

Concurrent validity of dementia screening tools
by Don James Benton

A thesis submitted in partial fulfillment of the requirements for the degree of Master of Nursing
Montana State University
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Abstract:
Problem. Dementia is a significant cause of morbidity and mortality in aging societies like Montana. Primary care providers under-recognize dementia, especially in the early stages. There is a lack of "user-friendly" tests that could be employed for routine screening.

Purpose. To evaluate the validity of the Animal Naming Test (ANT) by comparing it to the Behavioral Dyscontrol Scale (BDS) and the Mini-Mental State Exam (MMSE). Specific aims: Is there a relationship between an individual's score on the ANT, MMSE, and BDS? Is there a significant difference in test performance between community dwelling and extended care facility residing older persons? Does cognitive status and semantic recall ability predict executive function performance? Methods. Different statistical tests were utilized to examine instrument validity. Sixty individuals over age 65 with no significant impairment of mental status completed all three tests in a single session. To assess relationship between the tests a correlation matrix was used. A t-test and frequency analysis was utilized to compare performance differences between groups. A regression analysis was used to assess the ability of the MMSE and ANT to predict BDS score.

Results. Relationships between the tests were discovered. The tests all had significant relationships. Little difference existed between the two groups in test score, except for the ANT. Community dwellers scored a higher mean score. Regression analysis revealed that the MMSE and ANT are able to predict about 57% of the variance on the BDS. The MMSE was much more important in predicting BDS score. The ANT is a very weak contributor to predictive ability despite the significant correlation with BDS scores.

Conclusions. Several significant relationships were discovered. The MMSE and BDS had a strong positive correlating relationship. It was expected that the ANT and BDS would possess a strong correlation and perhaps a predictive relationship. This relationship did not occur.

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This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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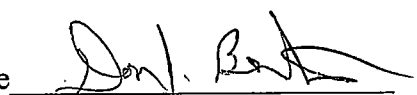
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ABSTRACT

Problem. Dementia is a significant cause of morbidity and mortality in aging societies like Montana. Primary care providers under-recognize dementia, especially in the early stages. There is a lack of "user-friendly" tests that could be employed for routine screening.

Purpose. To evaluate the validity of the Animal Naming Test (ANT) by comparing it to the Behavioral Dyscontrol Scale (BDS) and the Mini-Mental State Exam (MMSE). Specific aims: Is there a relationship between an individual's score on the ANT, MMSE, and BDS? Is there a significant difference in test performance between community dwelling and extended care facility residing older persons? Does cognitive status and semantic recall ability predict executive function performance?

Methods. Different statistical tests were utilized to examine instrument validity. Sixty individuals over age 65 with no significant impairment of mental status completed all three tests in a single session. To assess relationship between the tests a correlation matrix was used. A t-test and frequency analysis was utilized to compare performance differences between groups. A regression analysis was used to assess the ability of the MMSE and ANT to predict BDS score.

Results. Relationships between the tests were discovered. The tests all had significant relationships. Little difference existed between the two groups in test score, except for the ANT. Community dwellers scored a higher mean score. Regression analysis revealed that the MMSE and ANT are able to predict about 57% of the variance on the BDS. The MMSE was much more important in predicting BDS score. The ANT is a very weak contributor to predictive ability despite the significant correlation with BDS scores.

Conclusions. Several significant relationships were discovered. The MMSE and BDS had a strong positive correlating relationship. It was expected that the ANT and BDS would possess a strong correlation and perhaps a predictive relationship. This relationship did not occur.

CHAPTER 1

Introduction

The population of the United States is aging. It is estimated that 5,574 Americans turn 65 years of age each day (Federal Forum, 2000). People over 65 years old make up more than 13% of the population of the U.S., and this percentage has been steadily increasing (Federal Forum, 2000). It has been predicted that by the year 2050 there will be 19 million Americans age 85 years or older (U.S. Census, 2000). In some areas of Montana 15-20% of the population is over 65 years old and aging (U.S. Census, 2000).

Five to ten percent of the population over age 65 suffers from dementia (United States Department of Health and Human Services, 1996). The incidence of dementia doubles every five years after age 65 (United States Department of Health and Human Services, 1996). Those who suffer from dementia often live a decade or more with progressive debilitation and decline in social and occupational functioning. Dementias currently affect 2 to 4 million Americans (Public Health Service, 1996). The cost of providing care to these individuals has been estimated at 65 to 90 billion dollars a year (Public Health Service, 1996). The emotional toll and burden of suffering, experienced by these individuals and their families, is immeasurable (Public Health Service, 1996;United States Department of Health and Human Services, 1996).

With recent advances in therapies for dementia disorders, it has become increasingly important to recognize the cognitive changes in the early stages of the disease. This will allow for slowing of the disease progression; thus extending quality

and quantity of life. Primary healthcare providers often under-recognize early dementias. This is due to lack of routine screening, inability of the patient and their family to recognize the symptoms, and the difficulty involved with differentiating between memory change of aging and early dementia (Ashford, Mendiondo, Kryscio &, Schmitt, 2002).

The need for rapid screening tests for dementia has long been recognized and several have been developed. Tests of memory recall have been shown to be the most sensitive for Alzheimer's disease. In addition, tests of category verbal fluency have been shown to be able to discriminate between dementia patients and demographically matched healthy individuals (Ashford, Mendiondo, Kryscio &, Schmitt, 2002).

Problem

Dementia is a significant cause of morbidity and mortality in aging societies like Montana. However, primary care providers under-recognize dementia, especially in the early stages. There is a lack of rapid, "user-friendly" tests that could be employed for routine screening.

Purpose

The purpose of this study was to evaluate the validity of the Animal Naming Test (ANT) by comparing it to the Behavioral Dyscontrol Scale (BDS) and the Mini-Mental State Exam (MMSE). Three specific aims were addressed in this study. Aim 1: Is there a relationship between an older individual's score on the Animal Naming Test (ANT), the

Mini-Mental State Examination (MMSE) and Behavioral Dyscontrol Scale (BDS)? Aim 2: Is there a significant difference in test performance (ANT, MMSE, and BDS) between community dwelling and extended care facility residing older persons? Aim 3: Does cognitive status and semantic recall ability (as measured by the MMSE and ANT respectively) predict executive function performance as evidenced by scores on the BDS?

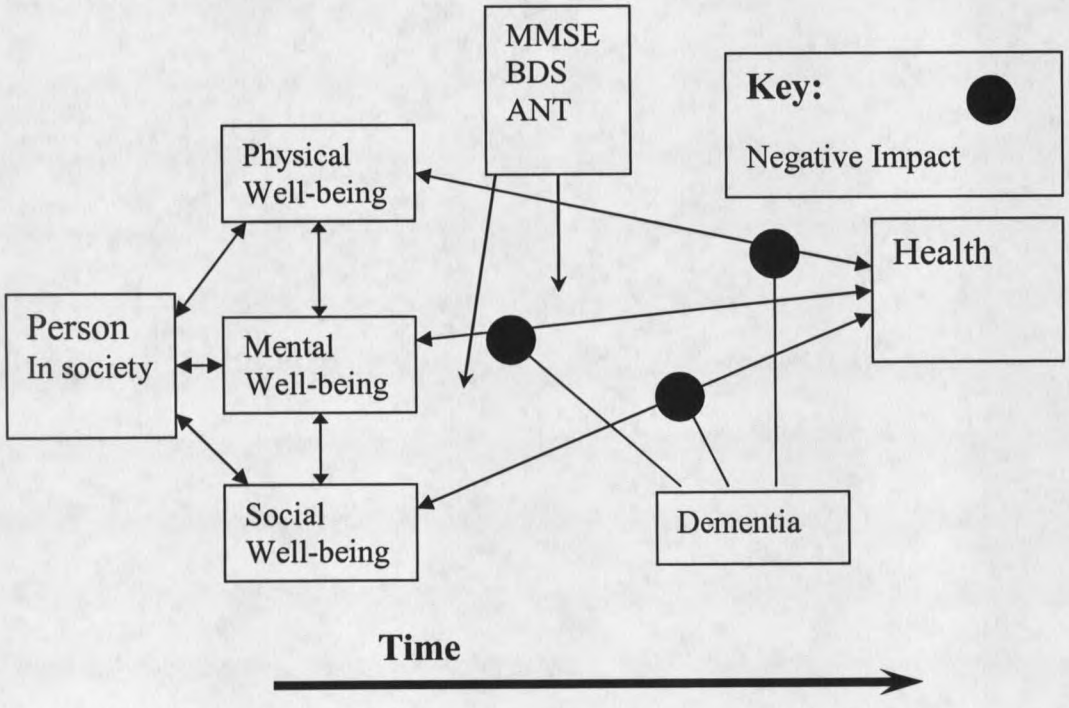
Framework

A framework was developed for this study that represents the relationship between a person and his or her health. Health has been conceptualized in a number of ways. Each definition attempts to describe the phenomena based on the attributes it possesses. Clearly expressing a concept such as health, poses a number of philosophical difficulties (Rogers, & Knafl, 2000). Yet to continue, a certain level of definition is required. To develop the framework for this study, health was defined as: A condition of physical, mental, and social well being that is accompanied by the absence of disease. It is a dynamic state, constant change and adaptation results in homeostasis. The individual experiencing the state interprets and applies his or her own values to the condition, yet there is a physiological portion of health which may or may not be dependent upon this mental interpretation (Anderson, Anderson, & Glanze, 1994).

The person experiencing a state of health exists within society and has a two-way relationship with health. Health is composed of three elements: physical, mental, and social. These components affect the health of the individual and the environment in which he or she lives. The components are also interrelated, which is to say that a change

in one area causes changes in the others, thus a change in the person's perception of health (Roy, 1999). Dementia has a progressive effect in each area over time. Early in the disease process, initial subtle mental changes progress to negatively influence health. These changes most often include short-term memory deficits, which only the sufferer may notice. As the disease progresses, social difficulties arise as the sufferers and their loved ones realize the illness exists. This time is marked by behavior changes, forgetfulness and personality alterations. Finally the sufferer's physical well-being is impaired as self care rapidly declines in the later stages.

