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UMI
Sensitivity and Psychometric Characteristics of Instruments and Tests Designed To Diagnose Dementia in Elderly People with Mental Retardation

A Dissertation

Presented In Partial Fulfillment of the Requirements for

the degree Doctor of Philosophy in the

Graduate School of The Ohio State University

by

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ABSTRACT

There is a growing need for detecting cognitive decline in older persons with mental retardation. In this study, a group of people with mental retardation was compared with another group of adults having both mental retardation and diagnosed dementia. The 38 subjects from the two groups were matched by I.Q., age, and diagnosis of Down Syndrome. Because of the practical problems involved in locating those with known dementia and mental retardation, we networked with centers known to have an interest in mental retardation and aging via the internet and listserves. All subjects were assessed with two published dementia assessment instruments designed for this population. In addition, two novel performance tasks were developed to see if they also were useful in separating subjects with and without dementia. Also, subjects were assessed with a measure of psychopathology. Results indicated that the dementia assessments and the two performance tasks did discriminate significantly between subjects with dementia and without. Results on the assessments were not related to I.Q., age, or gender of the subjects. Both assessment instruments were strongly related to the presence or absence of dementia in the subjects. The performance tasks were related to the IQ of the subject, but not to age or gender. Both performance tasks were strongly related to the presence or
absence of dementia. Various subscales of the measure of psychopathology also
discriminated between subjects with dementia and without.

We examined the relationships between the various indices and found that the
subcales of the two assessments, the two performance tasks, and several subscales of the
measure of psychopathology were significantly related to one another, indicating some
potential congruent validity. However, when the effects of depression were factored out,
the subscales of the psychopathology instrument no longer evidenced relationships with
the other indices. Finally, a logistic regression was conducted in an attempt to assess
which combination of tests would discriminate best between the samples. Directions for
future research were suggested, including the need for more prospective research using the
dementia assessment instruments to clarify their utility in assessing dementia in this
population.
DEDICATION

This is dedicated to Lance, Wednesday, and Casey, who help to make it all worthwhile!
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This project received support from the Graduate Student Alumni Research Award — I would like to thank them for this support.

I would like to thank my family, who have been such a strong source of support during the many years of my graduate school career.

Mostly, I must thank my husband Lance for always being my strongest supporter and the love of my life.
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Introduction

Age-related Cognitive Changes in the Normally Aging Population

A great deal of research has been undertaken over the past several decades examining the multiple effects of aging on human development. One area of particular interest for researchers has been that of cognitive changes over the life span. This research has taken many forms and approached aging and cognition from several viewpoints. A commonly used conceptualization of the types of abilities being examined in studying aging and cognition is Horn and Cattell's (1967) model of fluid and crystallized intelligence.

Horn and Cattell (1967) define fluid intelligence as the "capacity to perceive relations . . . [the] ability to maintain span of immediate awareness. . . concept formation . . . reasoning and abstracting" (p. 109). Some tasks designed to test fluid intelligence include letter grouping, figure classification, common word analogies, and semantic relationships. Crystallized intelligence is defined as the "extent to which one has
appropriated the collective intelligence of his culture for his own use" (p. 111). It is measured by such tasks as vocabulary and general information tests, tests of arithmetic reasoning, and formal reasoning.

In Horn and Cattell's (1967) study of age differences in fluid and crystallized intelligence a cross-sectional design was used in examining subjects of several age groups at once. They assessed 297 subjects divided into 5 age groups: 14-17 year olds, 18-20 year olds, 21-28 year olds, 29-39 year olds, and 40-61 year olds. They found that fluid intelligence declined with age and that this decline could not be attributed to decline in other functions, such as speediness. The results for crystallized intelligence showed an *increase* in ability as subjects aged, even when levels of education were factored in. In a later study, Horn (1982) confirmed these findings. Again using a cross-sectional design, he found age-related declines in fluid intelligence and increases in crystallized intelligence.

In an overview of several decades of research on this issue, Salthouse (1991) examined the results from studies employing several commonly used psychometric tests of intelligence, including the Wechsler Adult Intelligence Scale (Wechsler, 1955) and the Wechsler Adult Intelligence Scale - Revised (Wechsler, 1981b). He found, in general, little or no decrease in performance on measures of accumulated knowledge, such as the Wechsler Verbal scale. But efficiency of current processing, such as measured by subtests of the Wechsler Performance scale, did show age-related declines that could not be accounted for by declining health or differential representation of age groups.
A different approach was taken by other researchers. They were interested in examining changes in adult cognition over time. To this end, longitudinal studies were initiated (cf. Schaie, 1990; 1994; Shock et al., 1984). Schaie (1990) suggested that cross-sectional studies of adult cognition do not allow for examination of intelligence changes with age of individuals, nor do they take into account cohort shifts in mental abilities, mediated by increased access to education, improved nutrition, and the like. Schaie (1994) has been conducting the Seattle Longitudinal Study tracking approximately 5000 subjects since 1956. The subjects were assessed at intervals with several tests, including tests of primary mental abilities (Thurstone, 1938). Schaie found that factor analysis of the primary mental abilities resulted in a structure similar to Horn and Cattell's (1967) fluid and crystallized intelligence.

Schaie (1990; 1994) reported that the results of his continuing study indicated that there is a gain in crystallized and fluid abilities until subjects reached their late 30s or 40s. This is followed by a period of stability until the mid 50s or early 60s, followed by declines after subjects reach their 60s. Schaie noted, however, that decline affected less than a third of his subjects until the age of 74, and that even when subjects reached their 80s, only between 30 to 40% of subjects evidenced decline.

Of this detected decline, Schaie (1994) found that by age 88 when compared with the age 25, subjects evidence virtually no decline in verbal abilities (crystallized intelligence), but other abilities, such as inductive reasoning and spatial orientation (fluid intelligence), showed significant decline.
Dementia in the Normally Aging Population

Cognitive decline that is beyond the expected age-related changes may be indicative of an underlying disorder, such as dementia. Dementia is defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, American Psychiatric Association, 1994) as the development of multiple cognitive deficits manifested by memory impairment (impaired ability to learn new information or to recall previously learned information), and one or more cognitive disturbances, such as aphasia (language disturbance), apraxia (impaired ability to carry out motor activities despite intact motor function), agnosia (failure to recognize or identify objects despite intact sensory function), and disturbances in executive functioning (i.e., planning, organizing, sequencing, abstracting). These cognitive deficits cause significant impairment in social or occupational functioning and represent a significant decline from a previous level of functioning. The course of dementia is characterized by a gradual onset and continuing cognitive decline. Some common forms of dementia include dementia of Alzheimer's type (DAT), vascular dementia, and Huntington's disease (APA, 1994).

Alzheimer's disease is a progressive brain disorder that, along with the clinical signs of dementia, is characterized by neocortical atrophy, neuron and synapse loss, and the development of senile plaques and neurofibrillary tangles (Bondi, Salmon, & Kaszniak, 1996). Neurofibrillary tangles are bundles of filaments that encircle or displace the neuron (Dalton & Janicki, 1999). Senile plaques are areas of incomplete degeneration in the brains of older adults. Early plaques are surrounded by the remnants of axons and
dendrites, but older plaques develop a central core of amyloid protein. While plaques are often seen in older adults who exhibited no signs of dementia while alive, these are seen in great numbers in those with DAT (Dalton & Janicki, 1999) and may be considered part of the progressive and widening focus of brain tissue death (Scheibel, 1996).

It is not clear yet whether senile plaques and neurofibrillary tangles are the "cause" or the "effect" (i.e., result) of DAT and what their relationship is to the clinical signs of DAT. It has been suggested that the neurons in a person with Alzheimer's disease may have an impaired ability to protect themselves from wear and tear, or that plaques and tangles develop in response to injury and the deposit of amyloid protein is a response to that injury (Percy, 1999).

Estimates of the prevalence of DAT vary widely, depending on the definition of dementia, the sampling technique used, and the type of instrument used to identify cases. In their overview of several studies, Bondi, Salmon, and Kaszniak (1996) have suggested that 6% of the population of persons over the age of 65 have severe DAT, with an additional 10 - 15% having mild to moderate DAT. This disease is age-related, with the prevalence of DAT doubling for every 5 years of age over age 65 (Bondi, Salmon, & Kaszniak, 1996).

Some risk factors for the development of DAT have been identified. Those include age, lack of education, a family history of DAT, and head injury (Bondi, Salmon, & Kaszniak, 1996). Genetics may play a role in the development of DAT. A mutation on the amyloid precursor protein gene of chromosome 21 could contribute to the deposit
of amyloid protein in the brains of those with DAT. Additionally, mutations on chromosomes 14 and 19 have been identified as risk factors in the development of DAT (Bondi, Salmon, & Kaszniak, 1996). The presence of trisomy 21 (Down Syndrome) has been established as a risk factor for the development of DAT because of the triplication of the gene for the amyloid precursor (Prasher, Chowdury, Rowe, & Bain, 1997). Virtually all individuals with Down Syndrome over the age of 40 show, on autopsy, the characteristic lesions of DAT (Dalton & Janicki, 1999).

**Age-related Cognitive Changes in the Population of Persons with Mental Retardation**

In the United States, there are an estimated 526,000 adults age 60 and older with mental retardation and other developmental disabilities (e.g., cerebral palsy, autism, epilepsy). Their numbers will double to 1,065,000 by 2030 when all of the post World War II "baby boom" generation, born between 1946 and 1964, will be over the age of 60 (Zigman, Schupf, Haveman, & Silverman, 1995). As this population grows, it will be increasingly important to understand the age-related changes to be expected.

Only a few studies have examined cognitive changes in older persons with mental retardation, whether they be cross-sectional or longitudinal in design. One early study of age-related changes in persons with mental retardation was conducted by Fisher and Zeaman (1970). They examined a large group of people with mental retardation over a period of five years. Their findings indicated that mental age (MA) increased at least up
until subjects reached their late 30s (earlier for those with more severe levels of mental retardation). For all subjects, regardless of level of retardation, MA declined after the age of 60 years.

Hewitt, Fenner, and Torpy (1986) also studied a large number of older persons with mental retardation, utilizing both a cross-sectional and longitudinal design. Cross-sectional comparisons of various age groups indicated that male subjects experienced positive intellectual development from the ages of 35 to 60 years of age. After the age of 60, intellectual functioning declined. Longitudinal analyses (MA retested after an average of 5.6 years) also indicated that subjects evidenced cognitive decline after the age of 60.

In their review of several studies, the American Association on Mental Retardation/International Association for the Scientific Study of Intellectual Disabilities Working Group for the Establishment of Criteria for the Diagnosis of Dementia in Intellectual Disability (Aylward, Burt, Thorpe, Lai, & Dalton 1995) found that there was evidence to suggest that non-demented adults with Down Syndrome over the age of 40 maintain function in several areas (such as receptive and expressive language, short-term memory, nonverbal reasoning, fine motor skills, perceptual motor skills, and visual spatial skills) for relatively long periods. Slight decreases have been noted in verbal, long-term memory for those older than 50 years of age. Persons without Down Syndrome have been found to maintain ability in short-term and long-term memory, speeded psychomotor function, and visuospatial organization (Aylward et al., 1995).
Dementia in the Population of Persons with Mental Retardation

There is still not a great deal known about dementia (particularly DAT) in non-Down Syndrome older adults with mental retardation. What is known is that the features of Alzheimer’s in adults with mental retardation, especially those who are functioning at a higher level, seem to be similar to those without mental retardation (Moss & Patel, 1997). However, it is not clear what the prevalence rate is for those without Down Syndrome. Patel, Goldberg, and Moss (1993) found a prevalence rate of 11.4% for persons over 50 years of age with at least moderate intellectual disability. Other studies have produced rates from as low as 6% (Janicki & Dalton, 1997) to as high as 22% for those 65 and older (Cooper, 1997), and 12% in those aged 80 and over (Janicki & Dalton, 1997). Clearly, more research is needed to establish the true prevalence rate for this population.

There is some controversy regarding the rate of dementia and DAT in persons with Down Syndrome. As mentioned before, all persons with Down Syndrome who are 40 years and older evidence beta-amyloid plaques and neurofibrillary tangles upon post-mortem, and trisomy 21 is a recognized risk factor for the development of DAT. Because of this, it was assumed that a significant number of persons with Down Syndrome would develop DAT as they aged (Holland, 1999). However, the results from research have not been clear. Wisniewski, Howe, Williams, and Wisniewski (1978) studied fifty subjects with Down Syndrome. They found that subjects over the age of 35 were cognitively quite different than those under the age of 35. Subjects over the age of 35 demonstrated recent memory loss, difficulty in naming objects and a loss of vocabulary.
Additional studies (Dalton & Crapper, 1984; Hewitt & Jancar, 1986; Fenner, Hewitt, & Torpy, 1987) have confirmed the findings of premature aging in persons with Down Syndrome. Dalton and Crapper (1984) found, however, that age-related deterioration in memory associated with Alzheimer's disease occurred at slightly later age than found in previous studies — at around age 40. In addition, they found that memory deterioration occurred in 24% of their subjects, not the 100% they had expected based on the results of previously reported studies. Some 76% of their subjects showed no memory deterioration while being followed for 8 years.

