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Using the Iowa Screening Battery for Mental Decline as a Predictor of Functional Impairment

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Running Head: IOWA SCREENING AND FUNCTIONAL ABILITY

Using the Iowa Screening Battery for Mental Decline as a Predictor of Functional Impairment

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Abstract

Dementia is said to occur in at least 20% of the population aged 85 and older and is rising to almost epidemic proportions as the average age of the population in the United States continues to increase. Characteristically, dementia is manifested through memory impairment. These memory deficits along with other cognitive deficits render the individual at least somewhat disabled in social and occupational functioning. While there are many neuropsychological batteries which measure cognitive abilities and functional impairment, there has been no thorough consideration of how a cognitive screening battery might predict an individual's functional status. This study examined the Iowa Screening Battery for Mental Decline (ISBMD) and its capabilities to act as a predictor of functional impairment. Functional impairment was measured using the Functional Independence Measure (FIM) in the inpatient sample (n=13). The Activities of Daily Living Scale (ADL) and the Instrumental Activities of Daily Living Scale (IADL) were given in survey form to caregivers of the outpatient sample (n=9) to assess functional level. A significant correlation was found to exist between the composite score of the ISBMD and the total FIM Score (r=.742; p<.01). Preliminary findings suggest that the Iowa Screening Battery for Mental Decline is capable of predicting functional level.

Using the Iowa Screening Battery for Mental Decline as a Predictor of Functional Impairment

Dementia as a diagnosis incorporates many possible etiologies into one category due to the similar manifestations. According to the Diagnostic and Statistical Manual of Mental Disorders (4th ed.; American Psychiatric Association, 1994), dementia in general is characteristically defined by the appearance of cognitive deficits. These cognitive deficits must include memory impairments which can either be the inability to learn new material or the inability to recall previously learned material. In order for one to meet the standards for dementia outlined in the DSM-IV (1994), aphasia, apraxia, agnosia, or a loss of abstract thinking capabilities must accompany memory impairment. These impairments together must be severe enough to cause a disturbance in premorbid (prior to onset of dementia) social or occupational functioning capacities.

Clinical progression of dementia has been staged into three phases (Reisberg, Ferris, DeLeon, & Crook, 1982). The first phase is characterized by "early forgetfulness". This stage is relatively subjective, but can be validated by neuropsychological testing. When the forgetfulness becomes readily apparent upon mere observation, the person has digressed into the "intermediate confusional" phase. The third phase is deemed the "late" dementia phase in which survival becomes impossible without external assistance and support.

The etiology of dementia is widely varied and numerous subcategories are differentiated in the DSM-IV (1994). The most

common type of dementia is that of the Alzheimer's type. Unfortunately, this diagnosis is given only after many other possibilities have been excluded. For instance, the patient must show no evidence of suffering from a central nervous system disorder, a systemic condition, or a substance-induced condition likely to manifest itself with similar deficits. Vascular dementia, also called multi-infarct dementia, is another common form of dementia and is attributed to cerebrovascular disease. Multiple vascular lesions are typically evident on computed tomography (CT) and magnetic resonance imaging (MRI), and the age of onset is typically earlier than that seen in senile dementia of the Alzheimer's type (SDAT).

As the mean age and life expectancy continue to climb, the prevalence of dementia continues to increase (Khachaturian, 1985). The actual reported prevalence varies from one account to another, however, it has been estimated that 2-4% of the population over the age of 65 have SDAT, and the prevalence of dementia in general afflicts 20% or more of those persons over the age of 85 (American Psychiatric Association, 1994). The number of persons in the United States suffering from severe dementia is approximately 1 million while approximately another 3 million suffer mild to moderate dementia symptoms (Reisberg, et al., 1982). These figures highlight the urgent need for the development of preventive and therapeutic measures in the treatment of dementia.

Detection of clinical dementia is crucial for the facilitation of therapeutic interventions. The criteria distinguished by the DSM as

characteristic of dementia have been found to be 95 % reliable in the detection of dementia (Forette, et al., 1989). Many neuropsychological measures have been devised to detect this abnormal decline in elderly persons. Among those commonly used are the Mini-Mental State Examination (MMSE), the Mattis Dementia Rating Scale (mDRS), and the Iowa Screening Battery for Mental Decline (ISBMD). The MMSE is a brief screening examination composed of eleven questions which take only 5-10 minutes administration time (Folstein, Folstein, & McHugh, 1975). This test validly and reliably assesses cognitive aspects of mental functions (Folstein, et al., 1975; Nelson, Fogel, & Faust, 1986). According to Nelson, et al. (1986), five studies of reliability and 11 studies of validity present in the literature have adequately and substantially supported the use of the MMSE. Even though the MMSE is used by numerous doctors in the assessment of their patients, it has proven to not be as telling as some other available screens. The MMSE includes only a very minute portion in which memory is tested. The MMSE does not give insight into the full repertoire of symptoms surrounding a diagnosis of dementia since memory is the primary symptom of dementia. The mDRS assesses attention, initiation, perseveration, conceptualization, and memory in approximately 30-45 minutes (Mattis, 1976). Test-retest reliability has been determined in at least one study, and five studies have validated the use of the mDRS in the detection of cognitive impairment (Nelson, et al., 1986). The ISBMD consists of three parts: Temporal Orientation (TO), Form C of the Benton Visual Retention Test (BVRT), and the Controlled Oral Word

