or that were delivered with a more emotional tone of voice were categorized into the “stressful” theme rather than simply difficult. Remaining responses were geared toward the more practical aspects of the testing for both the patient and the physician in terms of coming up with a treatment plan for the future. Another participant was more positive about the process, questioning whether everyone of a certain age should be tested, or even be presented with cognitive challenges, on a more regular basis.

The next question in the interview was based upon the statistic that approximately half of older adults would prefer to know if they had MCI or AD dementia and the other half would not (Boustani et al., 2006; United States Preventative Services Task Force [USPSTF], 2014). Participants were asked if they would want to go through with testing, if they would want to know the results, and why. All participants reported that they would want to be tested, and that they would want to know the results. Responses were centered around the need to prepare for the future, to understand what (if any) treatment options were available, and what could be done to prepare financially. Another common theme that arose was that many were very clear that they also wanted their children to know for future planning purposes, but also out of love and honesty
with their families. Responses to this question about the experience of being tested were closely directed at the ethical quandary between autonomy and beneficence. The participants of this study were all in agreement that autonomy is the over-arching principle to be followed, because it was believed by the interviewees that people should know what diagnoses they have and also what can be done to address the problem.

Table 10

<table>
<thead>
<tr>
<th>Theme</th>
<th>Participants</th>
<th>Sample Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficult</td>
<td>5</td>
<td>“It would be hard. Nobody likes to think they have a problem”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“It wouldn’t be easy.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“It would be a whole lot harder than I thought it was.”</td>
</tr>
<tr>
<td>Stressful</td>
<td>5</td>
<td>“May be pretty stressful if you’re a person with test anxiety.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Could be frustrating, or even make people angry.”</td>
</tr>
<tr>
<td>Helpful for professionals</td>
<td>1</td>
<td>“Their doctor or whoever would get an idea of how their mind is.”</td>
</tr>
<tr>
<td>They just have to deal with it</td>
<td>1</td>
<td>“Hopefully it would open their eyes that it’s happening, so they could just deal with it.”</td>
</tr>
<tr>
<td>Positive variety</td>
<td>1</td>
<td>“It’s good to be pushed to think in different ways other than the automatic stuff.”</td>
</tr>
</tbody>
</table>
Table 11
Would You Want to Be Tested if You Were Referred for It?

<table>
<thead>
<tr>
<th>Theme</th>
<th>Participants</th>
<th>Sample Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>To be informed</td>
<td>4</td>
<td>“There are just some things you shouldn’t be ignorant about.”</td>
</tr>
<tr>
<td>Plan for the future</td>
<td>3</td>
<td>“You hear about the cost of nursing homes on the news all the time. I need to know if I have to go back to work while I can!”</td>
</tr>
<tr>
<td>My children should know</td>
<td>2</td>
<td>“My kids should know what they are up against in terms of helping me, but also their health.”</td>
</tr>
<tr>
<td>Find treatment options</td>
<td>2</td>
<td>“To see what can be done to help.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“You can’t get help if you don’t know about it.”</td>
</tr>
</tbody>
</table>

Finally, at the end of the interview participants were asked an open-ended question aimed at determining if there were any suggestions for conducting an assessment session that could make the experience more comfortable. Themes and sample responses are presented in Table 12. Many used adjectives to describe qualities of a good testing clinician as they described ways to make examines feel comfortable during the process. Others spoke about the need for conversation to open the session in order to learn about the patients and their backgrounds. It was also mentioned that it could be beneficial to administer one test instead of four. It was further suggested that it may be too overwhelming to do so many assessments in a single session, but perhaps it could be spread over a couple of appointments. It was also offered that this was a very difficult question to answer, because it is such an individualized experience, and that people may require very different approaches to testing. Finally, other responders mentioned things pertaining more to the side of the clinical professional. Comments centered around the fact that
everyone has a job to do, and clinicians have to adapt their habits to their work environments no matter how the patients may feel.