Figure 1. Conceptual framework: The person/health relationship is negatively impacted by dementia in each area of well-being over time. Early testing with the tools of interest leads to early diagnosis and intervention.



While severe, late-stage dementia and the associated gross cognitive impairments are usually easy to recognize, subtle changes early in the disease process or mild dementia can be difficult for the clinician to identify (Bland & Newman, 2001). Dementia's insidious onset can lead practitioners, patients and their families to underestimate the significance of cognitive decline or attribute them to the "normal aging" process (Costa, et al, 1996). By utilizing tools to screen for dementia, the primary care provider can help the dementia sufferer and the family make decisions about follow up and care early in the disease process. These decisions may allow the individual to delay the negative impacts on their social and physical well-being. Reversible causes of cognitive impairment may be addressed, thus preserving the person's health.

Definition of Terms

Individual

A person who interacts with society within a variety of environments; these interactions are influenced by physical, psychological and social issues.

For this study an individual is defined as an older person, age 65 years old or older, who resides in the target environments (community or extended care) in Montana.

Community Dwelling

A community dwelling individual is one who lives among the general population in a designated geographical area and is not living in an institution such as in-patient care, correctional facility, or nursing care facility (Anderson et al., 1994).

For the purpose of this study a community dwelling individual was defined as an individual living in the Billings area who is not the resident of a nursing care facility.

Long-Term Care Dwelling

Long term care dwelling individuals are those who reside at a facility that provides medical, social, and personal care services to people who suffer from chronic physical or mental disorders (Anderson et al., 1994).

For the purpose of this study long-term care facility dwelling individuals was defined as people who currently reside in a Miles City, Montana Long Term Care facility.

Mental Health

This term is used to denote a state in which an individual is free from mental illness and functions at a high level of behavioral and emotional adjustment and social adaptability, which allows them to be productive within society (Reber & Reber, 2001).

For this study the aspects of mental health concerning mental status, semantic recall, and executive function will be examined by the use of the ANT, MMSE, and BDS.

Cognitive Function

Intellectual process by which an individual perceives, becomes aware of, or comprehends ideas involves perception, thinking, remembering and reasoning as contrasted with emotional and volitional processes (Anderson, Anderson, & Glanze, 1994)

For the purpose of this study cognitive function will be used in a general manner to refer to thinking, perception, reasoning, and recall from memory as measured by the ANT, MMSE, and BDS.

Executive Function

Executive function is regarded as the ability to plan, problem-solve, reason, put complex tasks together, and get organized in everyday life with things like doing work, getting dressed, thinking ahead, and following instructions (the prefrontal cortex is believed to be responsible for executive function) (Delbello, 2001).

For the purpose of this study executive function is the phenomenon of interest for the Behavioral Dyscontrol Scale, with a score of 11 to 15 (of a possible 19) reflecting mild impairment.

Background

The "Baby Boomers" are growing older. This is significantly contributing to the trend for a "grayer" population in the United States. Every day about 5,574 Americans turn 65 years of age (Federal Forum, 2000). Persons over 85 are the fastest growing segment of the population. By the year 2050 there will be 19 million Americans who are 85 years or older in the U.S. (U.S. Census, 2000). People over 65 years old make up more than 13% of the population of the U.S. and this percentage has been steadily increasing for several years (Federal Forum, 2000). In some areas of Montana 15-20% of the population are over 65 years old and it has been predicted that this aging trend will continue (U.S. Census, 2000).

As with many disorders the burden of suffering from dementia increases with age. Five to ten percent of the population over age 65 already suffers from dementia. The incidence doubles every five years after age 65 (United States Department of Health and

Human Services, 1996). There are about 266,000 new cases of dementia diagnosed each year (Chow & MacLean, 2001). Alzheimer's disease, the most common and well-publicized cause of dementia, reaches a prevalence of 40% among those older than 80 years (Chow & MacLean, 2001).

Those who suffer from dementia often live a decade or more with progressive debilitation and decline in social and occupational functioning. Those diagnosed with dementia experience a lifespan that is reduced by 4 years or more. This is twice the mortality rate of age-matched individuals. Dementia sufferers have an increased rate of placement in nursing facilities (Chow & MacLean, 2001). The cost of providing care to dementia sufferers has been estimated to be 65 to 90 billion dollars a year (Public Health Service, 1996). The emotional toll and burden of suffering experienced by those with dementing disorders and their families is immeasurable (Public Health Service, 1996;United States Department of Health and Human Services, 1996).

Because the older population will increase in number by 50% over the next three decades, the need for dementia recognition and treatment will grow (Chow & MacLean, 2001). Recent advances in therapeutic interventions for dementia disorders have created opportunities to delay disability associated with these disorders. It becomes increasingly apparent that recognition of cognitive changes in the early stage of the diseases reduces suffering and debilitation. Slowing the progression of a dementia disorder through pharmocotherapy can extending quality and quantity of life, while support for caregivers and families can significantly reduce their emotional burden (Chow & MacLean, 2001). Timely placement of these services requires early recognition of the disease process.

Primary healthcare providers often under-recognize early dementias (Ashford, Mendiondo, Kryscio &, Schmitt, 2002). This is due to lack of routine screening, inability of the patient and their family to recognize the symptoms, and the difficulty involved with differentiating between memory change of aging and early dementia (Ashford, Mendiondo, Kryscio &, Schmitt, 2002). Individual reporting alone is not enough to detect early dementia. Patients, caregivers, and family members did not recognize symptoms in up to 53% of dementia cases detected by screening tests (Chow & MacLean, 2001).

The need for rapid screening tests for dementia has long been recognized and several have been developed. Tests of memory recall have been shown to be the most sensitive for Alzheimer's disease. In addition, tests of category verbal fluency have been shown to discriminate between dementia patients and demographically matched older adults (Ashford, Mendiondo, Kryscio &, Schmitt, 2002). Screening allows for earlier diagnosis. Since diagnosis is required for appropriate therapeutic intervention, screening for dementia could potentially delay progression of the disease process (Chow & MacLean, 2001).

Summary

The incidence of dementia continues to rise as the population ages. Dementia impacts the physical, mental, and social well being of the individual and the environment in which they live. Early recognition of the disease is the key to reducing the burden of suffering. The difficulty is that early dementia is under-recognized and few healthcare

providers screen the elderly for dementia. Development and validation of dementia screening tools will increase the recognition of early dementias. This recognition allows for appropriate intervention.

CHAPTER 2

Review of Literature

The review of literature discusses concepts of screening for dementia that are introduced in the conceptual framework. These concepts include: dementia, early recognition of dementia, and the tools of interest for this study. Dementia is discussed in regards to its detrimental consequences, classifications, etiologies, and its relationship to the concept of cognitive impairment. Screening is then explored with specific implications for screening for dementia. The specific tools of interest to this study are discussed along with underlying theories where applicable.

This review was written with the belief that early detection of dementia greatly enhances the opportunity for appropriate diagnosis and treatment. Establishing a valid tool for detecting possible dementia, which primary care providers can readily use, will increase recognition of early disorders. The early interventions can significantly reduce the negative impact to physical, mental and social well-being experience by the sufferer and their loved ones.

Dementia

Dementia is often defined as a progressive mental disorder, which is characterized by chronic personality disintegration, confusion, and deterioration of intellectual capacity and function. People suffering from dementia experience impaired control of memory, recall, judgment, and impulsiveness (Anderson, K., Anderson, L., & Glanze, 1994). The impaired mental functions include orienting, recent and remote memory, language ability,

and executive attention functions (McCance,& Huether, 1998). In contrast to the idea of the progressive nature of dementia, the literature frequently refers to "reversible causes of dementia" (Costa, Williams, Somerfeld, et al, 1996; Cummings & Benson in McCance & Huether, 1998, pp 486; Love & Webb, 2001; Tomoeda, 2001; Victor & Ropper, 2001; Tierney, McPhee &, Papadakis, 2003). The presence of reversible etiologies of dementia makes detecting early dementia more important.

Dementia Classifications and Etiologies

Classification of dementias can be performed by their etiologies (infectious, neoplastic, vascular, traumatic, etc.), by the broad primary vs. secondary categories (e.g. primary: Alzheimer's, secondary: brain neoplasm), or by the area of the brain that is affected (cortical, subcortical, combined cortical/subcortical, and miscellaneous dementia syndromes). (McCance, & Huether, 1998; Thomas, 1993). Alzheimer's disease is the most frequently occurring cause of dementia in North America (50-85% of cases), followed by multi-infarct or vascular dementias (10-20% of cases) (United States Department of Health and Human Services, 1989). Alzheimer's is a cortical dementia. Vascular dementias often involve diffuse areas of the brain (cortical and subcortical).

The physiological results of a progressive dementia are nerve cell degeneration and atrophy of the basal ganglia, diencephalon, and cerebral cortex. The specific pathological process is dependent upon the etiology (McCance,& Huether, 1998). Major etiologies of dementia include: Cortical dementias like Alzheimer's disease and Pick's disease. Subcortical dementias such as Parkinson's, Huntington's chorea, Wilson disease, spinocerebral degeneration, hydrocephalus, systemic illness, endocrinopathies,

deficiency states, drug and heavy metal intoxications, chronic alcohol abuse and the dementia of depression. Combined cortical and subcortical dysfunction dementias include multi-infarct, AIDS, Creutzfeldt-Jakob, and Kuru. Miscellaneous syndromes include posttraumatic, anoxic brain injury, and neoplasm of the brain (Adapted from Cummings & Benson in McCance & Huether, 1998, pp 486).

The specific mechanism of damage to brain function is dependent upon the etiology. Multiple vascular infarcts and generalized atherosclerosis of the brain occur, causing a disruption in cerebral blood flow and related tissue injury. Degeneration may occur due to genetic, inflammatory, and biochemical disruption. Traumatic disruption and related alteration in structure of the brain can result in dementia. By directly altering the structure (thereby function), blood flow is disrupted, and the resulting inflammatory and biochemical effects result in damage. Finally compression (increased intercranial pressure) such as in hydrocephalus, is a pathological mechanism that can result in the cascade of events leading to dementia (McCance & Huether, 1998).