Association (COWA) (Eslinger, Damasio, & Benton, 1984). Temporal Orientation is a brief screen which determines the patient's ability to state the date and time. The BVRT is a memory test based on accuracy in reproduction of designs. The COWA measures word fluency and is actually a subtest of the Multilingual Aphasia Examination (Benton & Hamsher, 1978). The administration time of the ISBMD is approximately 15 minutes. The validity of the ISBMD has been substantiated by many investigators (Eslinger, Damasio, & Benton, 1984; Eslinger, Damasio, Benton, & Van Allen, 1985; Benton, Eslinger, & Damasio, 1981). It is important to note at this point that none of the aforementioned screening batteries are intended to be used as diagnostic tools. Their main purpose is to determine whether there is a need for further testing. They are never sufficient alone and should be used only as part of a complete examination (Nadler, Richardson, & Malloy, 1994; Folstein, et al., 1975; Eslinger, Damasio, & Benton, 1984; Strain, et al., 1988).

One of the most devastating and debilitating aspects of dementia is the eventual need for assistance in all or most activities essential for survival, such as feeding, toileting, and grooming. As has been stated, qualification of some functional impairment is inherent in the diagnosis of dementia (American Psychiatric Association, 1994). The assessment of competency level is a necessary part of all evaluations; in addition, it is necessary to determine the availability of resources in order to ensure that the patient receives proper treatment and to minimize caregiver burden (Lawton & Brody, 1970). The first task

which must be accomplished is the establishment of an operational definition of competency. According to Lawton (1969), competency can be assessed on a number of levels, but it is essentially related to autonomy and the ability to "master" one's environment.

Many assessment measures have been devised with the purpose of determining functional independence. Those which were used as part of the present study include the Functional Independence Measure (FIM), the Activities of Daily Living Scale (ADL), and the Instrumental Activities of Daily Living Scale (IADL). The FIM is a commonly used measure in the inpatient rehabilitation setting to quantitatively assess the level of assistance required of patients to perform 18 fundamental activities such as eating, grooming, bathing, ambulation, etc. ("Procedures," 1990). The ADL Scale is similar in its areas of assessment except that it is much shorter than the FIM, and it is designed to be administered as a survey of the caregiver and/or patient (Haley, Levine, Brown, & Bartolucci, 1987). The IADL Scale assesses higher level self care tasks required for independent living such as the ability to use the telephone, go shopping, prepare foodstuffs, take appropriate medications, and handle finances (Lawton, 1969; Lawton & Brody, 1969). IADLs are assessed in a survey given to the patient and/or caregiver, just as is done with ADLs. Performance on the IADL Scale has been associated with both cognitive functioning and physical aptitude (Barberger-Gateau, Dartigues, & Letenneur, 1993). It has been consistently shown that the manner in which assessment is done plays an important role in the outcome (DeBettignies, Mahurin, & Pirozzolo,

1990). In other words, whether the method used is self report, caregiver report, or a performance test will influence the outcome. According to DeBettignies, et al. (1990), caregiver report was found to be more closely related to the patient's actual performance than was the self report. Even though caregiver account is closer to actual performance, Mangone, et al. (1993) reported that caregivers have a tendency to underestimate the actual abilities of the patient.

Numerous measures are available for both cognitive decline and functional impairment, but it would be beneficial and efficient, saving both time and money, to establish a measure which could adequately and accurately determine both cognitive and functional levels simultaneously or predict with reliability. Fitz and Teri (1994) have found the mDRS to be capable of significantly predicting both ADL and IADL scores in Alzheimer's disease patients. Seidel, Millis, Lichtenberg, and Dijkers (1994) used the mDRS as a predictor of FIM scores, particularly bladder and bowel management, and they found the mDRS to have significant predictive abilities. The time necessary for administration of the mDRS, however, deems this somewhat problematic due to the fact that a shorter cognitive screen and a short functional assessment could be done in the same amount of time. Other studies have been done using the functional level measures as predictors for things such as neurologist ratings of the patient and cognitive function (Pfeffer, Kurosaki, Harrah, Chance, & Filos, 1982); however, the ability of the Iowa Screening Battery for Mental Decline to be used as a predictor of functional impairment has not yet been

assessed. Using the ISBMD in such a manner would be desirable due to its brevity and ease of administration. The present study seeks to determine whether the ISBMD is significantly correlated to the Activities of Daily Living Scale, the Instrumental Activities of Daily Living Scale, and the Functional Independence Measure. The ISBMD is becoming increasingly popular and is being used by a wide variety of clinicians; therefore, having one screen to predict functional impairment while measuring cognitive decline would greatly increase the cost-effectiveness of a visit to the doctor.