Hewitt and Jancar (1986) compared a sample of 23 older individuals with Down Syndrome with a matched mentally retarded group without Down Syndrome by re-examining them approximately 3 years after a baseline examination. They found that those with Down Syndrome were more likely than the non-Down Syndrome controls to evidence cognitive deterioration, with an estimated mean age of onset of cognitive deterioration for the Down Syndrome subjects to be 49 years of age. No average age of deterioration for non-Down Syndrome was reported. Again, they did not find deterioration in all of their Down Syndrome subjects — some 39.1% of subjects with Down Syndrome showed cognitive deterioration.

A study by Eklund and Martz (1993) examined 128 individuals, 64 with Down syndrome, over a two-year period. Both a cross-sectional and longitudinal design were used, and the subjects' cognitive abilities were assessed using an extensive battery of tests. Results indicated that male Down syndrome subjects in their 40s showed lower
scores than subjects in their 30s. For females, the picture was not quite as clear. On some tests, females in their 50s performed better than those in their 30s or 40s, while on other tests they performed worse. This pronounced sex difference was not found among subjects without Down syndrome. Additionally, subjects without Down syndrome in their 60s generally scored higher than subjects in their 50s, whereas lower scores were apparent in subjects in their 70s.

Burt et al. (1998) have been following a group of 70 adults with Down Syndrome longitudinally in an attempt to clarify the prevalence of dementia in this population. Subjects have been assessed annually with an extensive battery of tests in order to detect dementia as it develops. Following the recommendations of the AAMR/IASSID workgroup, they have employed the International Classification of Diseases (ICD-10) (World Health Organization [WHO], 1992) criteria for the diagnosis of dementia in persons with mental retardation rather than the DSM-IV (APA, 1994). This is because the ICD-10 places more emphasis on non-cognitive aspects of dementia (WHO, 1992). This emphasis on non-cognitive aspects is important in this population, as studies have found that in persons with mental retardation (particularly those functioning at lower levels of intelligence) non-cognitive symptoms of dementia, such as apathy and social withdrawal, may be the primary symptoms noted (Lai & Williams, 1989; Janicki, Heller, Seltzer, & Hogg, 1995). ICD-10 criteria for the diagnosis of dementia include memory decline as well as declines in other cognitive functions. These functional declines include the following: (a) a decrease in abstract reasoning skills (i.e. judgment, thinking, planning
and organization), (b) apraxia (impaired ability to dress, self-feed, or brush teeth when that skill was previously present), (c) aphasia (language impairment), (d) agnosia (inappropriate use of everyday objects, such as brushing one's hair with a toothbrush), (e) alexia (decline in writing or reading skills), and (f) akalculia (decline in math skills). Non-cognitive symptoms include changes in the following: (a) awareness of one's environment, (b) decline in emotional control (i.e. emotional lability, irritability), (c) lack of motivation, and (d) coarsening of social behavior (WHO, 1992).

Results from their on-going study suggest that of the 70 subjects, 12 (17%) met all of the above criteria for dementia, 40 (57%) met subsets of the criteria, and 18 (26%) met no criteria for dementia. The average age of onset of onset for progressive dementia was 50 years of age. At least 3 of their subjects appeared to have dementia at their first assessment but showed improvement in subsequent years. The authors suggested that the improvement of these subjects highlight the need to identify treatable conditions that could account for the declines and the need to use extreme care when diagnosing dementia in adults with Down syndrome (Burt et al., 1998).

Screening for Dementia in the Normally Aging Population

In detecting dementia in the normally aging population, selected batteries should contain measures of verbal and nonverbal memory, executive functions (such as problem solving, language, visual spatial and visuoperceptual abilities, and attention) (Butters, Salmon, & Butters, 1994). A number of standardized mental status exams that evaluate
these cognitive domains have been used as dementia screens; these include the Mini-Mental Status Exam (Folstein, Folstein, & McHugh, 1975) and the Dementia Rating Scale (Mattis, 1976). Each of these has been shown to have demonstrated adequate sensitivity and specificity in detection of dementia and may also be useful in tracking the disease over a period of years (Butters, Salmon, & Butters, 1994).

**Screening for Dementia in Persons with Mental Retardation**

As mentioned before, the population of older persons with mental retardation is one that is rapidly growing (Zigman, Schupf, Haverman, & Silverman, 1995). As age is the strongest risk factor for developing dementia (Alyward, Burt, Thorpe, & Dalton, 1995), it will be increasingly important to be able to detect cognitive decline in this population.

As research in the area of aging and mental retardation indicates that cognitive abilities such as long-term memory do decline with age (Aylward et al., 1997), there is a great need to be able to detect any cognitive decline that may indicate the onset of dementia. The difficulty in assessing dementia in this population comes from the fact that the clients present with mild to severe cognitive impairments prior to age-related cognitive decline. Such premorbid cognitive impairment can make the detection of decline in cognitive abilities quite difficult. Several researchers have noted this problem with previously-existing measures. Dalton, Seltzer, Adlin, and Wisniewski (1992) found that, in attempting to detect cognitive deficits in persons with Down syndrome, commonly
used measures (such as changes in IQ scores) are often not helpful. This is because such measures are not particularly reliable in persons with lower cognitive abilities, as these persons will often score very poorly (the so-called "floor-effect").

In their review of instruments for assessing memory problems, Zelinski and Gilewski (1988) noted that people who are poorly educated or who are below normal in intelligence perform poorly on tests of mental status and often are likely to be labeled as cognitively declined when in fact they are not. An alternative to standard measures of dementia that has been suggested in persons with below-normal intelligence is the use of informant questionnaires (Zelinski & Gilewski, 1988). These may screen for cognitive decline independent of premorbid intelligence. This approach has also been suggested as being useful as part of a complete functional assessment for persons with mental retardation as a way of measuring changes in judgment, abstract thinking, and orientation (Seltzer & Luchterhand, 1992).

Recently, this writer attempted to adapt an informant questionnaire designed for the normal population [Short Informant Questionnaire on Cognitive Decline in the Elderly (Short IQCODE) (Jorm, 1994)] for use in mental retardation. I had little success, as the resulting psychometrics were quite poor. Ratings were completed for 40 subjects with mental retardation. Unfortunately, interrater reliability for the Short IQCODE was $r=.55$, and test-retest reliability was $r=-.21$. No linear relationships were found between the
Short IQCODE and age, gender, or IQ. Additionally, the Short IQCODE was found to have no relationship with a measure of behavior, with a mental status examination, and with a dementia rating scale (N=20) (Shultz, Aman, & Rojahn, 1998).

As the evaluation of dementia in this population requires use of a caregiver interview (Aylward et al., 1995) it is important to examine instruments designed specifically for this population. Two such instruments that are useful for gleaning information from caregivers are the Dementia Questionnaire for Mentally Retarded Persons (DQMRP) (Evenhuis, 1990), and the Dementia Scale for Down Syndrome (DSDS) (Gedye, 1995).

The Dementia Questionnaire for Mentally Retarded Persons was developed as a diagnostic screening instrument to be completed by caregivers. It consists of 50 items resulting in a sum of cognitive scores (assessing short- and long-term memory, spatial, and temporal orientation) and a sum of social scores (assessing speech, practical skills, mood, activity and interest, and behavior disturbance) (Evenhuis, 1996). This instrument has been evaluated by following a study group of 78 older individuals with mental retardation. The informant answers “yes,” “sometimes,” or “no” to 50 items covering 8 areas of functioning: (a) short-term and long-term memory, (b) spatial and temporal orientation, (c) speech, (d) practical skills, (e) mood, (f) activity/interests, and (g) behavioral disturbance. The use of this instrument longitudinally and as a single-time assessment have been evaluated (Evenhuis, 1996). When used longitudinally, the DQMRP, (particularly sections designed to measure changes in cognitive scores), demonstrated the
most sensitivity and specificity for the diagnosing of dementia than when used as a one-
time use instrument. However, Evenhuis (1996) found that as a single-use instrument,
the DQMRP demonstrated adequate sensitivity and specificity.

The Dementia Scale for Down Syndrome was developed to provide an objective
means for assessing cognitive decline in adults with mental retardation. The scale was
designed especially for assessing developmentally disabled adults in the lower ranges of
functioning (Gedye, 1995). Despite its name, the Dementia Scale for Down Syndrome is
not intended to be used solely with people having Down Syndrome. Informants are
asked to rate subjects on up to 60 items, 20 of which may indicate early stages of
dementia, 20 that may indicate middle stages of dementia, and 20 that may indicate late
stages of dementia. Additionally, informants report whether behaviors were typical of the
individual during adulthood, whether these behaviors are currently present or absent, and
whether or not the date of onset for the behavior is known (Aylward & Burt, 2000). This
scale was developed by following longitudinally a group of 70 older adults with mental
retardation since 1987. Gedye (1995) found that the DSDS demonstrated good reliability
and validity.

A recent study completed by Deb and Braganza (1999) used both the DSDS and
the DQMRP in 62 adults with Down Syndrome, ranging in age from 35 to 72 years of age
recruited from 5 health districts in South Wales. In this study, the authors compared the
results of the diagnosis of dementia by clinicians (using ICD-10 criteria) who examined
each subject, with the DSDS and the DQMRP as completed by an informant. They
found that the clinicians diagnosed 26 subjects with dementia. The DSDS diagnosed 26 subjects with dementia, but 4 of those subjects were not diagnosed by the clinicians — thus, the DSDS exhibited a specificity rate of 0.89 and a sensitivity rate of 0.85. The DQMRP diagnosed only 24 out of the 26 clinician-diagnosed subjects with dementia, but diagnosed 3 out of the 36 non-demented subjects as having dementia. Therefore, both the sensitivity and specificity rate of the DQMRP were 0.92.

In examining the rate of agreement of diagnosis of the DSDS and the DQMRP to each other, the authors found that 2 subjects who were diagnosed as having dementia by the DSDS scale were not diagnosed by the DQMRP. In addition, two subjects diagnosed by the DQMRP were not diagnosed by the DSDS. Deb and Braganza (1999) found that the DSDS and the DQMRP exhibited both a specificity and sensitivity of 0.92. They found an overall significantly positive correlation between the DSDS and the subscales of the DQMRP.

Hypotheses

The purpose of the present study was to use both the DQMRP and DSDS in order to examine their discrimination abilities. Given the results of the reviewed literature on the DQMRP and DSDS, it was hypothesized that:
1. The DQMRP and DSDS would discriminate between subjects with dementia and mental retardation and subjects with mental retardation but without dementia.

2. Scores on the DQMRP and DSDS would not be affected by age or prior IQ.

3. Other methods of assessment (i.e., a performance measure of memory and a specifically-developed mini-mental status exam) would also discriminate between samples with and without dementia.

4. In addition, I conducted statistical analyses to assess which combination of tests would discriminate best between the samples with and without dementia. This may have implications for choosing between the two dementia scales.

5. A correlation matrix was prepared within each group (demented and nondemented) to compare the degree of correspondence between the various indices.
CHAPTER 2

Methodology

Subjects

The subjects included in this project were recruited via the internet by contacting likely sources through newsgroups. Local subjects were recruited by contacting local County Boards of Mental Retardation in the Central and Southeastern Ohio area. All county boards were sent a package of materials that contained a description of the study, a copy of the approved O.S.U. Behavior and Social Sciences Human Subjects Review Committee application, and copies of all the instruments used in this study. These counties generally represent suburban and rural populations. Subject selection was made on the basis of several criteria.

Inclusion Criteria

1) Subjects had to be diagnosed with mental retardation.
2) Subjects had to be 45 years of age or older.
3) Subjects had to have some verbal ability in order for them to complete all of the testing.
4) Subjects with dementia had to be diagnosed by a licensed clinician who specialized in either aging or developmental disabilities or both using DSM-IV (APA, 1994) or ICD-10 (WHO, 1992) criteria for dementia.

**Exclusion Criteria**

1) Subjects could not have a profound auditory or visual deficit.

2) Subjects could not be non-ambulatory such that they could not complete the testing.

3) Subjects could not have a diagnosis of psychosis or schizophrenia.

4) Control and index subjects who were screened on the Reiss Screen for Maladaptive Behavior (Reiss, 1988) as exhibiting probable psychosis were excluded from the study.