Mild Cognitive Impairment

From a clinical and pragmatic view, mild cognitive impairment is a syndrome marked by deterioration of cognitive function (e.g.: thinking, conceiving, reasoning, recall, insight, perception). This impairment does not meet the criteria for dementia. The severity of impairment is between that of normal aging and dementia in older people (Reber & Reber, 2001; Petersen et al., 2001). This "low grade dementia" is either idiopathic or has the same etiologies as dementia.

A number of terms have been used to describe this diagnosis: mild cognitive impairment, isolated memory impairment, incipient dementia, cognitive disorder of non-specific etiology, and dementia prodrome (Petersen et al., 2001; Sadock & Kaplan, 1998). Regardless of the name given, there is a generally agreed upon constellation of symptoms. These include: report of memory deterioration (preferably corroborated by family or caregiver), memory deficits displayed in objective testing, global mental status and ability to perform activities of daily living (ADLs) remains largely intact, and the patient does not meet criteria for dementia or symptoms cannot be explained by other etiology (Petersen et al., 2001).

Screening for Dementia

To make the screening process for any disorder useful, a number of criteria have to be met (Gordis, 2000). Within the target population the disorder must be of sufficient prevalence. The individuals should be able to comply with subsequent tests and treatments. The disorder itself is required to possess significant morbidity and mortality. Treatments must be available. A period in which the disorder is detectable prior to disability is required. There must be improved outcome from early interventions. It is necessary for the screening test to have acceptable sensitivity and specificity, low costs and risks to those being screened, and it is required that a means of confirming or excluding the disorder exists (Tierney, McPhee &, Papadakis, 2003)

It is evident that screening for dementia in older people is a prudent clinical practice. Screening rationale is as follows: the prevalence for dementia doubles every 5

years in older people, reaching 30-50% by age 85 (Tierney, McPhee &, Papadakis, 2003). Many support programs, treatments, and therapies exist that help reduce the burden of suffering for those who live with dementia and their family members are generally available and tolerated well (U.S. Preventive Services Task Force, 1989; Hanninen, 1996; Doody et al., 2001). Dementia disorders cause significant morbidity and mortality (Doody et al., 2001). A number of interventions for sufferers and their families exist while research continues to evolve new therapies (Robinson, Kidd &, Rogers, 2000). For most causes of dementia there exists a period in which symptoms of the disorder are detectable prior to deterioration and disability. Early detection and interventions have been shown to improved outcomes in dementias, with complete resolution in a small percentage of cases (Tierney, McPhee &, Papadakis, 2003). Several screening tests for dementia have displayed acceptable sensitivity and specificity, low costs and risks to those being screened, confirmation or exclusion of dementia can be determined by complete neuropsychological evaluation, along with appropriate tests and imaging as indicated (Tierney, McPhee &, Papadakis, 2003). The United States Preventive Services Task Force has recently stated that there are insufficient data for or against recommending routine screening for dementia in the general elderly population. Clinicians should, however, assess cognitive function whenever mental deterioration is suspected, the patient reports related symptoms, or family members express concern in this area (Barclay & Sklar, 2003).

There are difficulties associated with screening for dementia. Often it is problematic to distinguish early pathology from cognitive change associated with aging.

This may be due to the slowed processing speed experienced with age (Laasonen, Lahti-Nuuttila &, Virsu, 2002). Age-related decline in sensory and perceptual abilities can complicate testing. Visual and auditory deficits associated with aging can negatively impact cognition and reduce the individual's ability to perform many tests of attention, intelligence, and memory (Scialfa, 2002).

Tools of Interest

The Screening tools that are being examined are the Mini-Mental State Exam, Behavioral Dyscontrol Scale, and the Animal Naming Test. Each tool is discussed with regard to the nature of the test, its use, origin, and philosophy where appropriate. Information, concerning specificity and sensitivity, is discussed in the methodology section.

Mini-Mental State Examination

The Mini-Mental State Examination (MMSE) is an instrument developed by Folstein and associates (1975) to measure global mental status both to screen for dysfunction and to use serially to track patient status (Folstein, Folstein &, Mchugh, 1975). The MMSE evaluates only the cognitive aspects of mental functions and includes measures of orientation, memory, attention, naming, following commands, writing a sentence, and copying a complex polygon (Folstein, Folstein &, Mchugh, 1975). It utilizes a 30-point scale (scores < 24 suggest cognitive impairment, whereas scores < 20 indicate dementia) and can be administered in about 10 minutes (Grigsby, Kaye, Baxter, Shertterly &, Hamman, 1998).

The MMSE is the most widely used screening tool for dementia. It may be stated that it is often the "gold standard", utilized as the "control" to establish validity of other tools (Frank & Byrne, 2000; Juby, 1999). Because of its brevity, reliability, and validity, the MMSE is commonly used for assessment of general mental status in the elderly (Grigsby, Kaye, Baxter, Shertterly &, Hamman, 1998).

The MMSE has been utilized to study a number of disorders. These include depressive psuedodementia (Devinsky, 1992), frontal lobe dysfunction of aging (Axelrod et al., 1992), early Alzheimer's disease (Galasko et al., 1990), and memory loss in women (Mercer, 1998).

The issue of educational bias in the MMSE has been debated. Murden and Galbraith (1997) propose a modified MMSE to adjust for educational bias within the tool. Schmand, Lindeboom, et al (1995) recommended adjusting scores by 2 points to accommodate educational differences, while additional authors have published normative data stratified by education (Crum, Anthony, Basset &, Folstein, 1993). Other authors found that scores on the MMSE correlated with age, regardless of educational level and there was no evidence to support altering the tool (Jones and Gallo, 2001). Contributing to this dispute is the fact that low education level is a risk factor for dementia (Schmand, Lindeboom, et al, 1995).

While the MMSE was designed as a test for mental status, it has been shown to be sensitive to executive dysfunction in the elderly (Axelrod et al., 1992). In contrast, it has been observed that executive dysfunction can be frequently observed in patients who score in the normal range on the MMSE (Kaye, Grigsby, Robbins &, Korzun, 1990).

Since early dementia patients may display executive dysfunction this becomes an important issue (Grigsby, Kaye, Eilertsen &, Kramer, 2000).

Behavioral Dyscontrol Scale

The Behavioral Dyscontrol Scale (BDS) is a 19-point, 9-item instrument developed to evaluate executive function (Kaye, Grigsby, Robbins &, Korzun, 1990). It has been shown to be valid among elderly subjects as a measure of the capacity for regulating one's own behavior. The majority of the items assess the subject's capacity to control simple, vastly novel, voluntary motor activities (Grigsby & Kaye, 1996). The BDS was adapted primarily from the work of Alexander Luria (Kaye, Grigsby, Robbins &, Korzun, 1990: Luria, 1980). Luria's research was based on patients with damage to the prefrontal cortex. These individuals were found to possess a "frontal lobe dysfunction" (Grigsby, Kaye, Eilertsen &, Kramer, 2000) with characteristic behavioral and cognitive deficits (Malloy, Webster &, Russel, 1985).

This "frontal lobe dysfunction" is more appropriately named "executive dysfunction" or "dysexecutive syndrome"(Grigsby, Kaye, Baxter, Shertterly &, Hamman, 1998). These terms are more accurate. This is due to the fact that the prefrontal cortex, theoretically held to house executive functions, is interconnected with a number of other areas of the brain. Loss of executive function can occur with lesions in these other areas as well (e.g., subcortical frontal area, basal ganglia, mediodorsal thalamic nucleus) (Grigsby, Kaye &, Robbins, 1995). Executive functions include the abilities of active problem solving, planning, working memory, attention, monitoring

ones behavior, regulating behavior, and reacting to cues in the environment to alter that behavior (Grigsby et al., 2002).

It is clear that executive function is required primarily when the behavior is novel; which is to say that well-learned or automatic behaviors require little use of the executive areas of the brain (Stuss & Benson, 1987). For example, an individual with executive dysfunction may be able to undress independently (a well-known behavior) though they may perform this activity in an inappropriate setting, such as while in public, due to the loss of inhibition, impulsivity, and disturbed self-regulation of behavior (Grigsby, Kaye &, Robbins, 1995). In apparent contrast this same individual may not get dressed in the morning, without prompting, due to the behavioral inertia associated with their executive dysfunction (Kaye, Grigsby, Robbins &, Korzun, 1990).

There is yet a "higher" level of functioning associated with the frontal lobe that is normally left to philosophy and theoretical psychology: consciousness. Similar to the concept of metacognition, consciousness is the ability to be aware of the self and the interaction between this self and the environment (Stuss, 1992; Perecman, 1987). The measure of "subject insight" on the BDS is an interpretation of the subject's outward expression of this recognition. Consciousness in this sense is significant in the discussion or testing of executive function (Stuss, 1992; Perecman, 1987).

Animal Naming Test

The Animal Naming Test (ANT) is a timed verbal fluency test in controlled association by category (Hanninen, 1996; Goodglass & Kaplan, 1983). By utilizing recall of a category (animals), the ANT tests semantic memory and recall ability. The

ANT and similar tests of semantic recall have been widely used. The ANT appears as a portion of the Stanford-Binet (Goodglass & Kaplan, 1983), has been used to diagnose semantic memory disturbance (Chertkow & Bub, 1990), and has proven to be the most effective type of tool in differentiating normal individuals from those with early Alzheimer's disease (Ashford, Mendiondo, Kryscio, & Schmitt, 2002).

The ANT involves the examiner providing the word "dog" as an example. The subject then verbally names as many animals as they are able. The examiner lists the named words in 15-second grouped columns with a total of 90 seconds provided for naming. A score is determined by the subject's most productive consecutive 60 seconds (excluding repeated names and the examiner's example word) (Goodglass & Kaplan, 1983). Other timing and scoring methods have been proposed for the ANT (Ashford, Mendiondo, Kryscio, & Schmitt, 2002; Hanninen, 1996).