Method

Participants

The first group of participants consists of men and women drawn from the outpatient neuropsychological services at Carle Foundation Hospital in Urbana, Illinois (n=9). These nine patients were either brought in by a family member or referred by their general practitioner in order to further explore memory disturbances which each were experiencing. Mean age for this group was 67.6 years (range=61 to 75 years; SD=8.8 years). Four of the participants were male (44.4%).

The second group of participants consisted of 13 rehabilitation inpatients drawn from the Department of Rehabilitation at Carle Foundation Hospital between January, 1995, and April, 1995. The diagnoses of ten of these patients included such things as arthritis, hip fracture and replacements, and a number of other maladies considered to be orthopedic rather than neurological in nature (n=10)(76.9%). The

other three participants in this group had neurological diagnoses, specifically an anoxic incident, traumatic brain injury, and cerebellar bleed (23.1%). Mean age of this group was 65.8 years (range=53 to 92 years; SD=14.8 years). This group consisted of six males (46.2%). Participants were treated in accordance with the "Ethical Principles of Psychologists and Code of Conduct" (American Psychological Association, 1992).

Materials

Neuropsychological measures routinely administered to determine cognitive functioning were used. For the outpatients these included the Mini-Mental State Examination (MMSE), a trailmaking task, the Kaufman Short Form of the Wechsler Adult Intelligence Scale - Revised (WAIS-R), the comprehension subtest of the Wechsler Adult Intelligence Scale-Revised, the North American Adult Reading Test (NAART), and the Iowa Screening Battery for Mental Decline (ISBMD). The inpatients were typically administered only the Iowa Screening Battery for Mental Decline.

Functional impairment was assessed in the outpatients using the Activities of Daily Living Scale (ADL) and the Instrumental Activities of Daily Living Scale (IADL). The ADL and the IADL scales were administered in a survey format to the caregiver. The Functional Independence Measure (FIM) was administered as a performance test to the inpatients.

Procedure

Following referral from the patient's physician, family member, or self, an initial appointment was made to meet with the patient to familiarize him or her with rights of receiving neuropsychological services through Carle Foundation Hospital and to inform the patient of what he or she could expect in the testing session. Each patient was made aware of the fact that they have the option to withdraw from treatment at any time, for any reason. Consent was then formally obtained, and each consenting participant then underwent a full neuropsychological evaluation incorporating the aforementioned measures of cognitive decline. Each test was administered according to standard procedures as is depicted in their respective manuals, and all testing was overseen by a board certified clinical neuropsychologist. The caregiver of each outpatient participant was asked to complete the ADL Scale and the IADL Scale to assess functional level (see Appendix A).

The inpatients were approached bedside and given information on neuropsychological services. A release form was signed at the time of admission. Each patient was administered the Iowa Screening Battery for Mental Decline. Functional levels were assessed on two occasions by physical and occupational therapists blind to the study's hypotheses and goals. The first evaluation occurred within one week of the patient's arrival on the unit, and the second evaluation was done at the time of discharge. The Functional Independence Measure ratings are a standard set of clinical data collected for each patient in the Department of Rehabilitation; therefore, the therapists are trained to

use the FIM as part of their orientation. The participants were scored based on the necessary level of assistance required to accomplish each of 18 tasks (see Appendix B).

Using the ISBMD as the independent variable in this study necessitates herein the inclusion of the standard directions and administration procedures as is outlined in the ISBMD Manual (Eslinger, Damasio, & Benton, 1984) (for further elaboration, see Appendix C). The first part of the ISBMD, the Temporal Orientation Test (TO), asks the patient to recite the year, month, day, date, and time of day as accurately as possible, with prompts to make an educated guess when necessary. The Benton Visual Retention Test (BVRT) requires the patient to reproduce each of 10 geometric designs after seeing each stimulus for a 10 second time period. The third test, the Controlled Oral Word Association, assesses word fluency by asking the participant to recite as many words as he or she can think of in a one minute time period. This is done using three different letters.