**Subject Solicitation and Procedure**

We proceeded by sending an announcement describing the study via e-mail to newsgroups such as the Aging-DD interest newsgroup and the Psych-DD interest newsgroup in order to contact researchers and clinicians across the United States and Canada, asking if they would be willing to collaborate with us on a project to assess the sensitivity of instruments designed to detect dementia in a population of elderly persons with mental retardation. If clinicians and researchers indicated an interest, they were sent a follow-up e-mail describing the study in more detail. If at that point the researcher or clinician felt he or she had access to a likely population of subjects, he or she was sent a package containing the research proposal along with a copy of all of the instruments and
consent forms. We asked that sites be able to provide at least 4 subjects — 2 diagnosed with dementia matched with 2 subjects without dementia. If so, they were sent a package containing all instruments, all the materials required for the study, and the protocol. After several calls for subjects, we received inquiries from approximately 56 sites in the United States, Canada, and Ireland. Of those sites that expressed interest, 28 asked for and were sent information packages that included the instruments. Of those sites, 9 tentatively agreed to participate in the study and were sent a package containing all the study materials. Of those sites, 7 sites actually completed the assessments. 2 sites were only able to provide 2 subjects — 1 with dementia and 1 without. Several of the researchers were oriented in a series of conference calls in which any questions that examiners had were answered and all procedures were standardized. When sites had completed their data collection, they sent the protocols back to us.

For local subjects (i.e, those tested by the author), each county board was to follow its own Institutional Review Board’s procedure for research with human subjects. Each county board recruited potential subjects from the clients they served.

Subjects who were their own guardians provided their verbal consent to participate in the study. For subjects who had a guardian, letters were sent to the guardians informing them of the study and asking their permission for their wards to participate (Appendix A contains a copy of the letter along with the application to the Behavior and Social Sciences Human Subjects Review Committee).
<table>
<thead>
<tr>
<th>Site</th>
<th>Number of Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuyahoga County Board of Mental Retardation - Ohio</td>
<td>10</td>
</tr>
<tr>
<td>Genessee County Mental Health Services - Michigan</td>
<td>8</td>
</tr>
<tr>
<td>Burt Lab - University of Texas — Houston Health Center</td>
<td>4</td>
</tr>
<tr>
<td>Thorpe Lab - University of Saskatchewan, Canada</td>
<td>4</td>
</tr>
<tr>
<td>Devereux - Whitlock Center, Pennsylvania</td>
<td>4</td>
</tr>
<tr>
<td>Local</td>
<td>4</td>
</tr>
<tr>
<td>Dr Gertrude A Barber Institute - Pennsylvania</td>
<td>2</td>
</tr>
<tr>
<td>George A Jervis Clinic - New York</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 2.1: Site locations and numbers of subjects assessed.

**Subject Characteristics**

Subjects consisted of 38 persons with mental retardation who ranged in age from 45 to 74 years of age (M=56), had an IQ range of 20 to 71 (M=41.14), and who were functionally sighted and hearing. Twenty-six (68%) of the subjects had a diagnosis of
Down Syndrome. In all, 17 (45%) of the subjects were female and 21 (55%) were male. Three subjects had epilepsy, 1 had a diagnosis of diabetes, 3 subjects had high blood pressure, 10 subjects had hypothyroidism, and 2 subjects had a diagnosis of depression. Subjects were divided into two groups of 19, the first group consisting of those with dementia and the second group consisting of those without dementia. The index and the control group were matched on the following variables, in this order of priority: diagnosis of Down Syndrome, age (within 5 years, in order to control for possible cohort effects), and IQ level (using an IQ score that was at least 5 years old to assure that matching was based on a premorbid IQ level in subjects with dementia, matched within 15 points of the control subjects). This matching was done by examining the records of potential subjects for the matching criteria by each site. Control and index subjects did not differ significantly from each other on IQ or age (see Table 3.2).

The index and control groups differed somewhat in the amount of psychotropic medications they were prescribed. Of the 19 subjects with dementia, 11 (58%) were taking psychotropic medications. Eight (42%) of 19 subjects without dementia were taking psychotropic medications.

Of the 19 subjects with dementia, 4 (21%) were taking antipsychotic medications, 1 (5%) was taking tricylic antidepressants, 5 (26%) were taking SSRI antidepressants, and 1 (5%) was taking anxiolytic medications. In addition, 7 (36%) were taking antiepileptic medications, 7 (36%) were taking thyroid medications, and 1 (5%) was taking a vitamin.
Of the 19 subjects without dementia, 1 (5%) was taking antipsychotic medication, 1 (5%) was taking a tricylic antidepressant, 3 (16%) were taking SSRI antidepressants, and 3 (16%) were taking anxiolytic medications. In addition, 2 (11%) were taking antiepileptic medications, and 4 (21%) were taking thyroid medications.

Materials

Three rating scales were completed by the caregivers of the subjects: (a) the Dementia Questionnaire for Mentally Retarded Persons, (b) the Dementia Scale for Down Syndrome, and (c) the Reiss Screen for Maladaptive Behavior.

(1) The Dementia Questionnaire for Mentally Retarded Persons (DQMRP) (Evenhuis, 1990) is an instrument designed to diagnose early dementia in persons with mental retardation. The DQMRP was developed as a diagnostic screening instrument to be completed by caregivers. It consists of 50 items resulting in a sum of cognitive scores (assessing short- and long-term memory, spatial and temporal orientation) and a sum of social scores (assessing speech, practical skills, mood, activity and interest, and behavior disturbance) (Evenhuis, 1996). This instrument has been evaluated by following a study group of 78 older individuals with mental retardation. The informant answers "yes", "sometimes", or "no" to 50 items covering 8 areas of functioning: (a) short-term and long-term memory, (b) spatial and temporal orientation, which is combined to form the
subscale Sum of Cognitive Scores (SCS); and (c) speech, (d) practical skills, (e) mood, (f)
activity/interests, and (g) behavioral disturbance, which are combined into the subscale
Sum of Social Scores (SOS).

The use of this instrument longitudinally and as a single-time assessment have
been evaluated by the scale's developer (Evenhuis, 1996). When used longitudinally, the
DQMRP, particularly changes in cognitive scores, demonstrated the most sensitivity and
specificity for the diagnosing of dementia. However, Evenhuis found that as a single-use
instrument, employing the absolute scores on both subscales, the DQMRP demonstrated
adequate sensitivity and specificity (Evenhuis, 1996). The absolute cutoff score used to
diagnose dementia is based on the level of mental retardation of the subject. For example,
in persons with mild levels of mental retardation, a SCS of \( \geq 7 \) and a SOS of \( \geq 10 \) are
needed to diagnose dementia. In persons with high moderate levels of mental retardation
(IQ 45-55), a SCS of \( \geq 15 \) and a SOS of \( \geq 15 \) are needed. In those with low/moderate
level of mental retardation (IQ 35-45), a SCS of \( \geq 25 \) and a SOS of \( \geq 15 \) are needed. In
those with severe level of mental retardation, a SCS of \( \geq 34 \) is required. The developer
has not yet established a criterion for the interpretation of SOS scores in those with
severe mental retardation or a criterion for the interpretation of SCS and SOS scores in
those with profound mental retardation (Evenhuis, 1996).
2) **Dementia Scale for Down Syndrome** (Gedye, 1995). This scale is designed to detect cognitive decline and early dementia in adults with mental retardation. The scale was designed especially for assessing developmentally disabled adults in the lower ranges of functioning (Gedye, 1995). Despite its name, the Dementia Scale for Down Syndrome is not intended to be used solely with people having Down Syndrome. Informants are asked to rate subjects on up to 60 items, 20 of which may indicate early stages of dementia, 20 that may indicate middle stages of dementia, and 20 that may indicate late stages of dementia. Additionally, informants report whether behaviors were typical of the individual during adulthood, whether these behaviors are currently present or absent, and whether or not the date of onset for the behavior is known (Alyward & Burt, in press).

Also, the scale asks questions that allow for the differentiation of dementia symptoms from those of depression, hearing and vision problems, problems with pain, medication-induced cognitive decline, and hypothyroidism (Gedye, 1995). The scale is scored by first identifying the first date at which the earliest symptom of dementia is noted by the caregiver. Then a “cutoff date” of 6 months is added to this date. This cutoff date is then applied to a set of 10 questions regarding cognitive decline (questions numbered 1 through 8, plus 21 and 22) — the “cognitive cutoff” items. If 3 or more “cognitive cutoff” items are present after this cutoff date, then a Early Stage and Middle Stage Tally score (EMT) is computed. A subject is considered to have dementia if the “cognitive cutoff” score is $\geq 3$ and the Early Stage and Middle Stage item score is $\geq 10$. 
The scale was developed by following longitudinally a group of 70 older adults with mental retardation since 1987. Gedye (1995) found that the DSDS demonstrated good reliability and validity.

(3) Reiss Screen for Maladaptive Behavior (Reiss, 1988). The Reiss Screen is a scale designed to identify seven mental health problems in people with mental retardation. This instrument was chosen for this study following the recommendation of the IASSID/AAMR Workgroup (Aylward, Burt, Thorpe, Lai, & Dalton 1995) who, as part of their suggested battery of instruments used for the diagnosis of dementia in persons with intellectual disabilities, recommend that behavioral/psychiatric functioning should be evaluated. They stated that the Reiss Screen “is the only caregiver-report instrument to screen for psychopathology in individuals at all levels of [intellectual disabilities]” (Aylward, Burt, Thorpe, Lai, & Dalton 1995, p. 160) It is made up of 38 items, 26 of which load onto the following subscales: (1) Aggressive Behavior, (2) Psychosis, (3) Paranoia, (4) Depression (Behavior Signs), (5) Depression (Physical Signs), (6) Dependent Personality Disorder, and (7) Avoidant Disorder (Aman, 1991). In general, the psychometric characteristics for this instrument appear to quite acceptable, with generally adequate levels of internal consistency (alpha ranged from .54 to .84) and good item by item interrater reliability (r=.30 to r=.73) (Aman, 1991).
(4) The "Shultz" Mini-Mental Status Exam is a scale that consists of 18 items designed to assess orientation, personal knowledge, immediate and delayed memory, and language comprehension.

**Development of the "Shultz" Mini-Mental Status Exam (SMM)**

In the diagnosis of dementia, a mental status examination is often used as a dementia screen instrument (Butters, Salmon, & Butters, 1994). One commonly utilized mental status exam is the Mini Mental Status Examination (MMSE) (Folstein, Folstein, & McHugh, 1975). However, results on the MMSE are often confounded by pre-morbid intelligence — that is, higher intelligence results in better performance and lower intelligence results in poorer performance (Weiner, 1996).

Given the importance of the mental status exam in the diagnosis of dementia, and the need for direct testing of the individual with mental retardation as well as informant-based information (Burt & Alyward, 1999), we developed a new mental status examination for use in the population of persons with mental retardation. The goal was to produce an instrument that would aid in the detection of dementia in persons at all levels of mental retardation.

To establish content validity, a variety of mental status examinations were examined: the Mini Mental Status Exam (Folstein, Folstein, & McHugh, 1975), the Short
Portable Mental Status Questionnaire (Pfeiffer, 1975), and the Test for Severe Impairment (Albert and Cohen, 1992), to determine the cognitive domains that were assessed on each of these instruments.

The new status examination was then pilot tested on 13 individuals with mental retardation. Items that all subjects missed or all answered correctly were dropped in order to avoid "floor" and "ceiling" effects. As a result, the final instrument consists of 18 items. A copy of the Shultz Mini-Mental Status Exam appears in Appendix B.

(5) **Demographic Health Questionnaire (DHQ)** This is an instrument designed to gather demographic information and information about the medical history and current state of health of the subjects. It covered the domains of (a) demographics, (b) medications (c) significant health problems, and (d) additional health problems. A copy of the Demographic Health Questionnaire appears in Appendix C.

(6) **Paired-Associate Learning Task** This task consisted of 15 everyday items (such as a cup, pencil, book, comb, sock, spoon, and so forth) that were shown to the subject, then placed in one of three colored boxes, each in one corner of the examination table. The subject was then given the item and instructed to place the item in the same box, while being reminded to remember in which box the item was placed. The subject was asked to indicate which item was paired with which colored box by placing the item in its correct box during each of 5 trials. The total number of correct responses was intended to be an
index of memory function. However, given the difference between our task and the
traditional paired-associate learning task, our task is more likely to be an index of
executive function. A copy of the paired-associate instructions appears in Appendix D.

Development of the Paired-Associate Learning Task (PA)

Memory dysfunction is one of the hallmark symptoms of dementia. One of the
most sensitive tests for detecting memory dysfunction is the paired-associate learning
task (Squire & Shimura, 1996). Paired-associate learning tasks have been utilized to
assess the effects of drug treatment on learning in children with attention-deficit disorder
(Swanson & Kinsbourne, 1976) and the effects on learning and memory of naltrexone in
adults with self-injurious behaviors and severe/profound mental retardation (Sandman et
al., 1993). This task was intended to assess attention, recall, and the learning of new
associations in a spatial rather non-verbal manner.

Given the importance of detecting memory dysfunction in the context of dementia
and the sensitivity of the paired associate learning task in the detection of memory
dysfunction, we developed a modified paired-associate learning task to aid in the
detection of dementia in persons with mental retardation. While Swanson and
Kinsbourne (1976) presented the items to the subjects in a random order, the items in our paired-associate learning task were presented to the subject in the same order during each trial.