The average adult can provide about 18 valid answers in the allotted time (Goodglass & Kaplan, 1983). Normal subjects state animal names rapidly in the first 15 seconds and taper off. Aphasic patients and those with dementia run out of words earlier and recover with bursts of additional words (Goodglass & Kaplan, 1983). The lower limit of normal is 12 valid words. The early Alzheimer's disease patient can rarely produce more than 10 animal names in 1 minute (Mega, 2002). Subjects may fail either through providing a limited number of appropriate responses or by giving the same response repeatedly (perseveration) (McCarthy & Warrington, 1990).

This test is of interest to dementia investigators because dementia patients suffer particular impairment in semantic memory and recall ability (Bayles, Kazniak &,

Tomoeda, 1987). Language is very sensitive to even mild changes in brain function (Love & Webb, 2001). The act of possessing a categorized list of mental representations ("animals") is only a small part of performing a recall task. The individual must attend to the task, or "remember to remember". They must control, and at least be mildly aware of, their mental tasks. The participant must also follow the instructions and select mental representations appropriate to the requested category (Stuss, & Benson, 1987). Early mild dementia patients experience word retrieval difficulties (Love & Webb, 2001). Studies of Alzheimer's patients reveal some deterioration of semantic storage. Semantic memory is thought to be largely resistant to the dementia process (Chertkow & Bub 1990). These Alzheimer's patients displayed difficulties in semantic searching and selection. Therefore the ANT is not a direct measure of semantic memory store, but a combined storage, sorting, retrieval, and expression test (Chertkow & Bub 1990).

Association Between Tests

Some data exists comparing the BDS to the MMSE. Grigsby and associates (1992) found that the BDS assesses a functional domain that is not the same as that assessed by the MMSE or other measures of gross orientation and cognitive status (Grigsby, Kaye, & Robbins, 1992). Much of the work utilizing both the MMSE and BDS has been in relation to prediction of functional level as in Activities of Daily Living (ADL) and Instrumental Activities of Daily Living. Through these evaluations, Grigsby and associates found that the MMSE is not predictive of functional independence. The BDS was found to be predictive of functional ability in the elderly (Grigsby, Kaye, & Robbins, 1995; Grigsby, et al. 1998). It has been noted that ADL is not the best choice

as a validity measure for psychological testing. ADL and independent function measures are influenced by a multitude of factors (Schmand, et al. 1995).

There exists a double dissociation between MMSE and BDS. That is, some individuals display a significant impairment of executive function with intact mental status, while others have impaired mental status and intact executive function (Grigsby, et al. 1998). Though severely impaired subjects, who scored 0 on the MMSE, also score 0 on the MMSE (Grigsby, et al. 2002).

Many studies have been published comparing the MMSE to other measures of executive function. The MMSE was compared to three neurocognitive tests sensitive to frontal lobe (executive) dysfunction. This comparison revealed a significant positive correlation between executive dysfunction (measured by a composite of the three neurocognitive tests) and MMSE score ($r = .49$, $p < .001$) (Axelrod, Goldman, & Henry, 1992).

Very little data exist directly comparing the ANT to either the BDS or MMSE. Impaired abilities on tests of semantic recall have been correlated with poor scores on the MMSE (Bayles, Tomoeda, et al, 2000). Adding a verbal fluency task (closely resembling the ANT) to the MMSE increased the sensitivity to mild Alzheimer's (Galasko, et al. 1990).

The mechanism of impairment in ability to perform the ANT can be closely related to executive functioning. Tests of memory and recall may be altered, not because of primary loss of memory storage, but a disruption in mnestic activity specifically motivation, attention, and utilization of an organized means of retrieval (Stuss, & Benson,

1987; Cherkow & Bub, 1990). It is no surprise that tests of verbal fluency from other established testing procedures have been correlated with tests of executive function (Royall, Mahurin, & Gray, 1992). Tests of verbal fluency (semantic recall) have been utilized to aid in assessing for perseveration, a sign of executive dyscontrol (Bryan & Luszcz, 2001).

Summary

Dementia is a disorder characterized by personality disintegration, confusion, and deterioration of intellectual capacity. These dysfunctions arise from impaired control of memory, recall, judgment, orienting, language ability, and executive attention functions. Dementia has a number of etiologies, some of which are reversible. Mild cognitive impairment is recognized as a prodromal state for many dementia cases. In order to optimally treat any dementia, early recognition is imperative. Screening for dementia in the elderly has become a prudent clinical practice.

The tools of interest to this study are the MMSE, BDS and ANT. The MMSE assesses global mental status. The BDS evaluates executive function through a series of novel tasks. The ANT measures semantic recall ability. While little data directly compare these three tests, there is a relationship between performance on tests of semantic recall and measures of executive function.

CHAPTER 3

Methodology

The purpose of this study was to evaluate the validity of the Animal Naming Test (ANT) by comparing it to the Behavioral Dyscontrol Scale (BDS) and the Mini-Mental State Exam (MMSE). Three specific aims were addressed in this study. Aim 1: Is there a relationship between an older individual's score on the Animal Naming Test (ANT), the Mini-Mental State Examination (MMSE) and Behavioral Dyscontrol Scale (BDS)? Aim 2: Is there a significant difference in test performance (ANT, MMSE, and BDS) between community-dwelling and extended care facility residing older persons? Aim 3: Does mental status and semantic recall ability, (as measured by the MMSE and ANT respectively), predict executive function performance as evidenced by score on the BDS?

Design

This study utilizes a descriptive correlation design to examine instrument validity (Burns and Grove, 2001). Burns and Grove define instrument validity as determining the extent to which an instrument actually reflects the abstract phenomena that it is intended to measure (2001). The instruments being evaluated in this study are the Animal Naming Test (ANT), previously a portion of the Arizona Battery for Communication Disorders of Dementia, the MMSE, and the BDS.

The Mini Mental State Exam (MMSE) was chosen as a screening tool to eliminate individuals with significant mental status impairment. The MMSE was first

used to screen out subjects with grossly impaired mental status (score less than 24). Subsequently, the MMSE scores were not included in the analysis.

Sample

Subjects were selected from two populations. Group one was a convenience sample of community dwelling seniors who participate in the Billings Community Center activities. These subjects voluntarily approached the researcher during times designated by the director of the center. Potential subjects were notified by an announcement at lunchtime and volunteered to participate. Group two was a convenience sample identified from the residents of a Miles City extended care facility. Potential subjects were identified by the director of nursing and approached by the researcher regarding their willingness to participate.

Two groups were selected to provide a more diverse sample of older people in Montana. The two groups allowed for evaluation of the tools with groups of people who have a presumed general difference in functional ability and independence. All subjects met the inclusion criteria.

Inclusion Criteria

Age 65 years old or older

Live in the designated areas: group 1. resident of extended care facility; 2. community dwelling resident

Ability to mentally and physically participate in, and complete, the series of tests

Ability to provide consent to participate

Read and understand English

Exclusion Criteria

A diagnosis of greater than mild dementia by report, or presumptive diagnosis with MMSE score of 24 or less

Unable to provide informed consent

Not a member of the groups of interest

The Interview and Testing Procedures

The interview was initiated with a brief explanation and informed consent was obtained (Appendix D). The interviewer answered all participants' questions. A general dialogue was developed to guide this portion of the interview (Appendix E).

The Animal Naming Test, Behavioral Dyscontrol Scale, and the Mini Mental State Exam were serially administered to older people (65 years or older) within the community and in a long-term care facility. After obtaining informed consent from the participant, demographic information was obtained. The MMSE was delivered to each subject to screen out potential participants whose mental state would indicate a high suspicion for impairment (MMSE score <24), which would exclude them from this study. The tests were then delivered in a single session with the order of testing alternating for each participant, (e.g.: participant number 1 performs BDS first, participant number 2 performs ANT first, etc.). This method of alternating the order of tests was chosen to reduce carryover affect.

Environmental factors were controlled by providing a private, quiet area with minimal distractions to the extent that was convenient and possible for each subject. The

test scores were then recorded on numbered demographics sheets for later analysis (T test, item analysis, regression analysis). The aim of the analysis was to determine if the Animal Naming Test is predictive of the scores on the other tests. No identifying information accompanied the demographics, the tests, or the test scores.

Demographics

Gender, age, education, marital status, income, ethnicity, presence of dementia disorders, and physical/sensory deficits were addressed through an interview. This information was then recorded on the demographic sheet (Appendix D). The demographic sheet and tests were marked with the number assigned to each participant.

Mini-Mental State Exam

The Mini-Mental State Exam (MMSE) is the dementia screening tool most widely used by clinicians. It is often utilized as a control by researchers to establish validity of other tools (Frank & Byrne, 2000; Juby, 1999). The MMSE assesses the cognitive aspects of mental functions. It includes measures of orientation, memory, attention, naming, following commands, writing a sentence, and copying a complex polygon (Folstein, Folstein &, Mchugh, 1975).

The MMSE utilizes a 30-point scale (scores < 24 suggest cognitive impairment, whereas scores < 20 indicate dementia) and can be administered in about 10 minutes (Grigsby, Kaye, Baxter, Shertterly &, Hamman, 1998). In the general population the MMSE is sensitive (0.82) and specific (0.87) for dementia. Studies of highly educated and poorly educated individuals have yielded sensitivities of 0.93 to 0.98 with variable

sensitivities (0.63 to 1.00) (Murden & Galbraith, 1997). Test-retest reliability over 24 hours has been reported as r=0.85 to 0.99 for stable demented patients and non-demented elderly. In one month and one year assessments the test-retest reliability was reported as 0.89 and 0.50 respectively (Mitrushina & Satz, 1991). The MMSE correlates with batteries of cognitive tests (r=0.776, p<o.ooo1) (Folstein, Folstein, & McHugh, 1975). Because of its brevity, reliability, and validity, the MMSE is commonly used for assessment of general mental status among the elderly (Grigsby, Kaye, Baxter, Shertterly & Hamman, 1998).