Table 12
*Suggestions for Clinicians Who Work with This Type of Patient?*

<table>
<thead>
<tr>
<th>Theme</th>
<th>Participants</th>
<th>Sample Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Make them comfortable</strong></td>
<td>7</td>
<td>“Help them open up to you somehow.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Be open and honest about what you are there to do.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“Be nice. Honey draws more flies than vinegar.”</td>
</tr>
<tr>
<td><strong>You just have to do it</strong></td>
<td>3</td>
<td>“I would see the healthcare worker as an authority figure. I would just do what I was told.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>“You have a job to do and you just have to get it done. People need to allow the professionals to work no matter how they feel about it.”</td>
</tr>
<tr>
<td><strong>Learn their background / choose one test</strong></td>
<td>2</td>
<td>“Don’t do quite so much – it could be overwhelming.”</td>
</tr>
<tr>
<td><strong>Too individualized</strong></td>
<td>1</td>
<td>“It’s so individual. I don’t know that there is a ‘blanket’ suggestion I could give. I think you have to customize it for the person.”</td>
</tr>
<tr>
<td><strong>Create a ruse</strong></td>
<td>1</td>
<td>“I guess you could create some kind of a ruse to get them to do it without knowing what they were doing...”</td>
</tr>
</tbody>
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**Discussion**

With regard to the most-liked tests, 18 participants chose the CLQT and themes related to that choice were that it was like playing a game and that it challenged them to think. Interestingly,
this was the test that the highest number of participants passed, including 12/13 of the non-MCI participants and 10 of the 13 participants with previously diagnosed MCI/mild AD. The reason for the higher success could be that the CLQT is not sensitive to mild impairments; however, it could also be that participants enjoyed it more and were thus more motivated to participate and do well. With regard to the test they liked least, the LACLS-5 was not favored by the largest number of participants. Themes related to this test included that it was weird, childish, and that they did not feel that they performed well. This was the test that was failed by the second highest number of participants, including 5/13 non-MCI participants and 11/13 with MCI/AD. Similar to the results of the CLQT, it is difficult to separate sensitivity and specificity of the test from the participants’ negative reaction to the test. Face validity has been shown to influence test-taking motivation, and thereby test performance in previous literature (Chan, Schmitt, DeShon, Clause, & DelBridge, 1997; Grand, Ryan, Schmitt, & Hmurovic, 2010; Kit, Tuokko, & Mateer, 2008). Overall, participants reported that the CLQT and the LACLS-5 were the most “challenging” assessments, however, perhaps challenging was used in a positive way in regard to the CLQT, whereas it was meant negatively in regard to the LACLS-5. The nature of the participant comments supports this interpretation.

Another interesting finding was that there were relatively few comments regarding the MoCA, although more participants (both non-MCI and those with MCI/mild AD) failed it than failed the LACLS-5. The reason for this is unclear, although perhaps it is due to the short, quick nature of the MoCA making it leave less of an impression on those who are tested. In addition, perhaps the nature of the tasks seemed less strange than the leather lacing required by the LACLS-5.
In retrospect, it was not surprising that all individuals who volunteered to participate in this study reported that they would want to be tested for a potential cognitive impairment and to learn of the results. Many reported that their primary reasons for wanting to know about any deficits were to plan for the future (often financially) and to explore treatment options, which is consistent with the literature (Gold, 2004; Holroyd, Turnbull, & Wolf, 2002; Teel, 2004). However, that does lead to the question of whether the remainder of the large number of people who received the recruitment flyer had no desire to volunteer because they did not want to know if they had a cognitive impairment. If this is the case, it is a limitation of the study with regard to being able to provide advice to clinicians working with individuals who do not want to know if they have a problem (Boustani et al., 2006; United States Preventative Services Task Force [USPSTF], 2014).

Most participants acknowledged that they could understand how there may be feelings of fear, stress, or anxiety associated with the process of being tested, and also of learning the results. Based upon those responses, many offered suggestions to clinicians to be kind, compassionate, and caring before, during, and after an assessment session in order to make evaluations more comfortable. There were those participants, however, who were more realistic in their responses about the need for testing whether it is comfortable or not, and demonstrated almost a lack of concern over patient feelings. An interesting response, which only occurred once so it was not a common theme amongst participants, was that completing all of the assessments might be overwhelming for some patients. That is a possibility, and something that should be considered when clinicians choose their assessment protocols for their patients.

The results suggest that clinicians must develop their skills as artful healthcare practitioners when broaching challenging topics, such as cognitive decline. The art of healthcare
relates less to understanding conditions, and more to understanding patients (Malterud, 2001). Clinicians who are viewed as warm and understanding have been shown to build stronger rapport with patients, thus enhancing the therapeutic alliance (Leach, 2005). Past research is consistent with the findings of this study where participants largely suggested that clinicians be open and kind, or warm in their interactions with patients who may be suspected of experiencing cognitive decline. Other participants’ comments were focused more on the workflow of healthcare clinics, where the primary objective is to get the job done as quickly and as efficiently as possible. Malterud (2001) reported that such environments may inhibit clinicians from building the strong alliances with their patients, but regardless, they still have the responsibility to form the best rapport possible with their patients in order to read clinical interactions as accurately as possible.