To establish content validity of this task, studies utilizing a paired associate task were examined for their procedures.

This task was pilot tested on 13 subjects. Results on this pilot testing produced the final form of the instrument.

**Procedure**

Once sites agreed to the study design, they were sent a kit containing the instruments, the performance tasks, and the informed consent letter, along with instructions regarding the use of these.

Sites were instructed that the performance tasks should be administered by the same person or maximally by two persons to help ensure consistency in administration. The performance tasks required approximately 30-45 minutes of the subject’s time. The performance tasks and the rating scales were to be completed within 30 days of each other. Informants for the rating scales were staff or family members who met the criteria described in the manuals of the rating scales. Briefly, they needed to know the subjects at least a year.
Test Sites and Examiners

For the central Ohio subjects, all performance measures (consisting of the Shultz Mini-Mental Status Exam and the Paired-Associate Learning task) were completed in designated rooms at the participant's group home or workshop. These were relatively quiet and free from outside distractions. The author assessed these subjects on the performance tasks and gave the DSDS as a semi-structured interview.

Instructions stipulated that all examiners have at least a bachelor's level of training in psychological testing and assessment. While the Dementia Scale for Down Syndrome requires the interviewing of two informants, for this study, one informant was interviewed. In part, this was to maintain parallel procedures for the two informant measures of cognitive decline.

Confidentiality

This study was approved by the Behavior and Social Human Subjects Committee of Ohio State University and by the appropriate human subjects body at each of the test sites.

All information obtained by this study was treated as confidential. Each subject who participated in the study was assigned an identification number. Any information that identified the subject by name remained with the examiner at the original site.
CHAPTER 3
Results

The main statistical analyses consisted of correlation matrices examining the linear relationship between the variables from different instruments and paired-samples t-tests examining the differences between subjects with dementia and those without dementia on different instruments. Computations were done on a personal computer using the SPSS statistical package, version 6.1 for the Power Macintosh. A summary of means and standard deviations of all assessment instruments by group appears in Table 3.1. Please note that IQ scores were collected on 35 out of 38 subjects; subjects without measured IQ scores were matched on the basis of a score that was estimated by the psychometrician from that particular site (see Appendix E for results for the 17 pairs of subjects with IQ scores). These scores were estimated based on the psychometrician’s familiarity with the subject and on the subject’s past recorded assessments, such as the Slosson Intelligence Test (Slosson, 1963) that were recorded as only levels of mental retardation, rather than IQ scores. All IQ data presented here are based on the 35 subjects with measured IQ scores — all results, unless noted otherwise, are based on an N of 38.
<table>
<thead>
<tr>
<th>Assessment Scales</th>
<th>Dementia</th>
<th>Non-Dementia</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>M</strong></td>
<td><strong>SD</strong></td>
<td><strong>M</strong></td>
</tr>
<tr>
<td><strong>Dementia Scale for Down Syndrome</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cognitive Cut-off**</td>
<td>3.89</td>
<td>2.54</td>
<td>.26</td>
</tr>
<tr>
<td>Early/Middle**</td>
<td>11.79</td>
<td>9.84</td>
<td>.42</td>
</tr>
<tr>
<td><strong>Dementia Questionnaire for Mentally Retarded Persons</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum of Cognitive**</td>
<td>26.68</td>
<td>7.19</td>
<td>10.95</td>
</tr>
<tr>
<td>Sum of Social**</td>
<td>24.47</td>
<td>11.23</td>
<td>7.42</td>
</tr>
<tr>
<td>Schultz Mini Mental**</td>
<td>9.11</td>
<td>4.14</td>
<td>11.84</td>
</tr>
<tr>
<td>Paired Associate**</td>
<td>22.68</td>
<td>15.94</td>
<td>45.37</td>
</tr>
<tr>
<td><strong>Reiss Screen</strong></td>
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<tr>
<td>REISS 26 TOTAL**</td>
<td>13.16</td>
<td>8.58</td>
<td>4.95</td>
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<td>AGGRESSIVE**</td>
<td>2.58</td>
<td>2.46</td>
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<td>AUTISM**</td>
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<td>.95</td>
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<td>1.69</td>
<td>.42</td>
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<td>PARANOIA**</td>
<td>1.68</td>
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<td>DEPRESSION (B)**</td>
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<td>2.03</td>
<td>.89</td>
</tr>
<tr>
<td>DEPRESSION (P)**</td>
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<td>2.69</td>
<td>1.16</td>
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<tr>
<td>DEPENDENT**</td>
<td>1.74</td>
<td>1.94</td>
<td>.95</td>
</tr>
<tr>
<td>AVOIDANT**</td>
<td>2.68</td>
<td>2.47</td>
<td>1.16</td>
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<tr>
<td>AGE**</td>
<td>56.89</td>
<td>7.32</td>
<td>55.26</td>
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<tr>
<td>IQ**</td>
<td>39.17</td>
<td>11.94</td>
<td>43.24</td>
</tr>
</tbody>
</table>

While the n for IQ was 35, the n for all other variables was 38.

*Higher scores indicate the presence of more dementia/psychopathology symptoms.

**Higher scores indicate better performance on these instruments.

Table 3.1: Summary of means on instruments and demographics for each group and results of t-tests.
**Dementia Scale for Down Syndrome (DSDS) Discrimination**

To assess the ability of the Dementia Scale for Down Syndrome in detecting differences between subjects with the diagnosis of dementia and their matches without the diagnosis, a paired-samples t-test was calculated. Following the scoring instructions, in order to be diagnosed with dementia, subjects had to reach a certain minimum criterion on the Dementia Scale for Down Syndrome Cognitive Cut-off (DSDSC) items. If that criterion was reached, then a Dementia Scale for Down Syndrome Early and Middle Stage items (DSDSEMT) score was calculated. The t score on the DSDSC was statistically significant ($t(18)=6.22$, $p<.001$), showing that subjects with dementia were rated by caregivers as having more cognitive difficulties than subjects without dementia. In addition, the t score on the EMT score was significant ($t(18)=5.19$, $p<.001$), indicating that subjects with dementia were rated by caregivers as having more dementia symptoms from the “Early and Middle” stages than those without. These results appear in Table 3.1.

**Sensitivity and Specificity of the Dementia Scale for Down Syndrome (DSDS)**

Sensitivity of an instrument is the ability of the test to correctly identify an outcome — in this study, the presence of dementia. Specificity is the ability of a test to correctly identify those who did not develop this outcome — in this case, those without dementia (Grunau, Whitfield, & Petrie, 2000).
Sensitivity in this case was calculated by taking the number of cases in which the clinician and the DSDS agreed on the presence of dementia (cell A), divided by the number of cases of agreement (A), plus the number of cases in which the clinician diagnosed dementia but the DSDS did not (B), plus the number of cases in which the test diagnosed dementia but the clinician did not (C).

Specificity is calculated by taking the number of cases that the clinician and the DSDS both agreed on the absence of dementia (D), divided by the number of cases in which the clinician diagnosed dementia but the DSDS did not (B), added to the number of cases in which the clinician did not diagnose dementia but the DSDS did (C), plus the number of cases of agreement on the absence of dementia (D).

<table>
<thead>
<tr>
<th></th>
<th>DSDS</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
<td>13</td>
<td>6</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
<td>19</td>
</tr>
</tbody>
</table>

Table 3.2: Agreement Between Clinician and DSDS on the Occurrence of Dementia.
Following the scoring guidelines in the manual, the DSDS showed a sensitivity of .68. In addition, again following the scoring guidelines, the specificity was calculated to be .76.

**Dementia Questionnaire for Mentally Retarded Persons (DQMRP) Discrimination**

To assess the sensitivity of the Dementia Questionnaire for Mentally Retarded Persons (DQMRP) in discriminating between subjects with the diagnosis of dementia and those without, a paired-samples t-test was calculated. Following the manual’s instructions, once scored, the DQMRP produces two subscales, the Sum of Cognitive Scores (SCS) and the Sum of Social Scores (SOS).

For the Cognitive Scores subscale, the t score was significant ($t(18)=6.37$, $p<.001$) indicating that subjects with and without dementia scored significantly different on this subscale — caregivers rated subjects with dementia as experiencing difficulties in cognitive areas. The t test on the Social Score subscale was also significant ($t(18)=6.61$, $p<.001$), again indicating that subjects with dementia scored significantly higher on this subscale. These results are presented in Table 3.1.

**Sensitivity and Specificity of Dementia Questionnaire for Mentally Retarded Persons (DQMRP).**

Because the scoring of the DQMRP is based on the IQ level of the subject, scores of subjects without IQs could not be evaluated for sensitivity and specificity. In
addition, cutoff scores are not available for those subjects with IQs less than 25, so scores
of subjects with IQs less than 25 were not included. Overall, scores could be calculated
for 32 subjects, 17 index subjects and 15 index subjects.

Sensitivity in this case was calculated by taking the number of cases in which the
clinician and the DQMRP agreed on the presence of dementia (cell A), divided by the
number of cases of agreement (A), plus the number of cases in which the clinician
diagnosed dementia but the DQMRP did not (B), plus the number of cases in which the
test diagnosed dementia but the clinician did not (C).

Specificity is calculated by taking the number of cases that the clinician and the
DQMRP both agreed on the absence of dementia (D), divided by the number of cases in
which the clinician diagnosed dementia but the DQMRP did not (B), added to the number
of cases in which the clinician did not diagnoses dementia but the DQMRP did (C), plus
the number of cases of agreement on the absence of dementia (D).
Table 3.3: Agreement Between Clinician and DQMRP on the Occurrence of Dementia.

Following the scoring guidelines in the manual, the sensitivity of the DQMRP was calculated to be .64, and the specificity was .66.

**Shultz Mini-Mental Status Exam (SMM) Discrimination**

A paired-samples t-test was calculated to determine if the Shultz Mini-Mental Status Exam significantly differentiated between those with dementia and those without. The t score was significant ($t(18)=-3.11, p<.01$). Subjects with dementia scored significantly lower on this instrument than subjects without dementia. These results are presented in Table 3.1.
**Paired Associate Learning Task (PA) Discrimination**

A paired-samples t test was calculated to determine if the Paired-Associate Learning task significantly differentiated between subjects with dementia and those without. The t score was significant ($t(18)=-5.00, p<.001$). Subjects with dementia performed significantly more poorly on this instrument than subjects without dementia. Please see Table 3.1 for these results.

**Reiss Screen for Maladaptive Behavior Discrimination**

Paired-samples t-tests were calculated to examine whether the subscales on the Reiss Screen were significantly different for subjects with dementia and those without. Results indicated that the following subscales were significantly different for subjects with dementia and those without: aggression ($t(18)=3.40, p<.01$), depression (physical signs) ($t(18)=-4.35, p<.001$), psychosis ($t(18)=-3.06, p<.01$), avoidance ($t(18)=-2.15, p<.05$), and paranoia ($t=-2.15, p<.05$). Each of these comparisons indicated that these areas were rated by caregivers as significantly more problematic for subjects with dementia than for those without. Additionally, the 26-item total score was also significantly higher for those with dementia ($t(18)=-4.17, p<.001$). Please see Table 3.1 for these results.
Relationships between Variables for All Subjects

Relationships between the Demographic Variables

For all subjects, IQ was not related to the age or the gender of the subjects ($r = .12$, $p = .50$ and $r = .31$, $p = .06$ respectively). The gender of the subjects was not related to the age of subjects ($r = .22$, $p = .19$).

Demographic Variables and the Dementia Scale for Down Syndrome

Pearson correlations were calculated to determine the relationship between the DSDSEMT score and IQ, age, gender, diagnosis of Down Syndrome, and the diagnosis of dementia. These results appear in Table 3.4. Scores on the DSDSEMT were not significantly related to age, gender, IQ, or presence of Down Syndrome. They were significantly related to the diagnosis of dementia ($r = .71$, $p < .001$).

Additionally, Pearson correlations were calculated to examine the relationship between the DSDSC score and IQ, age, gender, the diagnosis of Down Syndrome, and the diagnosis of dementia. Scores on the DSDSC were not significantly related to the subjects’ age, gender, IQ, or diagnosis of Down Syndrome. However, scores on the DSDSC were significantly related to the diagnosis of dementia ($r = .71$, $p < .001$).
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<th>ASSESSMENT SCALES</th>
<th>DEMOGRAPHIC VARIABLES FOR ALL SUBJECTS</th>
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<td></td>
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<td>AVOIDANT</td>
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*<.05, **<.01, ***<.001

¹While the n for IQ is 35, the n for all other variables is 38.

Table 3.4: Correlations between demographic variables, the two dementia assessment, the two performance tasks, and the Reiss Screen for Maladaptive Behavior.
Demographic Variables and the Dementia Questionnaire for Mentally Retarded Persons

Pearson correlations were calculated to determine the relationship between the scores on the DQMRP subscales and IQ, age, gender, Down Syndrome, and diagnosis of dementia. These results appear in Table 3.4. Scores on the DQMRP Cognitive Subscale were not significantly related to age, gender, IQ, or presence of Down Syndrome. However, scores on the DQMRP cognitive subscale were significantly related to the diagnosis of dementia ($r=-.66, p<.001$).