Behavioral Dyscontrol Scale

The Behavioral Dyscontrol Scale (BDS) is a 19-point, 9-item instrument developed to evaluate executive function (Kaye, Grigsby, Robbins &, Korzun, 1990). It has been shown to be valid among elderly subjects as a measure of the capacity for regulating one's own behavior. The majority of the items assess the subject's capacity to control simple, vastly novel, voluntary motor activities (Grigsby & Kaye, 1996). Cognitively intact elderly have a mean score of 12.8 (s.d.= 3.9) on the BDS. Scores of 0-6 on the BDS are indicative of severe impairment of behavioral control. Scores of 7-10 suggest moderate impairment. Scores of 11-15 may indicate mild impairment (Grigsby & Kaye, 1996). Test-retest reliability over 2 months has been reported to be 0.89 to 0.93. The BDS has been shown to correlate well with measures of independent ADL function (Grigsby & Kaye, 1996).

Normative data on the BDS utilizes the original BDS scoring method (19 point scale). This research was performed utilizing the BDS-2 (27 point scale) scoring criteria.

This method was selected for the clinical benefit of avoiding the "ceiling effect" found with the original method (Grigsby & Kaye, 1996). BDS-2 is useful for discriminating among normal, higher functioning adults by adding 1 point to each of the first eight items. This scoring method allows credit for exceptional performances. Other criteria remain unchanged. Normative data presented here is based on the original BDS scoring, BDS-2 normative data is still being collected (Grigsby & Kaye, 1996).

Animal Naming Test

The Animal Naming Test (ANT) is a timed verbal fluency test in controlled association by category (Hanninen, 1996; Goodglass & Kaplan, 1983). By utilizing recall of a category (animals), the ANT tests semantic memory and recall ability. The ANT and similar tests of semantic recall have been widely used. They have proven to be the most effective type of tool in differentiating normal individuals from those with early Alzheimer's disease (Ashford, Mendiondo, Kryscio, & Schmitt, 2002).

The average intact adult can score 18 points on the ANT. The lower limit for a normal score is 12 valid words. The early Alzheimer's disease patient can rarely produce more than 10 animal names in 1 minute (Mega, 2002). The ANT has been determined to be a valid measure of semantic recall ability and has correlated well with measures of cognitive impairment (Chertkow & Bub, 1990).

Tool Summary

The first function of the MMSE in this study was to eliminate subjects with significant impairment. This was achieved by halting the testing after a subject obtained

a score less than 24. After completing the MMSE, subjects completed the ANT and BDS. The order of the ANT and BDS was alternated to reduce carryover effect.

The BDS was scored utilizing the BDS-2 criteria. At this time, norms for BDS-2 scoring are not available. Equivalent scoring could be estimated through extrapolation, though it is not necessary for this study. Semantic recall ability is determined to be in the normal range if the individual is able to score 12 or greater on the ANT.

Human Subjects Protection

Montana State University-Bozeman Institutional Review Board approval was obtained for this study. Each participant signed an informed consent form (Appendix D). A single investigator performed all interviews and testing. At no time did the participants' names or identifying information accompany their demographics, tests, or test results. Each of these items was numbered. The investigator entered the data into SPSS 11.0 statistical software. All information was maintained in a safe, private area when not in the possession of the investigator.

Assumptions

The BDS, MMSE, and ANT are the tests utilized to assess the validity of the ANT among the elderly. It was assumed that elderly people living in the extended care facility would be less independent in functioning than the community dwellers. It was assumed that an individual scoring less than 24 on the MMSE potentially suffers

dementia or another cognitive disorder. This impairment would make them not representative of intact to minimally impaired elderly persons.

Data Analysis

Demographics

Descriptive statistics were used to examine the age, gender, ethnic background, marital status, income, education level, and diagnosis of dementia. The results of the testing are presented utilizing descriptive statistics. The tests performed were the MMSE, BDS, and ANT. The results were expressed with frequency distribution and measures of central tendency.

Aim 1.

The purpose of this study was to examine if there was a relationship between older individuals' scores on the Animal Naming Test (ANT), the Mini-Mental State Examination (MMSE) and Behavioral Dyscontrol Scale (BDS). A correlation matrix was utilized to examine relation ships between scores on the ANT, MMSE, and BDS.

Aim 2.

An additional purpose of this study was to determine if there was a significant difference in test performance (ANT, MMSE, and BDS) between community dwelling and extended care facility residing older persons. A T-test and frequency analysis to assess scores on each test was utilized to look for differences between the two groups of older individuals.

Aim 3.

Further, this study examined whether mental status and semantic recall ability (as measured by the MMSE and ANT respectively) was predictive of executive function performance as evidenced by score on the BDS. A regression analysis was utilized to compare the relationship between scores on the MMSE and ANT to scores on the BDS.

Potential Problems and Limitations

The convenience samples may not be representative of the elderly population in Montana. The low rate of minorities in the state of Montana makes the results of this study not generalizable to the other populations. The cognitive, executive, and semantic recall abilities of these subjects may not be representative of other elderly individuals. The process of participating in this study may have altered the participants' performance on the tests. The participants may have sensory deficits, which impaired their ability to participate. Participants may have not fully understood the test instructions. Potential errors may have occurred in testing, scoring and recording the data.

Summary

The purpose of this study was to evaluate the validity of the Animal Naming Test (ANT) by comparing it to the Behavioral Dyscontrol Scale (BDS) and the Mini-Mental State Exam (MMSE). By assessing concurrent validity with the ANT, BDS and MMSE, correlation of measures can be determined. This study utilized a descriptive correlation design. Subjects were convenience sampled from two groups. The first group was from

elderly extended care facility dwellers. The second group was from community dwelling elders who participate in a community center's activities. The institutional review board approved the study. This study was voluntary and informed consent was obtained form each participant.

Each participant performed the MMSE, BDS, and ANT. Measures were taken to reduce participant discomfort. Data from the interview and testing were numbered and no identifying information was attached. Data analysis was performed on SPSS 11.0 statistical software.

CHAPTER 4

Results

Descriptive statistics were utilized to present the demographic characteristics of the participants (n=60). The extended care dwelling and community dwelling groups were compared for differences in these demographics by utilizing a t-test. Test results and individual test items were compared, using a Pearson's bivariate correlation. By using a t-test and frequency analysis, test performance differences between the two groups were discovered. Regression analysis was used to exam a predictive relationship between the Mini-Mental State Exam (MMSE), Animal Naming Test (ANT), and Behavioral Dyscontrol Scale (BDS).

Demographic Characteristics

The sample consisted of 60 participants, 47% (n=28) extended care dwelling and 53% (n=32) community dwelling. The entire sample (n=60) reported their race as Caucasian. The mean age was 79 (SD=7.5) with a range of 65 to 96. Forty three percent of participants (n=26) were male and 57 percent (n=34) were female. Forty seven percent (n=28) were widowed, 5% (n=3) never married, 32% (n=19) were married, and 17% (n=10) reported being divorced.

Highest annual income reported by subjects included: 15% (n=9) less than $10,000, 42% (n=25) between $10,001 and $30,000, 17% (n=10) between $30,001 and $60,000, 5%(n=3) over $60,000, and 22% (n=13) gave no response. Reported education

levels were 12% (n=7) 5 years or less, 22% (n=13) 5 to 11 years, 35%(n=21) high school graduates, 25%(n=15) some college, 5% (n=3) college graduates, and 1.7% (n=1) reported having obtained a masters or doctorate.

The presence of perceived sensory-neural and physical limitations, significant enough to interfere with test taking, was obtained. Only 3.3% (n=2) of subjects reported cognitive impairment or dementia, 18% (n=11) reported vision limitation, 12% (n=7) reported hearing difficulties, 1.7% (n=1) reported limitations of speech, one third (n=20) reported difficulty writing, and 1.7% (n=1) responded in the "other limitation" category.

Table 1. Demographics of Sample (n=60)

	(%)	n
Gender		
Male	43	26
Female	57	34
Group		
Community dwelling	53	32
Extended Care	47	28
Ethnic Background		
Caucasian	100	60
Marital Status		
Never Married	5	3
Married	32	19
Widowed	47	28
Divorced	17	10
Education		
5 Years or less	12	7
5 to 11 Years	22	13
High School	35	21
Some College	25	15
College Graduate	5	3
Masters/Doctorate	2	1

Yearly Income		
No Response	22	13
< $10,000	15	9
$10,001 to $30,000	42	25
$30,001 to $60,000	17	10
>$60,000	5	3
Perceived Significant Limitations		
Cognitive	3	2
Vision	18	11
Hearing	12	7
Speech	2	1
Writing	33	20
Other	2	1

Significant Group Demographic Differences

The community dwelling group was younger (mean age 75.7 vs. 83.1), had more married individuals (41% vs. 21%), and was more likely to be divorced (25% vs. 7%). Extended care dwellers were more likely to report impairment of vision (36% vs. 3%), and hearing (25% vs. 0%). People living in extended care were more likely to be widowed (68% vs. 28%). By utilizing a t-test, no other significant differences between the groups were found.

Table 2. Significant Demographic Group Differences: Extended Care (n=28) vs. Community Dwelling (n=32)

Demographic	Community	Extended Care
Age (mean)	75.7 years	83.1 years
Married	41%	21%
Divorced	25%	7%
Widowed	28%	68%
Visual Impairment	3%	36%
Hearing Impairment	0%	25%

Aim 1

Is there a relationship between older individuals' scores on the Animal Naming Test (ANT), the Mini-Mental State Examination (MMSE) and Behavioral Dyscontrol Scale (BDS)? Correlations between scores on the ANT, MMSE, and BDS were examined. The data was analyzed utilizing Pearson's Bivariate Correlation with significance at $p<0.01$ and $p<0.05$ level (2-tailed). Each of the tests was found to have a number of significant correlations with the other tests or individual items on the BDS or MMSE (Table 3). For individual items on the MMSE please see appendix A, for BDS items see appendix C. Relationship to demographic information was also investigated. These items were examined in a correlation matrix (Table 4).