In conclusion, although there was some individual variability among participant responses, there were also consistent themes that emerged. Participants preferred assessments that challenged them (in a positive way) or were fun, but the test that was most frequently described using these adjectives was also the one on which the entire group performed best. Conversely, one of the tests on which they performed most poorly was also one they liked least due to its being “weird” and “difficult.” Future studies should be aimed at trying to separate test success from participants’ reaction to the test items. The results of such studies could be used to guide the development of new tests that are both motivating (by being enjoyable and challenging in a positive way) and sensitive to cognitive deficits. Non-MCI participants indicated that it was important to have one’s cognitive skills evaluated, but these were individuals who volunteered to participate in the research. Future studies should attempt to elicit the views of individuals who are less ready to engage in cognitive assessment in order to better understand how to provide the most positive and productive experience for them.
References


CHAPTER V
CONCLUSION

A series of three studies was conducted to determine the best assessment practices for MCI in an aging population. Currently, no streamlined nor consistent recommendation for choosing assessment instruments exists, although the diagnostic criteria set forth by the NIA/AA workgroup can direct clinical practitioners toward tools. Suggested methods would include a subjective report of cognitive decline, objective assessment of cognitive domains, and a measure of ADL/IADL abilities.

The first study in the series of three aimed to determine if commonly used assessment tools (AD8, MMSE, and CLQT) were consistent in identifying individuals with MCI, or perhaps even a subtype of MCI. There was very little agreement in terms of categorical results (the presence of absence of MCI). One can speculate that if cut-off scores are adjusted even slightly, there could be more agreement across measures, which suggest that validity of the instruments should be re-assessed. This could be of great value for assessing the mildly impaired population. The question then remains whether just one tool is enough to provide a thorough picture of the individual’s cognitive abilities and challenges.

The second study in the series was a follow-up to the first. The MMSE was replaced by the MoCA due to greater evidence of sensitivity for mild cognitive impairments. The AD8 was also completed by a close family member or caregiver of each participant in addition to being completed by the participant, because there were questions regarding the reliability of individuals’ self-reporting on cognition. The LACLS-5 was added to gain more insight into ADL/IADL abilities. While there was agreement between measures to an extent, there was very little agreement across all five conditions for both the impaired and the typical group. The
instrument that demonstrated the most sensitivity and specificity was the AD8 when completed by the close family member or caregiver. Whether that is due to greater insight into their loved ones’ abilities or due to the existing knowledge regarding whether an impairment was present is unclear. Overall, the results of the second study could lead clinicians toward using more than one assessment instrument and formulating their own battery of tools in order to capture each aspect of the NIA/AA diagnostic criteria. This could be a valuable option if the clinician is trying to determine if a specific MCI subtype is present. The three instruments that could provide a well-rounded examination of cognitive function based upon this research are the AD8-other report, the MoCA, and the LACLS-5. In conjunction, these three tools would allow clinicians to assess each of the MCI diagnostic criteria as established by the NIA/AA with high sensitivity, but specificity is still lacking.

Finally, participants who volunteered for the second study were also asked semi-structured qualitative interview questions about the tests they went through and the overall experience of being tested. Participants were asked about which testing experiences they liked the best and the least, as well as which test they thought gave the most insight into how a person thinks. Themes relating to each question were determined through an iterative data analysis process in an attempt to understand how participants chose their preferences.

Participants in the non-MCI group were also asked to reflect on what the experience of being tested could be like for someone who had a need to undergo cognitive assessment. All of those who volunteered to participate in this study stated that they would want to be tested, and would want to understand their results. This is not surprising given the fact that they chose to be a part of this research. However, these results are likely not generalizable since all who volunteered for the study were most likely inherently interested in knowing about their cognitive
status. The untold story is from those who were recruited, but chose not to volunteer. Their beliefs on cognitive assessment would be extremely valuable to know, as well.

One of the more holistic take-away messages came from asking for suggestions for how clinicians could improve the experience for those who must undergo testing was to not do so many assessments in one session. This suggestion came about because interviewees recognized the potential for negative emotional reactions (e.g., stress, anxiety, fear of failure). It was also noted that the administration of too many tests could easily become overwhelming, especially for someone with MCI or AD dementia. Additionally, participants suggested that the clinician’s demeanor is an important element during situations that could be deemed stressful. There was an overarching theme related to clinicians displaying “warmth”, “kindness”, and “understanding”, which has also been documented in the literature (Leach, 2000; Malterud, 2001).