Results on the DQMRP Social subscale also indicated that these scores were not significantly related to age, gender, IQ, or presence of Down Syndrome. Again, the scores on this subscale were significantly related to the diagnosis of dementia ($r=-.69, p<.001$), indicating that subjects with dementia were rated by caregivers as exhibiting more problems behaviors than those without dementia.

Demographic Variables and the Shultz Mini-Mental Status Exam

Pearson correlations were calculated to determine the relationship between the scores on the Shultz Mini-Mental Status Exam and IQ, age, gender, Down Syndrome, and diagnosis of dementia. These results appear in Table 3.4. Scores on the Shultz Mini-Mental Status Exam were not significantly related to the subject’s age or gender. However, the results on the Shultz Mini-Mental Status Exam were also significantly related to a diagnosis of dementia ($r=-.37, p<.05$). Additionally, scores on the Shultz
Mini-Mental Status Exam were significantly related to the subjects’ IQ (n=35, r=.39, p<.05), with individuals having lower IQs performing more poorly on this instrument.

In an attempt to explore the relationship between the Shultz Mini-Mental Status Exam and IQ further, subjects pairs with IQ scores were averaged and the pairs were split at the median (mdn=38.5) resulting in 9 pairs of subjects in the “low IQ” category and 9 pairs of subjects in the “high IQ” category.

Paired-samples t-tests were conducted on the “high IQ” demented and non-demented subjects, comparing their scores on the Shultz Mini-Mental Status Exam. The paired t-test was not significant (t(8)=-1.62, p=.144), indicating that the Shultz Mini-Mental Status Exam did not discriminate between subjects with and without dementia in the “high IQs” group.

A t-test on the “low IQ” group did reach significance (t(8)=-3.60, p<.01), indicating that the Shultz Mini-Mental Status Exam did discriminate between subjects with and without dementia for those with lower IQs.

Scores were also related to the presence of Down Syndrome (r=-.66, p<.001). Subjects with Down Syndrome performed more poorly on this instrument.

**Demographic Variables and the Paired-Associate Learning Task**

Pearson correlations were calculated to determine the relationship between the scores on the Paired-Associate Learning Task and IQ, age, gender, Down Syndrome, and diagnosis of dementia. These results appear in Table 3.4. Scores on the Paired-Associate
Learning Task were not significantly related to subject's age, or gender. Much like the Shultz Mini-Mental Status Exam, the scores were significantly related to subjects' IQs ($r=.50, p<.01$), signifying that subjects with lower IQs scored lower on the test than subjects with higher IQs. Results on the Paired-Associate Learning Task were significantly related to the diagnosis of dementia ($r=-.45, p<.01$).

In an attempt to explore the relationship between the Paired-Associate Learning Task and IQ, the IQs of the matched pairs of subjects were averaged and the pairs were split at the median (mdn=38.5). This resulted in 9 pairs of subjects in the "low IQ" category and 9 pairs of subjects in the "high IQ" category.

Paired-samples t-tests were conducted on the "low IQ" demented and non-demented subjects, comparing their scores on the Paired-Associate Learning Task. The paired t-test was significant ($t(8)=-4.04, p<.05$), indicating that the Paired-Associate Learning Task did discriminate between those with dementia and those without for the "low IQ" group. A t-test on the "high IQ" group also reached significance ($t(8)=-4.04, p<.05$) indicating that the Paired-Associate Learning Task also discriminated between subjects with and without dementia for those with higher IQs.

Scores were also related to the presence of Down Syndrome ($r=-.59, p<.001$). Subjects with Down Syndrome performed more poorly on this instrument.
Demographic Variables and the Reiss Screen

Pearson correlations were calculated to determine the relationship between the scores on the Reiss Screen subscales and IQ, age, gender, Down Syndrome, and diagnosis of dementia. These results also appear in Table 3.4. Scores on the subscales that distinguished between subjects with and without dementia [aggression, depression (physical signs), psychosis, avoidance, and paranoia] were not significantly related to age, gender, or the diagnosis of Down Syndrome. While scores on the depression (physical signs) and psychosis subscales were not significantly related to IQ, interestingly, the relationship between scores on the aggression subscale and IQ of subjects did approach significance ($r=.32, p=.055$). This may suggest that subjects with higher IQs tended to be rated by caregivers as exhibiting somewhat more aggression than those with lower IQs. Scores on the aggression, depression (physical signs), psychosis, and avoidance subscales were also significantly related to the diagnosis of dementia.

Scores on the 26-item Total Score of the Reiss Screen were not significantly related to the age, gender, or diagnosis of Down Syndrome of the subjects, but the scores did evidence a significant relationship to dementia ($r=.54, p<.001$). The scores did approach, but did not reach, a significant relationship to IQ ($r=.32, p=.056$).

Relationships Between the Various Indices.

A correlation matrix was calculated to explore the relationships among the various assessments used in this study.
Dementia Scale for Down Syndrome and the Dementia Questionnaire for Mentally Retarded Persons

As would be expected, scores on the two subscales of the DSDS and the two subscales of the DQMRP were significantly related, indicating that these two instruments were assessing some of the same elements of dementia in the population of persons with mental retardation. Please see Table 3.5 for these results.

Dementia Scale for Down Syndrome and the Shultz Mini-Mental Status Exam and the Paired-Associate Learning Task

Scores on the DSDSEMT and scores on the Shultz Mini-Mental Status Exam were significantly correlated ($r=-.51$, $p<.001$) indicating that these two instruments may both be assessing similar elements of dementia. The correlation was negative, showing that subjects who scored higher on the DSDS (indicating the presence of more symptoms of dementia) performed more poorly on the Shultz Mini-Mental Status Exam.

Scores on the DSDSC and the Shultz Mini-Mental Status Exam were also significantly correlated ($r=-.41$, $p<.05$). Again, these scores were negatively correlated, indicating that a higher score on the DSDSC was related to poorer performance on the SMM.
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*p < .05, **p < .01, ***p < .001

Table 3.5: Pearson correlations between all assessment instruments.
Similarly, scores on the DSDSEMT and the Paired-Associate Learning Task were significantly related ($r=-.45, p<.01$). Subjects who scored higher on the DSDS tended to score lower on the PA.

Scores on the DSDSC and the Paired-Associate Learning Task were also significantly related, ($r=-.41, p<.05$), showing a negative relationship between the DSDSC and the Paired-Associate Learning Task. These results appear in Table 3.5.

**Dementia Scale for Down Syndrome and the Reiss Screen**

Scores on the DSDSEMT were significantly related to the Reiss 26-Total Score, as well as to the depression (physical signs) subscale ($r=.42, p<.01$; $r=.41, p<.01$, respectively), and the depression (behavioral signs) subscale ($r=.33, p<.05$).

Scores on the DSDSC were significantly related to the Reiss 26-Total Score ($r=.42, p=.007$), as well as to the following subscales; aggression ($r=.33, p=.039$), depression (behavioral signs) ($r=.39, p=.014$), and to depression (physical signs) ($r=.39, p=.015$). See Table 3.5 for these results.

**Dementia Questionnaire for Mentally Retarded Persons, the Shultz Mini-Mental Status Exam, and the Paired-Associate Learning Task**

The two subscales of the DQMRP, (a) the DQMRPS, and (b) the DQMRPC, and the Shultz Mini-Mental Status Exam were significantly related ($r=-.58, p<.001$, $r=.-
indicating that subjects who scored more poorly on the Shultz Mini-Mental Status Exam were rated as exhibiting more problems on both subscales than subjects who scored higher on the Shultz Mini-Mental Status Exam.

The relationships between the two subscales of the DQMRP, (a) the DQMRPS and (b) DQMRPC, and the Paired-Associate Learning Task were significant ($r = -0.46$, $p < 0.01$; $r = -0.59$, $p < 0.001$ respectively). In both cases the relationship between the Sum of Cognitive Scores was somewhat more strongly correlated than the relationship with the Sum of Social Scores. These results are presented in Table 3.5.

**Dementia Questionnaire for Mentally Retarded Persons and the Reiss Screen**

Scores on the DQMRPC subscale were significantly related to subscales that distinguished between subjects with and without dementia — (a) aggression, (b) depression (physical signs), (c) psychosis and (d) avoidance ($r = 0.45$, $p < 0.01$; $r = 0.48$, $p < 0.01$, $r = 0.57$, $p < 0.001$, and $r = 0.42$, $p < 0.01$, respectively) but not for paranoia. Scores on the DQMRPC were also associated with scores on the autism subscale ($r = 0.52$, $p < 0.01$), indicating some potential overlap between the symptoms in these subscales and the symptoms of dementia as assessed by the DQMRPC subscale.

Scores on the DQMRPS subscale were also related to the aggression, depression (physical) and psychosis subscales ($r = 0.50$, $p < 0.01$; $r = 0.78$, $p < 0.001$, and $r = 0.56$, $p < 0.001$, respectively) as well as to the autism ($r = 0.62$, $p < 0.001$), avoidance ($r = 0.63$, $p < 0.001$), and depression (behavioral signs) ($r = 0.50$, $p < 0.01$) subscales. The comparison also approached
significance with the dependent scale \( r = .31, p = .052 \) marking some overlap in symptoms in these behavioral areas and dementia symptoms as assessed by the DQMRPS subscale. Please see Table 3.5 for these results.

**Relationships Between Variables with Depression Partialed Out.**

In order to explore the possible contribution of subjects with depression to the significant correlational relationships between all of the assessment instruments, a correlation matrix was run with the two scores from the Reiss Screen for Maladaptive Behavior depression subscales partialed out.

As one can see from Table 3.6, the relationships between the subscales of the DSDS with the two subscales of the DQMRP remained significant, as did the relationship between the two subscales of the DSDS and the two subscales of the DQMRP with the Paired-Associate Learning Task. However, the DSDSC subscale was no longer significantly related to the Shultz Mini-Mental Status Exam. All of the other dementia assessments did remain significantly related to the Shultz Mini-Mental Status Exam, as well as the Paired-Associate Learning Task.

The partialing out of the depression subscales did remove the significant relationship between the two dementia instruments and the performance tasks with the Reiss Screen Total Score. In general, the assessments and performance tasks were no longer significantly related to the subscales of the Reiss Screen for Maladaptive Behavior, save for the DQMRP Sum of Social Scores subscales relationship to the autism and
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* p < .05  ** p < .01  *** p < .001

Table 3.6: Pearson correlations between all assessment instruments with scores from the depression variables partialed out.
psychosis subscales ($r=.37$, $p<.05$, $r=.39$, $p<.05$). This suggests that some of the significant relationships found between the two dementia instruments and the two performance tasks with the Total score and other subscales of the Reiss Screen for Maladaptive Behavior could be because the Reiss Screen was picking up symptoms of depression and not symptoms of dementia in the subjects in this study.

The partialing out of depression did not remove the significant relationships between the dementia scales and dementia. The DSDSEMT subscale and the DSDSC subscale remained significantly related to dementia ($r=.53$, $p<.01$, and $r=.66$, $p<.001$ respectively), as did the DQMRP Sum of Social Scores subscale and the Sum of Cognitive Scores subscales ($r=.56$, $p<.01$, and $r=.60$, $p<.001$ respectively). The Paired-Associate Learning Task also continued to be significantly related to dementia ($r=-.55$, $p<.01$). However, the Shultz Mini-Mental Status Exam was no longer significantly related to dementia ($r=-.28$, $p=.11$). This suggests that the Shultz Mini-Mental Status Exam might be assessing symptoms of depression rather than symptoms of dementia. More research with this instrument is needed to clarify this issue.

**Relationships Between Variables for Each Group**

In addition to the Pearson correlations calculated for the subjects as a whole, correlations were calculated for the groups of subjects with and without dementia to explore the impact of this diagnosis on the various indices.
Relationships Between Variables for Subjects with Dementia

For subjects with dementia (N=19), results on the DSDSEMT and the DSDSC were not significantly related to age, gender, or IQ. Likewise, scores on the two subscales of the DQMRP were not found to be significantly related to gender, age, or IQ of the subject. Additionally, scores on the Shultz Mini-Mental Status Exam and the Paired-Associate Learning Task for the subjects with dementia were not significantly related to subject’s age, gender, or IQ. Scores on the Reiss Screen for Maladaptive Behavior subscales and Total Score were not significantly related to age, gender, or diagnosis of Down Syndrome of the subject. However, the Total score, as well as the aggressive, paranoia, and depression (physical signs) subscales did evidence a relationship to the IQ of the subject (r=.67, p<.01, r=.63, p<.01, r=.63, p<.01, and r=.47, p<.05, respectively). In general, subjects with higher IQs tended to be rated as exhibiting more symptoms of psychopathology than subjects with lower IQs. The correlations between age, gender, and IQ on the one hand and the two dementia instruments and Paired-Associate Learning Task and Shultz Mini-Mental Status Exam tasks, and the Reiss Screen for Maladaptive Behavior on the other for subjects with dementia are presented in Table 3.7.