Table 3. Correlations Between Test, Scores and Individual Test Items $^{\Psi}$

	MMSE	ANT	BDS
MMSE	1		
ANT	.375**	1	
BDS	.748**	.355**	1
MMSE Item 1	.460**	.381**	.480**
MMSE Item 2	.309*	.222	.276*
MMSE Item 4	.670**	.140	.486**
MMSE Item 5	.538**	.207	.444**
MMSE Item 7	.288*	.037	0.99
MMSE Item 11	.489**	.126	.262*
BDS Item 1	.588**	.287*	.714**

BDS Item 2	.384**	.279*	.543**
BDS Item 3	.445**	.082	.517**
BDS Item 4	.639**	.183	.675**
BDS Item 5	.301*	.337**	.382**
BDS Item 6	.259*	.064	.495**
BDS Item 7	.248	.373**	.348**
BDS Item 8	.522**	.175	.613**
BDS Item 9	.365**	.095	.539**

** p< 0.01, * p< 0.05, Ψ Items with no significant correlations were excluded from this table.

MMSE

Score on the MMSE correlated to ANT score (.375) and BDS score (.748). It also correlated with several individual BDS items. Correlations significant to p<0.01 included: item one (.588), item 2 (.384), item3 (.445), item 4 (.639), item 8 (.552), and item 9 (.365). Correlations significant to p<0.05 included: item 5 (.301), and item 6 (.259). The MMSE correlated with some demographic information. There was a relationship between MMSE score and education (.380), income (.456), and report of writing limitation (-.267).

BDS

The BDS score correlated with ANT score (.355) and several individual MMSE items. Those correlations significant to a p<0.01 included: item 1 (.480), item 4 (.486),

and item 5 (.444). Correlations significant to a $p<0.05$ included: item 2 (.267), and item 11 (.262). Score on the BDS also correlated with income (.271) and education (.280).

ANT

ANT score correlated to MMSE item 1 and several BDS items. These BDS items included: item 1 (.287), item 2 (.279), item 5 (.337), and item 7 (.373). Score on the ANT correlated with group association (.375). Community dwellers tended to score higher. The scores also correlated with education (.317), income (.327), report of vision limitation (-.295), and writing limitation (-.278).

Table 4. Correlations Between Test Score and Demographic Data

Test	Group	Education	Income	Vision	Writing
MMSE	.124	.380**	.456**	-.181	-.267*
ANT	.375**	.317*	.327*	-.295*	-.278*
BDS	-.004	.280*	.271*	-.023	-.223

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

Aim 2

Is there a significant difference in test performance (ANT, MMSE, and BDS) between community dwelling and extended care facility residing older persons? A t-test and frequency analysis to assess scores on each test was utilized to look for differences between the two groups of older individuals. Relevant results were reported.

Mean score for the Mini-Mental State Exam (MMSE) was 27.7 (SD=1.6) with a range of 25 to 30. The selection of subjects and exclusion criteria (MMSE score >24)

results in this sample all scoring in the "no impairment" category. Little difference existed between the two groups. Community dwellers scored 27.9 (SD=1.6) while extended care residents scored 27.5 (SD=1.7) on average. Two community dwelling and three extended care subjects were excluded due to scoring 24 or less on the MMSE. Excluded samples were not included in the analysis.

The mean score for the Behavioral Dyscontrol Scale (BDS) was 15.7 (SD=3.2) with a range of 8 to 22. Little difference was discovered between the two groups in BDS scores. Both groups scored a mean of 15.7 (SD= 3.7 for extended care; SD=2.8 for community).

Overall, the sample scored a mean of 16.1 (SD=4.7) on the Animal Naming Test (ANT) with a range of 9 to 28. A significant disparity existed between the two groups in ANT performance. A Pearson's bivariate correlation revealed a significant positive correlation (.375, $p<0.01$) between living in extended care and scoring poorly on the ANT. Community dwellers scored a mean of 17.7 (SD=4.9) while extended care residents scored 14.2 (SD=3.8). An average intact adult can score 18. The lower limit for a normal score is 12. Early Alzheimer's disease patients rarely score more than a 10. More than one quarter, 28.6% (n=8), of the extended care sample scored below the normal range and 17.9% (n=5) scored 10 or less. Only 6.3% (n=2) of community dwellers scored less than 12 points. The community sample had 47% (n=15) of subjects scoring 18 or greater, compared to the extended care group's 21.5% (n=6) (Table 5).

Table 5. Group Differences on Test Scores

Test	Community	Extended Care
MMSE	27.9 (SD=1.6)	27.5 (SD=1.7)
BDS	15.7 (SD=2.8)	15.7 (SD=3.7)
ANT	17.7 (SD=4.9)	14.2 (SD=3.8)
ANT: % Below Normal	6.3% (n=2)	28.6% (n=8)
ANT: % Above Average	47% (n=15)	21.5% (n=6)

Aim 3

Is mental status and semantic recall ability (as measured by the MMSE and ANT respectively) predictive of executive function performance as evidenced by score on the BDS? A regression analysis was utilized to compare the relationship between scores on the MMSE and ANT to scores on the BDS. A multiple regression analysis was performed to evaluate how well MMSE and ANT score predicted the BDS. The predictor variables were the ANT and MMSE scores, while the criterion variable was the BDS score. There was a significant linear relationship between the dependent (BDS) and the set of predictor variables, $F = 37.10$, $p < .001$. The sample's multiple correlation coefficient was .752. MMSE and ANT scores can predict about 57% of the variance on BDS scores. The MMSE was much more important in predicting BDS score ($t = 7.59$, $p = < .001$). The ANT is a very weak contributor to predictive ability ($t = .93$, $p < .358$) despite the significant correlation with BDS scores ($r = .375$, $p < .001$).

Summary

Descriptive statistics were utilized to present the demographic characteristics of the participants (Table 1). The extended care dwelling (n=28) and community dwelling (n=30) groups were compared for differences in these demographics by utilizing a t-test. The results were reported in table form (Table 2). Test results and individual test items were compared, using a Pearson's bivariate correlation (Table 3). Group membership, education level, income, visual impairment, and writing difficulties were compared to test scores (Table 4). By using a t-test and frequency analysis, the only significant difference discovered between the two groups in test performance was in the Animal Naming Test (Table 5). Regression analysis was used to exam a predictive relationship between the Mini-Mental State Exam (MMSE), Animal Naming Test (ANT), and Behavioral Dyscontrol Scale (BDS). It was discovered that the ANT and MMSE combined could predict 57% of the variance in BDS score. The ANT was a weak contributor to this weak predictive ability.

CHAPTER 5

Discussion

The purpose of this study was to evaluate the concurrent validity of three mental screening tools: the Animal Naming Test (ANT), the Behavioral Dyscontrol Scale (BDS) and the Mini-Mental State Exam (MMSE). Specifically this study addressed three questions: 1) Is there a relationship between an older individual's score on the Animal Naming Test (ANT), the Mini-Mental State Examination (MMSE) and Behavioral Dyscontrol Scale (BDS)? 2) Is there a significant difference in test performance (ANT, MMSE, and BDS) between community dwelling and extended care facility residing older persons? 3) Is cognitive status and semantic recall ability (as measured by the MMSE and ANT respectively) predictive of executive function performance as evidenced by score on the BDS?

Extended care dwelling and community dwelling groups were compared for differences in demographics by utilizing a t-test. Test results and individual test items were compared, using a Pearson's bivariate correlation. By using a t-test and frequency analysis, test performance differences between the two groups were explored. Regression analysis was used to exam a predictive relationship between the Mini-Mental State Exam (MMSE), Animal Naming Test (ANT), and Behavioral Dyscontrol Scale (BDS).

The screening process of excluding subjects scoring less than 25 on the MMSE resulted in a relatively high mean MMSE score. Very few subjects in the extended care population were excluded by this criterion. This was partially due to the selection of

subjects by the director of nursing and staff of the facility. They selected those that were believed to possess a global mental status that would allow them to achieve an adequate MMSE score for inclusion in this study.

Conclusions

Aim 1.

Three assessment tools, the MMSE, BDS, and ANT, were used in this study. Volunteer subjects (n=60) over 65 years old performed all three tests in individual sessions. The relationship between performances on each test was examined using a Pearson's Bivariate Correlation. Each of the tests was found to have a number of significant correlations with the other tests and some individual items on the BDS or MMSE (Table 3). Supplemental data, regarding relationship of test scores to demographic information, were also obtained. These items were examined in a correlation matrix (Table 4).

Significant relationships do exist between the scores on the MMSE, ANT, and BDS. Score on the MMSE correlated modestly with ANT score (.375) and much higher with BDS score (.748). MMSE score also correlated with several individual BDS items. The BDS score correlated to some extent with ANT score (.355, $p<.001$) and several individual MMSE items. ANT score correlated moderately with MMSE item 1 and several BDS items (table 3).

The relationship discovered between MMSE and BDS scores is consistent with findings in previous work. The MMSE has been found to correlate with a battery of

executive function tests (Axelrod, & Goldman, 1992). The BDS is a measure of executive function that assesses a different mental phenomenon than the MMSE. Though it has been determined, subjects who perform very poorly on the BDS tend to do badly on the MMSE as well. This is often due to global impairment of mental functions (Grigsby, et al, 1997).

BDS item one (tap twice with the right hand, once with the left) correlated well with total BDS score (.714) and MMSE score (.588). BDS item four (if examiner taps twice the subject taps once, if the examiner taps once the subject taps twice) has an even stronger relationship to MMSE score (.639, $p<0.01$). The BDS tasks require regulation of behavior. Further studies need to be performed to examine these relationships. The possibility of developing a brief tool that combines novel tasks and mental status needs to be evaluated.

A significant, minimal to moderate relationship exists between education and scores on the MMSE (.380, $p< 0.01$), BDS (.280, $p<.005$), and the ANT (.317, $p<.005$). These relationships agree with the idea that tests, such as the MMSE, can have valid educational bias. Low education level also continues to be a likely risk for dementia (Schmand, et al., 1995). Income had a significant relationship with the MMSE (.456), BDS (.271), and ANT (.327). Despite the observation of the relationship of test scores to income, and relationship of scores to education, there was no significant, independent relationship between education and income.