Strengths of this dissertation include the combination of both quantitative test results and qualitative information about the experience of being tested to gather perceptions about the assessment process. Often past literature has examined indicators of reliable and valid assessment tools for MCI or AD/dementia, but to the researcher’s knowledge, there has not been a qualitative examination looking deeper into how patients perceive the tests or the evaluation process. It is important to delve into the hermeneutic interpretation of how patients are reacting to the testing as their thoughts and emotions during an evaluation may have an impact on the results.

One limitation to this series of three studies was the reliance on patient report regarding any medical diagnoses, particularly those that may affect cognition. Future studies could be strengthened by gaining access to medical records for confirmation of, and perhaps more detailed, medical history. In addition, to improve the accuracy of sensitivity and specificity
measures, it would be beneficial for participants to undergo a full neuropsychological battery for the most accurate diagnosis possible. From there, the shorter, more commonly used assessments by SLPs in healthcare settings could be given for a comparison of results.

In conclusion, professionals who work with individuals with suspected MCI will continue to have to make clinical judgments as to which assessment(s) to administer when a referral is received. Depending on the perceived cognitive level of the patient, it may be appropriate to administer a series of several assessments, such as in this dissertation, to determine not only if MCI exists, but perhaps even more about the specific subtype. However, if a patient experiences significant difficulty with the number of assessments, or if the testing becomes overwhelming, it may need to be abandoned. It is also important to consider the evidence showing the sensitivity and specificity of cognitive assessments, particularly for assessing the mildly impaired population. Finally, having some idea as to personal preferences of the patients may lead to a more effective session. Tests that were perceived as fun, challenging, or holistic were favored over those that were difficult, stressful, or unusual. Clinicians must consider both the patient experience and the types of diagnostic information provided. The difference in choosing some tools over others does not counteract the need for clinical compassion and a well-established rapport with all patients.
References


Appendix A

Interview Questions

“Now that we are done with each of the ways of measuring thinking ability, I would like to end by asking you what you thought of the different types of activities you just completed. I had you answer those eight questions in the beginning, we did the one-page quick activity, and the longer one with the booklet, and we also did the one with the leather and the stitches.

Of the 4, which one did you like the best?”
   Possible follow-up: “Why?”

“Which one of the 4 did you like the least?”
   Possible follow-up: “Why?”

“Which one of the 4 do you think probably gave the best insight into how a person thinks?”
   Possible follow-up: “Why?”

“What do you think this process might be like for people who have experienced changes in their thinking?”

“Sometimes a person will know that they are having difficulty with their thinking skills and they will seek help from a doctor or other medical professional. But sometimes it comes as a surprise to people that they need to be tested for their thinking abilities. If you were in this position of not being aware that there was a problem, would you want to go through with testing?”
   Possible follow-up: “Why or why not?”

“If you went through with the testing, would you want to know the results?”
   Possible follow-up: “Why do you feel that way?”

“What suggestions do you have to make the testing process more comfortable for people who are aware of the need to be tested? Would your suggestions be different for professionals who are asked to test someone who was NOT aware that they were having problems?”
Appendix B

HSIRB Approval Letter 2016

Date: January 19, 2016

To: Nickola Nelson, Principal Investigator
   Julie Dalmasso, Student Investigator

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 16-01-07

This letter will serve as confirmation that your research project titled “Investigation of Three Ways to Measure Changes in Thinking Ability in Adults” has been approved under the expedited category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may only be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., you must request a post approval change to enroll subjects beyond the number stated in your application under “Number of subjects you want to complete the study”). Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: January 18, 2017
Appendix C

HSIRB Approval Letter 2017

Date: July 6, 2017
To: Linda Shuster, Principal Investigator
    Julie Dalmaso, Student Investigator for dissertation
From: Amy Naugle, Ph.D., Chair
Re: HSIRB Project Number 16-01-07

This letter will serve as confirmation that the change to your research project titled “Investigation of Three Ways to Measure Changes Thinking Ability in Adults” requested in your memo received July 3, 2017 (to add an Information Sheet that would serve as a “Waiver of Documentation” for the questionnaire that close family members or caregivers of participants will be asked to complete) has been approved by the Human Subjects Institutional Review Board.

The conditions and the duration of this approval are specified in the Policies of Western Michigan University.

Please note that you may only conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: January 18, 2018