For subjects with dementia (N=19), as one can see from Table 3.8, the subscales of the DSDS were significantly related to one another (r=.78, p<.001) but were not significantly related to the subscales of the DQMRP, nor were they significantly related to any of the other assessment measures.
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<th>ASSESSMENT SCALES</th>
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<td>Cognitive Cut-off</td>
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<td>Early/Middle</td>
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*p < .05  **p < .01  ***p < .001

1While the n for IQ is 18, the n for all other variables is 19.

Table 3.7: Relationship between the assessment instruments and demographics for subjects with dementia.
### Table 3.8: Pearson correlations between all assessment instruments for subjects with dementia (N=19).

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<tr>
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<td>.84***</td>
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* p < .05, ** p < .01, *** p < .001
The subscales of the DQMRP did evidence more relationships to the other assessment instruments than did the DSDS for subjects with dementia. The subscales of the DQMRP were significantly related to each other ($r=.82, p<.01$). In addition, the Change of Cognitive Score subscale was significantly negatively related to the Shultz Mini-Mental Status Exam ($r=-.57, p<.01$). Also, the Change of Cognitive Score subscale was related to the Reiss Screen Total Score, aggressive, and autism subscales ($r=.51, p<.05; r=.47, p<.05$, and $r=.60, p<.01$, respectively).

The Change of Social Score subscale was significantly negatively related to the Shultz Mini-Mental Status Exam ($r=-.58, p<.01$) and the Paired-Associate Learning Task, ($r=-.48, p<.05$), indicating that subjects rated as exhibiting more dementia symptoms scored more poorly on these instruments. The Change of Social Score subscale was also significantly related to the Reiss Screen Total Score, autism, depression (behavioral signs), depression (physical signs), and the avoidant subscales ($r=.59, p<.01; r=.63, p<.01, r=.55, p<.01$ and $r=.68, p<.01$, respectively).

The Shultz Mini-Mental Status Exam and the Paired-Associate Learning Task were significantly related to each other in subjects with dementia ($r=.84, p<.001$).

**Relationships Between Variables for Subjects without Dementia**

For subjects without dementia, the DSDSEMT was not significantly related to age, gender, or IQ. Likewise, scores on the DSDSC were not significantly related to age, gender, or IQ.
On the DQMRP, the two subscales were not found to be significantly related to gender or age of the subject. However, while scores on the Social subscale evidenced no relationship with IQ, scores on the Cognitive subscale did approach significance at the .05 level ($r = -.47, p = .053$), suggesting that subjects without dementia with relatively low IQs tended to score somewhat more poorly on this subscale than those with relatively higher IQs.

Scores on the Shultz Mini-Mental Status Exam and the Paired-Associate Learning Task for the subjects without dementia were not significantly related to age. However, both the Shultz Mini-Mental Status Exam ($r = .50, p < .05$) and the Paired-Associate Learning Task ($r = .60, p < .01$) scores were significantly related to IQ, again indication that subjects with lower IQs tended to perform more poorly on both instruments.

Additionally, while scores on the Shultz Mini-Mental Status Exam were not related to gender, scores on the Paired-Associate Learning Task were significantly related to gender ($r = .52, p < .05$), with females scoring somewhat higher on the Paired-Associate Learning Task than did males. Scores on the Reiss Screen for Maladaptive Behavior subscales and Total Score were not significantly related to age, IQ, or diagnosis of Down Syndrome of the subject. However, the paranoia subscale of the Reiss Screen for Maladaptive Behavior did show a relationship to the gender of the subject ($r = .48, p < .05$), indicating that females tended to be rated as showing more symptoms of paranoia than did males in subjects without dementia. The correlations between age, gender, and IQ on
the one hand and the two dementia instruments and Paired-Associate Learning Task and Shultz Mini-Mental Status Exam tasks, and the Reiss Screen for Maladaptive Behavior on the other for subjects without dementia are presented in Table 3.9.

For subjects without dementia, the subscales of the DSDS were significantly related to each other ($r=.75$, $p<.001$). In addition, the DSDSEMT subscale was significantly related to the DQMRP Sum of Cognitive Score subscale ($r=.75$, $p<.001$), the DSDSC subscale was related to the paranoia subscale Reiss Screen for Maladaptive Behavior ($r=.46$, $p<.05$). No other significant relationships were found for the subscales of the DSDS.

For subjects without dementia, the subscales of the DQMRP were not related to each other. The Sum of Cognitive Score subscale was negatively related to the Shultz Mini-Mental Status Exam ($r=-.65$, $p<.01$). This is surprising, given that these were subjects without dementia, and presumably they were not experiencing any kind of cognitive decline. And yet, in these subjects without dementia, subjects rated as showing more dementia symptoms as assessed by the Sum of Cognitive Scores subscales also scored more poorly on the Shultz Mini-Mental Status Exam. It could be that this subscale picked up on possible cognitive changes in those in the index group that do not yet warrant the diagnosis of dementia, but are still experiencing cognitive changes.

The Sum of Cognitive Score subscale was positively related to the autism and psychosis subscales of the Reiss Screen for Maladaptive behavior ($r=.48$, $p<.05$, and $r=.46$, $p<.05$). The Sum of Social Score Subscale was related to the Reiss Screen for
### Table 3.9: Relationship between the assessment instruments and demographics for subjects without dementia.

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<thead>
<tr>
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<th>DEMOGRAPHIC VARIABLES FOR SUBJECTS WITHOUT DEMENTIA</th>
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<td>AVOIDANT</td>
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</table>

<sup>*</sup><sub>p < .05</sub>  <sup>**</sup><sub>p < .01</sub>  <sup>***</sup><sub>p < .001</sub>

<sup>1</sup>While the n for IQ is 18, the n for all other variables is 19.
Maladaptive Behavior Total score, as well as to the autism, depression (physical signs), and avoidant subscales ($r=.61, p<.01; r=.66, p<.01, r=.73, p<.001$, and $r=.58, p<.01$, respectively).

The Shultz Mini-Mental Status Exam was significantly related to the Paired-Associate Learning Task ($r=.53, p<.05$), as well as to the paranoia subscale of the Reiss Screen for Maladaptive Behavior ($r=.49, p<.05$). The Paired-Associate Learning Task was significantly related to the Reiss Total score, as well as to the depression (physical signs) subscale ($r=.52, p<.05$, and $r=.49, p<.05$). All correlations between the dementia instruments, the Paired-Associate Learning Task, the Shultz Mini-Mental Status Exam, and the Reiss Screen for Maladaptive Behavior for subjects without dementia are presented in Table 3.10.

**Logistic Regression Model**

A logistic regression analysis was performed in order to determine which combination of the various indices best discriminated between subjects with dementia and without dementia. A logistic regression analysis was chosen as it allowed for both parametric and nonparametric dichotomous dependent and predictor variables to be analyzed. A forward stepwise logistic regression analysis was performed with the (a)
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<td>.07</td>
<td>.03</td>
<td>.61**</td>
<td>.25</td>
<td>.52*</td>
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<td>-.02</td>
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<td>.60*</td>
<td>.07</td>
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<td>.38</td>
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<td>12. DEPRESSION (B)</td>
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<td>.17</td>
<td>-.21</td>
<td>.23</td>
<td>.41</td>
<td>.29</td>
<td>.67**</td>
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<td>.02</td>
<td>-.01</td>
<td>.73***</td>
<td>.14</td>
<td>.49*</td>
<td>.59*</td>
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<td>.10</td>
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<td>.02</td>
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<td>.84***</td>
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<td>.52*</td>
<td>.37</td>
<td>.23</td>
<td>.10</td>
<td>.60**</td>
<td>.60**</td>
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</tbody>
</table>

*b < .05. **b < .01. ***b < .001

Table 3.10: Pearson correlations between all assessment instruments for subjects without dementia (N=19).
DSDSEMT, (b) DSDSC, (c) DQMRPC, (d) DQMRPS, (e) SMM, (f) PA, (g) the discriminating Reiss Screen subscales (aggression, depression (physical signs), psychosis, avoidance, and paranoia), and (h) the Reiss Screen 26-item Total entered into the regression as one block in order to explore the relative influence that each variable contributed to the dependent variable, dementia. The DSDSC score was then entered into the model first and reached significance \[Wald (1, N=38) =7.78, \beta=1.618, (SE=.58, SE=.58)\]. This iteration provided a 86% correct classification rate, indicating that 86% of the subjects were correctly identified as having dementia or not. However, with the entry of the DQMRPS to the model, the contribution of the DSDSC to the model changed and no longer significantly discriminated between the group with dementia and the group without \[Wald X^2 (1, N = 38) =3.6503, \beta=1.39, (SE=.73)\]. The DQMRPS did significantly discriminate between subjects with and without dementia \[Wald X^2 (1, N = 38) =5.03, \beta=.1496, (SE=.0667)\]. At this point, the calculations ended, indicating that none of the other indices contributed significant additional variance to this model. The odds ratio for the DQMRPS indicates that as the DQMRPS increases, the odds of a dementia outcome also increases. This final iteration provided a 92.11% correct classification rate, indicating that in 92% of the subjects were correctly identified as having dementia or not using these two variables. These results appear in Table 3.11.
In an attempt to explore the contribution of the DQMRPS alone to the model, a second forward step-wise logistic regression was conducted, this time forcing DQMRPS into the model on the first step. By itself, the DQMRPS did significantly discriminate between subjects with dementia and without \[\text{Wald } X^2 (1, N = 38) = 11.17, \ p = .0008 (\beta = .2088, \ SE = .0625)\]. Please see these results in table 3.12. The next variable into this model was the DSDSC, which once again, approached, but did not reach significance \[\text{Wald } X^2 (1, N = 38) = 3.6503, \ p = .056 (\beta = 1.39, \ SE = .73)\]. With the entry of the DSDSC into the model, contribution of the DQMRPS returned to level of the first logistic regression \[\text{Wald } X^2 (1, N = 38) = 5.03, \ p = .024 (\beta = 1.1496, \ SE = .0667)\]. At this point, the calculations ended, indicating that none of the other indices contributed significant

<table>
<thead>
<tr>
<th>Predictor</th>
<th>(\beta)</th>
<th>(\text{Wald } X^2)</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>DQMRPS</td>
<td>.15</td>
<td>5.03*</td>
<td>1.16</td>
</tr>
<tr>
<td>DSDSC</td>
<td>1.39</td>
<td>3.65</td>
<td>4.03</td>
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</tbody>
</table>

*\(p < .05\)

Table 3.11: Results of the second logistic regression: Use of all variables that discriminated between demented and non-demented groups.
additional variance to this model. This final iteration, as above, provided a 92.11% correct classification rate, indicating that in 92% of the subjects were correctly identified as having dementia or not using these two variables.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>β</th>
<th>Wald $X^2$</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>DQMRPS</td>
<td>.2088</td>
<td>11.17 *</td>
<td>1.23</td>
</tr>
</tbody>
</table>

* $p < .001$

Table 3.12: Results of the second logistical regression: Contribution of the DQMRPS when forced into the model first, before the other variables.

A third logistic regression analysis was performed with all the above variables, in addition to including all of the Reiss subscales. The results were identical to the first logistic regression.

A fourth logistic regression was performed, this time suppressing both the DQMRPS score and the DSDSC score, while including all other indices. The DSDSEMT score significantly discriminated between the group with dementia and the group without.
Additionally, the Reiss Aggression subscale score significantly discriminated between the group with dementia and the group without, \[ \text{Wald } X^2 (1, N = 38) = 5.6263, \ p = 0.017, (\beta = 0.8185, \ SE = 0.3541) \]. At this point, the calculations ended, indicating that none of the other indices contributed significant additional variance to the model. The odds ratios for the DSDSEMT and the Aggression subscale indicate that as they increase, the odds of a dementia outcome also increase. The final iteration provided a 84% correct classification rate. This indicates that this model correctly predicted the presence or absence of dementia in our subjects 84% of the time. These results appear in Table 3.13.

<table>
<thead>
<tr>
<th>Predictor</th>
<th>( \beta )</th>
<th>( \text{Wald } X^2 )</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSDSEMT</td>
<td>0.35</td>
<td>6.51*</td>
<td>1.42</td>
</tr>
<tr>
<td>Aggression</td>
<td>0.82</td>
<td>5.63*</td>
<td>2.27</td>
</tr>
</tbody>
</table>

*\( p < .05 \).