It was proposed that the ANT would have a strong correlation with BDS performance. This was based on the knowledge that language is sensitive to even mild

changes in brain function (Love & Webb, 2001). It seems intuitive that impairment in executive function would be closely linked to recall ability. Executive function is required to attend to the task at hand and "remember to remember" the category (Stuss & Benson, 1987). For example, in Alzheimer's patients, word retrieval difficulties arise early, in the mild stage of the disease. This is attributed, not to loss of the semantic memory itself (at least in the early stages), but to the retrieval process (Love & Webb, 2001). Despite the significance of this relationship, the correlation in this study is actually quite weak. This could theoretically relate to the priming and cueing that occurs with performance of the BDS (the practice repetitions). Previous studies have shown that semantic recall gives very different results when compared to the use of priming in verbal tasks (Cherktow & Bubb, 1990).

Primarily it is believed that these are very different measures. While the mental elements required in performing the BDS and ANT may be interrelated, each test assesses different mental entities. Further research is needed to evaluate the role of executive function in semantic recall tasks, and to evaluate if performance on the BDS and ANT are predictive of early dementia.

Aim 2.

T-test and frequency analyses were used to look for differences between the two groups test scores. The selection of subjects and exclusion criteria (MMSE score >24) results in this sample all scoring in the "no impairment" category on the MMSE. Little difference existed between the two groups in MMSE score. Community dwellers scored 27.9 (SD=1.6) while extended care residents scored 27.5 (SD=1.7) on average. Nearly

no difference was discovered between the two groups in BDS test performance. Both groups scored a mean of 15.7 (SD= 3.7 for extended care; SD=2.8 for community).

Significant disparity existed between the two groups in ANT score. A Pearson's bivariate correlation revealed a significant positive correlation (.375, $p<0.01$) between living in extended care and scoring poorly on the ANT. Community dwellers scored a mean of 17.7 (SD=4.9) while extended care residents scored 14.2 (SD=3.8). An average intact adult can score 18, low normal is 12, and early Alzheimer's patients rarely score more than a 10 (Mega, 2002). More than one quarter of the extended care sample scored below the normal range, while only two community dwellers scored in this category. The community sample also had more than double the number of subjects who scored 18 or greater when compared to extended care subjects (Table 3).

Some may attribute these differences to the increased age of the extended care group since age has been associated with producing fewer animal names (Mega, 200). Contrary to this point is the fact that age was not significantly associated with performance on the ANT. A more probable factor would be the increased sensory difficulties reported by the extended care dwellers. Living in extended care correlated with report of visual limitation. Visual and auditory dysfunctions have been shown to negatively impact cognition (Scialfa, 2002). Score on the ANT had a negative correlation with report of visual limitation, regardless of group membership. While the absolute number of subjects reporting limitation in vision was small (n=11), this is an important finding to consider. It generates the question: Does significant visual limitation negatively impact performance on semantic recall tasks? Some research has

been performed in this area (Scialfa, 2002). Evaluation of sensory impairment's impact on test performance could provide information important to the aging population.

There are a number of other factors that might explain the difference between the groups in ANT performance. There may be decreased stimulation from the environment either through lack of visual cueing or lack of challenge to recall stored information. That is, the residents of extended care may see fewer animals or experience fewer opportunities to be challenged to draw concepts from their memory.

Decreased performance on a test of semantic recall can be linked to other difficulties. Lack of motivation must be differentiated from lack of ability. Decreased volition may be due to the vegetative signs of depression. Those with apathy, with or without depression, have a diminished ability to direct their behavior toward an objective (Grigsby, et al, 1995).

Aim 3.

A multiple regression analysis was performed to evaluate how well MMSE and ANT score predicted the BDS score. A significant linear relationship existed between the BDS and the predictor (MMSE and ANT) variables, $F = 37.10$, $p < .001$. It was determined that the MMSE and ANT scores can predict about 57% of the variance on BDS scores. The MMSE was much more important in predicting BDS score ($t = 7.59$, $p = < .001$). The ANT is a very weak contributor to predictive ability ($t = .93$, $p < .358$) despite the significant correlation with BDS scores ($r = .375$, $p < .001$).

Score on the ANT and MMSE were found to be modestly predictive of BDS score. It had been theorized that the ANT would be a strong predictor of BDS score due

to the idea that semantic recall utilizes executive functions (Axelrod, & Goldman, 1992). It was discovered that ANT score was the weaker contributor to prediction of the two.

Discussion of Findings

These results cannot be generalized to other populations of older people. The entire sample (n=60) identified themselves as Caucasian. While this is not exceedingly deviated from the 90.6% white population of Montana (97% white in Custer County, Montana) it does fail to represent other races (U.S. Census Bureau, 2000). The study also has a relatively small sample size. This is especially evident when the extended care subgroup is considered (n=28). A single participant composes 3.6% of that group. This limits the significance, statistical power, and ability to generalize these findings.

The relationships that were discovered between the ANT and reported disabilities were of interest. Report of visual limitation and handwriting difficulty were significantly related to decreased score on the ANT. The interesting observation is that the ANT requires neither writing nor visual ability. Therefore it is not a direct inability to perform the tasks, but some other mechanism. There is no doubt that this finding could be a product of extraneous variables found when dealing with the complexities of human subjects. Regardless of this possibility, studies to examine these phenomena should be performed.

The comparison of test performance between extended care and community dwelling elderly was curious. The groups performed remarkably close on the MMSE and

BDS. It was only when the ANT was examined that the disparity was revealed. To examine why residents of a care facility score lower on the ANT might prove useful.

The conclusion that is drawn is that these tests measure different mental functions. The relationships discovered between the tests can be attributed to global function. In other words, individuals with intact functioning will score well on the tests, while those with global deficits will perform poorly on the BDS and MMSE (Grigsby, et al., 2002). In contrast, several cases of dissociation occurred. Individuals would perform the MMSE and the ANT well (or one of these) and struggle on the BDS. In casual observation, the interviewer noted that those individuals who displayed perseveration of speech, or verbal content, tended to score lower on the BDS than those who did not. The conflicting observations make it difficult to draw convincing conclusions.

Implications

Practice

The tools evaluated in this study are only part of a practitioner's assessment. A focused history, physical exam, evaluation of relevant laboratory values, and assessment of functional status all play an important role in evaluating an older client. Consulting the patient's family can provide useful insight into some issues. When results of this complete evaluation are mixed (intact score on MMSE or BDS, yet the family reports decline in function) referral for neuropsychological evaluation is indicated.

The results of this study reveal that any one of these assessment tools is inadequate to globally assess an older individual for decline in mental function. An

individual patient may score well above any proposed cut point on the MMSE and still display startling executive dysfunction on the BDS. Conversely, an individual who performs reasonably well on the BDS may not be oriented to place and time (Grigsby, et al, 2002).

Sensory deficits must be considered when performing psychological testing with elderly clients. This study displays that report of significant impairment correlates with poor test performance. It has been stated that test selection should be based on the presence and nature of an individual's physical and sensory deficits (Costa, et al, 1996). Results of this study demonstrate that visual impairment may adversely impact performance on tasks that do not require intact vision. Evaluation of the results suggests that this is not a product of increased age associated vision loss.

The question of screening all older clients still remains. Some propose that routine screening would be appropriate and reduce suffering on a population level (Peskind, 2003). Current evidence indicates that the potential benefits of dementia screening are outweighed by the harm created with false positive tests. The United States Preventive Services Task Force does not currently recommend routine screening for dementia (Barclay & Sklar, 2003). Judicious use of these screening tools in symptomatic clients provides a reasonably objective means of detecting deficits. Clients with decline in function or poor test performance can then be referred for complete evaluation.

Education

Nurse practitioner programs need to continue to incorporate the whole-person approach to assessment and treatment of patients with dementia. Strong critical thinking

skills and general knowledge about screening principles will continue to produce Nurse Practitioners who are intelligent, informed consumers of psychological tests. This will help individual providers realize the limitations of any single evaluation tool. Educational programs also need to teach future healthcare providers that sensory limitations, age, education, and socioeconomic status are important factors in assessing patients for cognitive impairment.

Research

Further studies need to be performed regarding the presence of executive dysfunction in early dementia, and the ability for the BDS to predict dementia. ANT and other rapid tests of semantic recall need to be evaluated for their sensitivity to subtle cognitive changes in the elderly and early dementia patients. The development and examination of a tool that utilizes novel tasks, orientation, assesses for preservation, and utilizes recall ability may prove to be more sensitive to global mental dysfunction in the elderly. By utilizing multiple operational approaches, researchers may find that they avoid much of the double dissociation effects found when clinicians compare several test results. More data needs to be obtained regarding the effects of sensory deficits on test performance. Studies regarding loss of visual acuity and diminished semantic recall ability are lacking. Individuals who lose their physical vision may also experience a decreased ability to visualize a mental group of objects or recall the concepts from a specific category.

Summary

Several significant relationships were discovered between the MMSE, BDS and ANT performance. The MMSE and BDS had a strong positive correlating relationship. This reproduced results of studies performed with other measures of executive function (Axelrod, & Goldman, 1992). It was predicted that the ANT and BDS would possess a strong correlation. This did not prove to exist.

The two groups performed nearly identically on the BDS and MMSE. The community group scored much higher on the ANT than the extended care dwelling group. The extended care group was older than the community group; age and ANT score did not possess a significant independent relationship. Increased age alone does not explain the difference in performance. The extended care dwellers were far more likely to report sensory loss. This could explain the difference in test scores (Scialfa, 2002). Further research should be performed to examine the cause of semantic recall performance deficit in the extended care group.

The ANT and MMSE were found to be modestly predictive of BDS performance. ANT contributed little to the predictive ability. It had been theorized that the ANT would be a strong predictor of BDS score due to the idea that semantic recall utilizes executive functions (Axelrod, & Goldman, 1992).

This study was performed with subjects who identified their race as Caucasian. This was a product of convenience sampling and the high prevalence of whites in the geographical areas involved in the study. The sample was quite small, especially in

regards to the extended care subgroup. This study opens the door for further research projects in dementia, recall, and executive function in the elderly.

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APPENDICES

APPENDIX A

MMSE TEST AND SCORING

MINI-MENTAL STATE EXAM AND INSTRUCTIONS

Maximum Score	Score	Orientation
5	( )	What is the (year) (season) (date) (day) (month)?
5	( )	Where are we: (state) (county) (town) (hospital) (floor)?
		Registration
3	( )	Name 3 objects: 1 second to say each. Then ask the patient all 3 after you have said them. Give 1 point for each correct answer. Then say them until he/she learns all 3. Count trials and record. Trials_____
		Attention and Calculation
5	( )	Serial 7's. 1 point for each correct. Stop after 5 answers. Alternatively spell "world" backwards.
		Recall
3	( )	Ask for the 3 objects repeated above. Give 1 point for each correct.
		Language
9	( )	Name a pencil, and watch (2 points) Repeat the following "No ifs, ands or buts." (1 point) Follow a 3-stage command: "Take a paper in your right hand, fold it in half, and put it on the floor." (3 points) **Read and obey the following:** Close your eyes (1 point) Write a sentence (1 point) Copy design (1 point)
Total score:_____		

INSTRUCTIONS FOR ADMINISTRATION OF MINI-MENTAL STATE EXAM

Orientation

1. Ask for the date. Then ask specifically for parts omitted, e.g., "Can you also tell me what season it is?" One point for each correct.
2. Ask in turn "Can you tell me the name of this hospital?" (town, county, etc). One point for each correct.

Registration

Ask the patient if you may test his memory. Then say the names of 3 unrelated objects, clearly and slowly, about one second for each. After you have said all 3, ask him to repeat them. This first repetition determines his score (0-3) but keep saying them until he can repeat all 3, up to 6 trials. If he does not eventually learn all 3, recall cannot be meaningfully tested.

Attention and Calculation

Ask the patient to begin with 100 and count backwards by 7. Stop after 5 subtractions (93, 86, 79, 72, 65). Score the total number of correct answers.
If the patient cannot or will not perform this task, as him to spell the word "world" backwards. The score is the number of letter in correct order, e.g., dlrow = 5, dlorw = 3.

Recall

Ask the patient if he call recall the 3 words you previously asked him to remember. Score 0-3.

Language

Naming: Show the patient a wrist watch and ask him what it is. Repeat for pencil. Score 0-2.
Repetition: Ask the patient to repeat the sentence after you. Allow only one trial. Score 0 or 1.
3-Stage command: give the patient a piece of plain blank paper and repeat the command. Score 1 point for each part correctly executed.
Reading: On a blank piece of paper print the sentence "Close your eyes," in letters large enough for the patient to see clearly. Ask him to read it and do what it says. Score 1 point only if he actually closes his eyes.
Writing: Give the patient a blank piece of paper and ask him to write a sentence for you. Do not dictate a sentence; it is to be written spontaneously. It must contain a subject and verb and be sensible. Correct grammar and punctuation are not necessary.
Coding: On a clean piece of paper, draw intersecting pentagons, each side about 1 in., and ask him to copy it exactly as it is. All 10 angles must be present and 2 must intersect to score 1 point. Tremor and rotation are ignored.

APPENDIX B

ANT TEST AND SCORING

Animal Naming Test

Name as many animals as you can in one and one half minutes. I will keep track of how many you name without repeats.

Stratified timing:

0-15 sec. _____

15-30 sec. _____

30-45 sec. _____

45-60 sec. _____

60-75 sec. _____

75-90 sec. _____

Score: total number of animals named without repeats: _____

APPENDIX C

BEHAVIORAL DYSCONTROL SCALE AND SCORING

BDS Score Sheet

Subject # _____

Item#/ Score

1. _____ Tap twice with the right (dominant) hand, once with the left (10 reps)
2. _____ Tap twice with the left, once with the right (10 reps)
3. _____ If I say "red", squeeze my hand. If I say "green", do nothing (15 reps)
4. _____ If I tap once, you tap twice. If I tap once, you tap twice (5 reps)
5. _____ Alternating touching of thumb and fingers (5 reps)
6. _____ Fist-edge-palm repetition
7. _____ Head's test
8. _____ Alphanumeric sequencing (1A, 2B, 3C, 4D, 5E, 6F, 7G, 8H…)
9. _____Insight

Notes:

APPENDIX D

DEMOGRAPHICS AND CONSENT FORM

Demographics:

Participant number: _____

Age: _____ Gender: ___Male ___ Female

Years of formal education:

1. 5 or less
2. 11 or less
3. High school
4. Some college
5. College graduate
6. Masters/doctorate

Marital status:

1. Never Married
2. Married
3. Widowed
4. Divorced
5. Separated

Income (in dollars):

1. Less than 10,000
2. 10,001 to 30,000
3. 30,001 to 60,000
4. Over 60,000

Ethnicity:

1. Native American____
2. Caucasian___
3. African American__
4. Hispanic__
5. Asian__
6. Other_____

Documented dementia or other cognitive impairment

1. Yes__: _____
2. No__
3. Unknown

Physical limitations:

1. Vision__
2. Hearing__
3. Speech__
4. Writing__
5. Other__: _____

Scores:

MMSE: _____

ANT: _____

BDS: _____

SUBJECT CONSENT FORM
PARTICIPATION IN HUMAN RESEARCH
MONTANA STATE UNIVERSITY:
Concurrent Validity of Screening Tools

Background and Purpose of Study:

You are being asked to participate in a study that compares different screening tests of memory and mental associations. Change in mental function is a serious problem in older people. By developing faster and easier tools to screen for cognitive problems, people can be diagnosed and treated more efficiently. The purpose of this study is to evaluate three tools to see if they have the same findings despite assessing different parts of the brain.

Participation:

People over 65 years old who do not have significant memory problems, like dementia, can participate in this study. If you agree to participate, you will perform a series of three tests in random order:

1. Mini Mental State Exam: a variety of memory, mental exercises, and direction following tasks.
2. Behavioral Dyscontrol Scale: a series of seven body movement tasks.
3. Animal Naming Test: a verbal test of category memory.

The tests will be performed in a single session, which will take about 30 minutes.

Risks of Study:

This study has only the risks involved in performing psychological testing, and handling a paper and pen. In the event your participation in this research directly results in injury to you, medical treatment consisting of advice to seek care from a healthcare professional will be available, but there is no compensation for such injury available. Further information about this treatment may be obtained by calling Don J. Benton, RN, student FNP at (406) 234-8163.

Costs and Benefits:

Other than the time spent in performing the tests, there is no cost to the participant. There are no direct benefits to participants of this study. If you wish, you may receive your scores on each individual test.

Your participation is voluntary; you may stop participating at any time without penalty. The researcher will answer any questions you have regarding this study.

Confidentiality:

While you will be asked to provide demographic data, and to sign this form, no identifying information will accompany your information. Instead, the test and demographics will be numbered. Regardless of these conditions, the demographics and testing information will be kept confidential.

More information:

Dr. Karen Zulkowski is supervising the researcher performing this study; you may contact her with questions or problems at 657-1739 during business hours or at 259-2886 after hours. Additional questions about the rights of human subjects could be answered by the Chairman of the Human Subjects Committee, Mark Quinn, (406) 994-5721.

SUBJECT CONSENT FORM
PARTICIPATION IN HUMAN RESEARCH
MONTANA STATE UNIVERSITY:
Concurrent Validity of Screening Tools

AUTHORIZATION: I have read the above and understand the discomforts, inconvenience and risk of this study. I, _____ *(name of subject),* agree to participate in this research. I understand that I may later refuse to participate, and that I may withdraw from the study at any time. I have received a copy of this consent form for my own records.

Signed: _____

Witness: _____

Investigator: _____

Date: _____

APPENDIX E

DIALOGUE GUIDE

DIALOGUE: PRE-TESTING, CONSENT, POST-TESTING.

1. "Hello, My name is DJ Benton. I am a nurse who is getting my Master's degree so that I can become a Nurse Practitioner. As part of the Master's program, each of us has to perform some type of a study. My study involves evaluating some memory and mental exercise tests to see how they compare to each other. I need some people over 65 years old to take the tests so I can compare the results of the tests to one another. Would you be willing to hear a little more and maybe participate?"

   If no: thank person for their time. If yes: proceed to 2.

2. "This study is confidential. Nobody accesses any of your information or records. Nothing appears in any medical records or anything. There is a consent form to sign, but those are kept in a secure place when they are not with me and are separate from the tests.

   The tests are a variety of memory and mental exercises. Many people think some of them are kind of fun.

   They do not take too long. So far, most people have taken less than 20 minutes."

   - If participant declines, ask if there are any questions and thank them for their time.
   - When the participant agrees to join the study proceed by discussing the informed consent, reinforcing confidentiality: "after you sign here to say it is okay that we do this together, I will separate the signed consent from your tests. After that I will not know whose test is whose and no one else

will either". Draw attention to the risks, benefits, costs, purpose, contact people and phone numbers. If they agree, go to page two of the consent. Explain that they can withdraw at any time, or refuse any part of the study without penalty. Ask if they have any questions. Answer any questions. Give the participant page one of the consent and have them sign page two. Separate signed consent form and place it in the appropriate folder.

3. "Okay, lets proceed. Let me know if you have questions or want to stop. First I will get some information about you. If you don't feel like answering some of the questions, that is okay. Just tell me you don't want to answer them."

   - Fill out demographic sheet with participant's responses.

4. "Due to the need for scores in certain categories, different people might take a different number of tests. Some people take one test and some take three; depending on how many we need in each category.

   Some of the test items may seem very difficult while others seem very easy or even a little silly, but that is okay. Just remember that we are testing the tests, not you."

   - Continue with testing. Stop as need for participant needs or questions.

5. – After tests are completed.

   "We are all done. Thank you for participating, it really helps me out. Do you have any questions?"

   - Answer questions. Thank participant again and assist them as needed, if appropriate, for mobility or other issues.

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