Table 3.13: Results of the fourth logistical regression: DQMRPS and DSDSC suppressed.
Chapter 4:
Discussion

Research into age-related declines in cognition in older persons with mental retardation (Dalton & Crapper, 1984; Fisher & Zeaman, 1970; Hewitt, Fenner & Torpy, 1986; Wisniewski, Howe, Williams, & Wisniewski, 1978) indicates that this population, particularly those with Down Syndrome, does experience decline in cognitive abilities. This makes the detection of cognitive decline an important component in serving elderly persons with mental retardation. Difficulties in detecting this decline are well-documented (Dalton, Seltzer, Adlin, & Wisniewski, 1992). As research in the area of aging and mental retardation indicates that cognitive abilities, such as long-term memory, do decline with age (Alyward, et al., 1997), there is a great need to be able to detect any cognitive decline that may indicate the onset of dementia. As stated earlier, the difficulty in assessing dementia in this population comes from the fact that the clients present with mild to severe cognitive impairments prior to age-related cognitive decline. Such premorbid cognitive impairment can make the detection of decline in cognitive abilities quite difficult.
This study was intended to address some of the above issues by attempting to examine further the two instruments that have been designed to detect dementia in this population, the Dementia Questionnaire for Mentally Retarded Persons (Evenhuis, 1990), and the Dementia Scale for Down Syndrome (Gedye, 1995).

The present study has several limitations which may limit its ability to illuminate the key issue — namely, whether or not these instruments clearly distinguish between those with and without dementia in persons with mental retardation.

Due to the exploratory nature of the study and the lack of research information available on the two dementia assessment instruments in question, we wanted to examine the data in as many ways possible — hence, we conducted numerous t-tests and correlations. The lack of empirical data regarding the assessment of dementia in this population utilizing these particular instruments justified the many comparisons conducted, as well as setting of the significance level at .05 without Bonferroni corrections. Though this does allow for likely Type I error, we felt that the potential exploratory contribution to the field of assessment of dementia in this population justified this significance level. Nevertheless, some of the relationships appearing as “significant” in the Results section must be interpreted with caution. Some will probably not survive the test of time.

Another limitation of this study was the small number of subjects. We were aware of the difficulties of finding potential subjects who fit the inclusionary criteria of this study in our own area — hence, the internet was used to identify a potential pool of
subjects who would qualify for this study out of the immediate area. While this did yield several potential subjects, many potential collaborative sites, for a variety of reasons, were unable to follow through and assess subjects.

The use of multiple sites for data collection in order to assess as many subjects as possible was also problematic. We relied on these sites to follow the directions for the assessments without direct supervision, though we did conduct conference calls with interested sites in order to clarify data collection procedures.

The requirement that index subjects be diagnosed by a physician or clinician with experience in aging or developmental disabilities, along with the requirement that those with dementia be carefully matched on diagnosis of Down Syndrome, IQ, and age presented its own set of difficulties. Several sites that expressed interest in the study either lacked access to subjects with an acceptable diagnosis, or had difficulty finding matches for those subjects who did have the diagnosis, and therefore, could not participate in the study.

Another limitation to the study was also in the IQ scores used for our data analysis. For example, in an effort to assure that subjects were matched with control subjects who had similar IQs to the index subjects' premorbid IQ, this study relied on IQ scores that were at least 5 years old — thus, we did not have data on the current IQ score of the subjects in this study. Even if we had current IQ data, they would not be legitimate to use in this study. In addition, the IQ scores were obtained with a variety of methods, which reduced the “comparability” of the IQ data included in this study.
Finally, an additional limitation to the study was the Paired-Associate Learning Task, which was a variation of the traditional paired-associate learning task. In the traditional verbal learning paired-associate task, once a stimulus-response list has been learned, the stimulus items are presented to the subject in a random fashion (Shimamura, Jurica, Gershberg, & Knight, 1995). Items in Swanson and Kinsbom’s (1976) spatial paired-associate learning task were presented to the subjects in random order. As our items were not presented to the subjects in a random fashion, our version may have assessed a different function than intended - perhaps it assessed executive function (such as ability to focus attention and the ability to perform mental or physical tasks in the proper sequence [Weiner, Teri, & Williams, 1996]) rather than memory. It is possible that a more traditional version of the paired-associate task may have produced different results; hence our results with this instrument must be interpreted with caution.

Despite these many limitations, the study did reveal several quite interesting results.

**Differentiation of the Assessment Instruments, the Performance Tasks, and the Reiss Screen for Maladaptive Behavior**

The first hypothesis of this study stated that the DQMRP and DSDS would discriminate between subjects with dementia and mental retardation and subjects with mental retardation but without dementia. This study showed that, indeed, both
instruments discriminated between those with and without dementia. The second hypothesis stated that scores on the DQMRP and DSDS would not be affected by age or prior IQ. This too was shown to be the case in this study.

Results of the paired-samples t-tests indicated that both subscales of the Dementia Questionnaire for Mentally Retarded Persons (Sum of Social Scores and Sum of Cognitive Scores) significantly differentiated between those with dementia and without dementia. They did so without a relationship to the gender, age, or IQ of the subject, or to the presence of Down Syndrome of the subject. Both of the subscales were significantly related to the diagnosis of dementia. Both subscales seemed to be quite sensitive to differences between those with and without dementia.

Both subscales of the Dementia Scale for Down Syndrome also differentiated between those with and without dementia. Scores on this instrument showed no relationship to the gender, age, IQ of the subject, or to the presence of Down Syndrome of the subject being assessed. Both of the subscales were significantly related to the diagnosis of dementia. The informants responding to the questions rated those with dementia and those without dementia quite differently.

The third hypothesis stated that the other methods of assessment (i.e., a performance measure of memory [Paired-Associate Learning Task] and a specifically-developed mini-mental status exam [Shultz Mini-Mental Status Exam]) would also discriminate between samples with and without dementia. Again, we found that to be case.
The Shultz Mini Mental Status Exam discriminated between subjects with dementia and without dementia; however, the IQ of the subject had an impact on the outcome of the scores — people with lower IQs performed more poorly on this instrument than those with higher IQs. In examining this relationship by doing a median split with the subjects and dividing them into a “higher IQ” group and a “lower IQ” group, the median split t-test indicated that the Shultz Mini Mental Status Exam did not discriminate between those with dementia and those without dementia in subjects with higher IQs (IQ range 20 to 71). This instrument should be used with caution in persons with higher IQs. This instrument might need further revision — it might benefit from the addition some more difficult items which might allow it to be used more effectively in those persons with higher IQs. Also, the addition of more items that tap into fluid intelligence might increase its effectiveness. Then, a graded scoring scale could be used, with fewer errors allowed for persons with higher IQs than for those with lower IQs to avoid potential false positives in persons with lower IQs.

In general, subjects with Down syndrome tended to score more poorly on the Shultz Mini-Mental Status Exam than subjects without Down Syndrome. However, when correlations were calculated for subjects with and without dementia separately, only subjects with Down Syndrome with the diagnosis of dementia continued to show this relationship to scores on the Shultz Mini-Mental Status Exam. While there did not seem to be a relationship between the diagnosis of Down Syndrome and IQ, either for the overall pool of subjects (r=-.06, p=.70) or for subjects with Down Syndrome who were...
diagnosed with dementia ($r = -.16, p = .51$), nonetheless, these subjects were performing more poorly on this instrument than those without Down Syndrome. As Down Syndrome is a known risk factor for developing dementia, perhaps this instrument is quite sensitive to picking up on cognitive changes that are unique in persons with Down Syndrome and dementia and not found in those with dementia without Down Syndrome. Perhaps, too, the subjects with Down syndrome had lower IQs and the IQ accounted for the relationship.

The Paired-Associate Learning Task discriminated between subjects with dementia and without dementia. However, the IQ of the subject had an impact on the outcome of the scores — people with lower IQs performed more poorly on these instruments than those with higher IQs.

While the median split IQ t-test indicated that the Paired-Associate Learning Task was as effective in discriminating between those with and without dementia in those with higher IQs and lower IQs, nonetheless, a relationship existed between the scores and IQ. Perhaps a graded scoring scale could be used, with fewer errors allowed for screening dementia in persons with higher IQs than for those with lower IQs.

In addition, much like the Shultz Mini-Mental Status Exam, scores on the Paired-Associate Learning Task also were related to the diagnosis of Down Syndrome. In general, subjects with Down syndrome tended to score more poorly on this instrument than subjects without Down Syndrome. However, when correlations were calculated for subjects with dementia, presence of Down Syndrome was associated with scores on the
Paired-Associate Learning Task. Again, as above, there did not seem to be a relationship between the diagnosis of Down Syndrome and IQ, either for the overall pool of subjects or for subjects with Down Syndrome who were diagnosed with dementia. Nevertheless, these subjects performed more poorly on this instrument than those without Down Syndrome. Perhaps, the Paired-Associate Learning Task picked up on cognitive changes that are unique in persons with Down Syndrome and dementia and not found in those with dementia without Down Syndrome. Perhaps, too, the subjects with Down syndrome had lower IQs and the IQ accounted for the relationship.

In order to help to distinguish the possible impact of psychopathological symptoms on the rating scales, we included the Reiss Screen for Maladaptive Behavior in our battery of assessments. We found that the Reiss Screen for Maladaptive Behavior Total Score, as well as several of the subscales (aggressive, psychosis, paranoia, depression (physical signs), and avoidant) also discriminated between those with dementia and those without. In general, they did so without a relationship to the gender, age, or to the presence of Down Syndrome. They also did so without a relationship to the IQ of the subject, with the exception of the paranoia subscale, which did evidence a significant relationship to IQ.

Relationships between the various Indices

We conducted several correlation matrices in order to examine the linear relationship between the various indices. In general, for all of the subjects, the subscales
of the DSDS were significantly related to both of the subscales of the DQMRP. This significant relationship suggests congruent validity in assessing dementia for both of these instruments.

Additionally, the subscales of both instruments were generally negatively related to scores on the Shultz Mini-Mental Status Exam and the Paired-Associate Learning Task — subjects who were rated as evidencing more symptoms of dementia scored lower on the performance tasks than those without. These results, along with the paired-samples t-tests, suggest that the Shultz Mini-Mental Exam and Paired-Associate Task may be helpful in detecting cognitive changes in persons with dementia. More studies will need to be conducted using these instruments with the changes suggested above to see if this is indeed the case.

These relationships were less evident when correlations were calculated for two groups of subjects separately — in the case of subjects with dementia, the subscales of the dementia instruments were related to each other, but not to the subscales of the other instrument. In addition, the DQMRP continued to be related to the Shultz Mini-Mental Exam and the Paired-Associate Task, but not the DSDS. The DQMRP subscales were related to subscales of the Reiss Screen for Maladaptive Behavior, but the DSDS subscales were not. These results should be interpreted with some caution as the number of subjects in these comparisons was quite small ($N=19$).
In examining the relationships between the indices for subjects without dementia, we did find that the DSDSEMT subscale was related to the DQMRP Change of Cognitive Subscale and the Reiss Screen for Maladaptive Behavior paranoia subscale, but no other significant relationships were found with the DSDS.

The subscale DQMRP Sum of Cognitive Score showed a relationship with the Shultz Mental Status Exam and several subscales of the Reiss Screen for Maladaptive Behavior, while the DQMRP Sum of Social Score subscale was also related to various subscales of the Reiss Screen for Maladaptive Behavior.

In order to control for the possible overlap of depression and dementia symptoms in our subjects, a partial correlation was calculated with the influence of the two Reiss Screen depression subscales partialed out. Interestingly, many of the linear relationships between the Reiss Screen for Maladaptive Behavior and the two dementia assessments, as well as the two performance tasks, disappeared. However, in general, the other relationships remained significant with the exception of the relationship between the DSDSC and Shultz Mini-Mental Status Exam. As Aman (1991) pointed out, the discrimination function of the separate subscales of the Reiss is in question — therefore, it could be that the discrimination seen in subjects with and without dementia on several of the Reiss Screen’s subscales, as well as the Total Score, could be due to this assessing symptoms of depression and not dementia. This potential overlap of depression and dementia symptoms as assessed by the Reiss Screen has been noted by Burt (1999) who has suggested that this overlap is often seen in persons with mental retardation,
particularly in those with Down Syndrome. This overlap may cause people with mental retardation to be at risk for being misdiagnosed as having dementia, a progressive disease, rather than depression, a treatable psychiatric condition (Burt, 1999). Further, there are not any generally accepted instruments or criteria for diagnosing depression in adults with mental retardation (Burt, 1999). It could be the case that some of our subjects were evidencing depression as well as dementia — perhaps more subjects have depression than those two subjects already diagnosed with depression. This presence of depression in our subjects could have contributed to the relationships found between the Reiss Screen for Maladaptive Behavior and the other indices.

A logistic regression model was used in order to look for a potential battery of tests that successfully discriminate between those with dementia and those without. The results indicated that, in general, the DQMRP Sum of Social Score subscale was the variable that best predicted subjects with dementia and those without. This would support research that has suggested that some of the first symptoms in those with dementia in mental retardation may be more socially oriented rather than changes in memory or cognition as is typical in the normally aging population (Janicki, Heller, Seltzer, & Hogg, 1995; Lai & Williams, 1989). The DSDSC subscale also contributed to the model, but did not reach significance. Hence, its contribution must be interpreted with caution. The other model, which suppressed both of the above variables, indicated that the next two variables that were best at predicting dementia were the DSDSEMT
subscale and the Aggression subscale of the Reiss Screen. Both of these variables reached significance, but only in the absence of the DQMRP Sum of Social Score subscale and the DSDSC subscale.

Conclusion

The purpose of this study was to assess the sensitivity and psychometric characteristics of the Dementia Scale for Down Syndrome and the Dementia Questionnaire for Mentally Retarded Persons in assessing dementia in the population of persons with mental retardation. Overall, this study seems to indicate that both the DSDS and the DQMRP were successful in distinguishing between those subjects with dementia and without. It is difficult to clearly state which instrument was more effective in distinguishing those with dementia from those without. In examining the logistic regression model and the other relationships, however, it appears that the DQMRP was slightly more effective at discriminating between those with dementia and those without than the DSDS.

Perhaps the better discrimination of the DQMRP could be due to the pattern of development of dementia in persons with mental retardation. If indeed persons with mental retardation show more non-cognitive symptoms than cognitive symptoms of dementia, then the DSDS’s reliance on more cognitive items as the first step in diagnosing
dementia in this population may put it at a disadvantage. On the other hand, the use of both cognitive and social items equally to diagnose dementia may offer the DQMRP an advantage.

However, the advantage of the DQMRP must be viewed with caution, particularly given the somewhat restricted range of the IQ scores of the subjects in this study (20 to 71 - 68% of our subjects had an IQ score of 35 or above). The DQMRP was developed following several individuals with mental retardation, but very few were in the low range of IQ. Additionally, there are no scoring criteria available at the time of this study to assess those in the lowest range of IQ using this instrument. If this study had included more individuals in the lower range of IQ (the group for whom the DSDS was developed in the first place [Gedye, 1995]), then perhaps the results would have been more favorable to this tool. In addition, we required only one informant in completing the DSDS, while the manual states that two informants should complete this instruments. More prospective studies using both of these instruments, following individuals longitudinally, may help to clarify this issue of which instrument, if either, is better at detecting dementia in this population.
Summary:

It is clearly important to be able to identify decline in this population, and currently, there is a lack of a “gold standard” to do so (Deb & Braganza, 1999). We hope that this study is a concrete step to helping to advance that “gold standard”.
LIST OF REFERENCES


APPENDIX A
PRELIMINARY FORMS
Script for Obtaining Verbal Consent for Subject's

Who Are Their Own Guardians

Hello, . My name is Jennifer Shultz and I wanted to tell you about some work that I will be doing here in the next few months. I go to school at Ohio State and I am studying Psychology. I am interested in learning more about what happens to people when they get older. To do this, I am asking some people here if I can ask them some questions and give them some tests. I would also like to ask some questions of those people's instructors, and to look at some information in their files from the office. I would like to know if you would like to work with me. You don't have to do this if you don't want to. Also, you can say yes now and then change your mind and say no later - its okay to quit if you want to stop at any time. You can let me know now, but if you want to think about it, you can let me know later. Thank you for letting me talk to you today!
Dear:

My name is Jennifer Shultz and I am a Graduate Student in Psychology at The Ohio State University. My main area of concentration is Mental Retardation/Developmental Disabilities, with an emphasis in aging. I am beginning to work on research for my Dissertation under the supervision of Michael Aman, Ph.D.

I am writing to you to tell you about a study I am doing in hopes of obtaining your permission to allow ____________ to participate in this study. The purpose of the study is to examine the trustworthiness and value of two instruments that screen for loss of learning ability in persons with mental retardation. The subjects will also be assessed with a psychological screening form, a mental status questionnaire, and a memory test. Additionally, subject's medical records and past I.Q. levels will be accessed as part of the study. The study will require 30 to 45 minutes. Anyone participating in the study will be allowed to withdraw from the study any time without penalty. Also, if you give your permission for ____________ to participate in the study, he or she will be able to refuse at any time. All information gathered for the study will remain confidential.
Please indicate on the form beginning on the next page whether or not you give your permission for ______________ to be involved in the study and, if you do, sign the enclosed consent form. If you have any questions, please don't hesitate to contact me at (740) 344-3512. I appreciate your consideration and look forward to hearing from you.

Sincerely,

Jennifer M. Shultz

465 Moull Street

Newark, Ohio 43055

(740) 344-3512
CONSENT FOR PARTICIPATION IN SOCIAL AND BEHAVIORAL RESEARCH

I consent to participating in (or my ward's participation in) research entitled:

Sensitivity and Psychometric Characteristics of Instruments and Tests Designed to Diagnose Dementia in Elderly People with Mental Retardation.

Michael Aman, Ph.D. or his/her authorized representative has

(Principal Investigator)
explained the purpose of the study, the procedures to be followed, and the expected duration of my (my ward's) participation. Possible benefits of the study have been described as have alternative procedures, if such procedures are applicable and available.

I acknowledge that I have had the opportunity to obtain additional information regarding the study and that any questions I have raised have been answered to my full satisfaction. Furthermore, I understand that I am (my ward is) free to withdraw consent at any time and to discontinue participation in the study without prejudice to me (my ward).

Finally, I acknowledge that I have read and fully understand the consent form. I sign it freely and voluntarily. A copy has been given to me.

Date: ______________________ Signed: _______________________

(Principal)

89
Signed: ___________________  Signed: ___________________

(Principal Investigator or (Person authorized to consent
his/her authorized representative) for participant — if required)

Witness: ___________________
APPENDIX B
SHULTZ MINI-MENTAL STATUS EXAM
Shultz Mini-Mental Status Exam

Subject # __________________________ Date: ____________

(EQUIPMENT NEEDED: BOX, SPOON, PENCIL, COMB)
ONE POINT FOR EACH CORRECT ITEM.

PERSONAL KNOWLEDGE
1. What is your name? __________________________
2. What is the name of this place? (Room name or building name correct). __________________________
3. Where do you live? (Name of home or address correct) __________________________

ORIENTATION
4. What is the day today? (Day of week or date correct). __________________________

SIMPLE COMMANDS/LANGUAGE COMPREHENSION
(place box and spoon to the left of the test administrator on the testing table).
5. Point to the ceiling. __________________________
6. Touch your ear. __________________________
7. Touch your knee. __________________________
8. Put the spoon in the box.
   (Use physical assistance as needed - no point if assistance used) __________________________

IMMEDIATE MEMORY
9. Where is the spoon? (Verbal or gestural response correct). __________________________

GENERAL KNOWLEDGE
10. Who is the President of the USA/Prime Minister of Canada? __________________________
11. How many days are there in a week? __________________________
12. (Place both comb and pencil in front of subject). Which one do you use on your hair? (Point or gesture towards comb correct). __________________________
13. How many months are there in a year? 

TWO-STEP COMMANDS (MUST BE IN ORDER)
14. Touch the comb with the pencil.
   (Once finished, remove the comb and pencil) 
15. Touch your ear then your knee. 

DELAYED MEMORY
16. Where is the spoon?
   (Verbal or gestural response correct). 

MOTOR PERFORMANCE
17. (Place the comb in front of subject).
   Show me how to use this comb.
   (Movement towards hair correct.) 
18. (Say to subject “Watch what I do.”
   Demonstrate clapping hands two times,
   then pausing, then clapping once.
   Say to subject “Now you do it just like
   me.”) 

TOTAL POINTS 

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APPENDIX C

DEMOGRAPHIC HEALTH QUESTIONNAIRE
Demographic Health Questionnaire

A: Demographics

1. Subject #: ________________________  
2. Age: _______  
3. Date of Birth: _______________________  
4. Sex: _______  
5. Race/ethnicity: _____________  
6. IQ (At least 5 years old): ________________. How Measured?_.  
   Date of IQ Testing: _______________________  
   Additional Adult IQ Scores: ________________  
7. Diagnosis of Dementia? (Yes or No)______________________  
   Name and Title of Person who made Diagnosis:______________  
8. Residential Placement  
   a) ICF/MR______  
   b) Hospital______  
   c) Group Home______  
   d) Own apartment/home______  
   e) Family's home______  
   f) Other _______  

B: Health Questions:  

1. Please list all current medications:  
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2. Please list any significant health problems in the last year: 

3. Hospitalized in the last year? (Yes or No). 

4. Reason for hospitalization: 

5. Please place a check for any of the following that apply:
   a. Epilepsy
   b. Stroke(s)
   c. Diabetes
   d. Tardive Dyskinesia
   e. Cardiovascular Disease
   f. Family History of Dementia
   g. High Blood Pressure
   h. Emphysema
   i. Bronchitis
APPENDIX D

PAIRED-ASSOCIATE LEARNING TASK
Paired-Associate Learning Task

Subject # ________    Date:    ________

1. Equipment Needed: 3 Boxes - Red, White, and Blue. Objects: Cup, Pencil, Book, Comb, Whistle, Bar of Soap, Car, Sock, Spoon, Doll, Marker, Toothbrush, Ball, Key, Shoe.

2. Place the boxes in each side of the table with you sitting across from the subject at a square table (red - Assessor's side; white - Assessor's left side of table; blue - Assessor's right side of table). As you introduce each item, lay that item on the table in the center of the boxes in such a way so that the subject can see and reach the item.

3. With the subject watching, place the cup in the red box, saying “This is a cup, it goes in the red box.”

4. Remove the cup from the box, then tell the subject to place the cup in the red box. Use verbal and physical prompts as needed. When the subject can place the cup in the correct box without physical prompts, say “Remember which box this goes in”. Then continue to the next object.

5. Repeat #3 and #4, this time using the pencil and the red box.

6. Continue with the remaining objects and boxes (Pencil, Book, Comb, and Whistle in the Red Box: Bar of Soap, Car, Sock, Spoon, and Doll in the White Box; Marker, Toothbrush, Ball, Key, and Shoe in the Blue Box).

7. Begin the test: Start by placing the cup on the table, ask the subject to place the cup in the box it was in before.

8. Finish test with the other objects.

9. If items were MISSED during Trial #1, take all items out of the boxes and place the items in their correct boxes yourself, beginning by saying to the subject “Remember which boxes these go in.” If no items were missed, remove all the items from their boxes and begin Trial #2.

10. If items were MISSED during Trial #2, take all items out of the boxes and place the items in their correct boxes yourself, beginning by saying to the subject “Remember which boxes these go in.” If no items were missed, remove all the items from their boxes and begin Trial #3.
11. Finish the test with Trials #3, #4, and #5 with corrections each time, as above, if necessary.

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2. PENCIL (R) ____________ 10. DOLL (W) _____
3. BOOK (R) ____________ 11. MARKER (B) _____
4. COMB (R) ____________ 12. TOOTHBRUSH (B) _____
5. WHISTLE (R) ____________ 13. BALL (B) _____
6. BAR OF SOAP (W) ________ 14. KEY (B) _____
7. CAR (W) ____________ 15. SHOE (B) _____
8. SOCK (W) ________

TRIAL #5: CHECK IF PLACED IN CORRECT BOX:

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2. PENCIL (R) ____________ 10. DOLL (W) _____
3. BOOK (R) ____________ 11. MARKER (B) _____
4. COMB (R) ____________ 12. TOOTHBRUSH (B) _____
5. WHISTLE (R) ____________ 13. BALL (B) _____
6. BAR OF SOAP (W) ________ 14. KEY (B) _____
7. CAR (W) ____________ 15. SHOE (B) _____
8. SOCK (W) ________

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APPENDIX E

CORRELATIONS BETWEEN MEASURES FOR 35 SUBJECTS
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<td>.34*</td>
<td>.22</td>
<td>.50**</td>
<td>- .21</td>
<td>- .11</td>
<td>.66***</td>
<td>.20</td>
<td>.59***</td>
<td>.37*</td>
<td>.32</td>
<td></td>
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</tr>
<tr>
<td>13. DEPRESSION (P)</td>
<td>.35*</td>
<td>.38*</td>
<td>.49**</td>
<td>.77***</td>
<td>- .26</td>
<td>- .16</td>
<td>.83***</td>
<td>.39*</td>
<td>.69**</td>
<td>.61***</td>
<td>.26</td>
<td>.54**</td>
<td></td>
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<tr>
<td>14. DEPENDENT</td>
<td>.09</td>
<td>.05</td>
<td>.06</td>
<td>.29</td>
<td>.06</td>
<td>.01</td>
<td>.49**</td>
<td>.25</td>
<td>.20</td>
<td>.08</td>
<td>.46**</td>
<td>.54**</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>15. AVIODANT</td>
<td>.31</td>
<td>.26</td>
<td>.43*</td>
<td>.64**</td>
<td>- .29</td>
<td>- .10</td>
<td>.79***</td>
<td>.30</td>
<td>.75***</td>
<td>.62***</td>
<td>.22</td>
<td>.58***</td>
<td>81***</td>
<td>.31</td>
</tr>
</tbody>
</table>

* _p < .05** _p < .01*** _p < .001

Pearson correlations between all assessment instruments for subjects with IQ scores (N=17)