Scoring

Iowa Screening Battery for Mental Decline. Each section was scored according to standard instructions within the ISBMD Manual (Eslinger, Damasio, & Benton, 1984)(see Appendix C). The scoring sheets for the subtests are included in Appendix D. The score for the Benton Visual Retention Test and the Controlled Oral Word Association, following corrections for gender and education level, are combined in a linear discriminant function from which a composite value is calculated. If the patient receives a composite score greater

than =1.52, s/he is considered to be highly probable normal. A score between 0 and +1.52 places the patient in the questionable performance category, and below 0 is considered highly probable dementia.

The BVRT is given a score of either 0 or 1 for each design based on whether the design was replicated correctly. Errors found in the replications of designs in the BVRT are categorized as omissions, additions, distortions, perseverations, rotations, misplacements, and size errors purely as informative data. Description of each type of error can be found in Appendix E. The categorization of errors does not influence the patients' scores and the gathering of these data were for purely informative purposes and for further statistical analyses.

Functional Independence Measure. Each task was assessed by the inpatients' physical and occupational therapists on a scale of 1-7, with 7 representing total independence. The total score was then calculated. Subscores were also calculated for tasks A-M and tasks N-R (see Appendix B).

Activities of Daily Living. The responses given on the survey were scored as either zero or one within each category, a score of one representing full independence (see Appendix A). A total score was then calculated, with a maximum score being equal to six.

Instrumental Activities of Daily Living. This survey was scored identical to the ADL Scale, with the exception that the maximum total score possible was eight (see Appendix A).

Results

In the overall sample, 40.9% (n=9) of the participants obtained an Iowa Screening Battery for Mental Decline composite score placing them in the highly probable dementia category (score < 0), 22.7% (n=5) obtained a score in the questionable performance category (score between 0 and +1.52), and 36.3% (n=8) scored in the highly probable normal category (score > +1.52). Separated by group, the outpatients consisted of 44.4% persons scoring in the highly probable dementia range (n=4), 11.1% in the questionable performance range (n=1), and 44.4% in the highly probable normal range (n=4); the inpatients contained 38.5% highly probable dementia participants (n=5), 30.8% questionable performance (n=4), and 30.8% highly probable normal participants (n=4). Statistical analyses revealed that the ISBMD composite was not significantly correlated to the age of the patients (see Figure1).

The statistical analyses performed on data obtained for the outpatient group revealed no significant correlations between the ISBMD composite score and ADL score, nor were any significant correlations found between the ISBMD composite score and IADL score (see Table 1). When the ISBMD composite score was separated into the BVRT score and the adjusted COWA score, neither component was significantly correlated with the ADL or IADL scores. No further analyses were done using this group.

The data collected from the inpatient participants revealed many significant correlational relationships. When a Pearson product-moment correlation was done, it was determined that the ISBMD

composite score was significantly correlated with the total FIM scores at initial evaluation (r=.742; p<.01) (see Figure 2), and both sections of the FIM scores, tasks A-M (r=.584; p<.05) (see Figure 3) and tasks N-R (r=.635; p<.05) (see Figure 4) (see Table 2). Using Spearman rank order correlations, ISBMD composite score was highly correlated to eating (rho=.689; p<.01), problem solving (rho=.614; p<.05), and memory (rho=.608; p<.05), all of which were measured by the FIM at initial evaluation (see Table 3).

When the ISBMD components, the BVRT and COWA scores, were subjected to a Pearson product-moment correlation, it was discovered that the BVRT number correct score was significantly correlated to the total FIM score at initial evaluation (r=.709; p<.01) (see Figure 5) and the total FIM score at discharge (r=.614; p<.05), but of particular interest is the finding that the BVRT is related to tasks A-M on the FIM at initial evaluation (r=.647; p<.05) (see Figure 6). The BVRT must be tapping into some sort of abilities necessary for the performance of daily tasks. The BVRT requires some sort of sequential planning and execution which is also necessary to complete tasks such as eating, grooming, and dressing. The COWA score, with educational and gender adjustments, was found only to be correlated to tasks N-R on the FIM upon initial evaluation (r=.653; p<.05) and tasks N-R at discharge (r=.595; p<.05) (see Table 2).

When the errors made on the BVRT were categorized (these are not figured into the ISBMD composite score since only the number correct is used) evidence emerges as to which types of errors are more

indicative of functional impairment. The errors were categorized according to scoring techniques outlined in the Benton Visual Retention Test manual (see Appendix E). Pearson product-moment correlations suggest that the omission of figures from the design is significantly correlated to tasks A-M on the initial FIM evaluation (r=-.565; p<.05) and the total FIM score at the time of discharge (r=-.585; p<.05). The total number of errors made on the BVRT was highly significantly correlated to tasks A-M on the FIM evaluation at the time of discharge (r=-.706; p<.01) and the total FIM score at discharge (r=-.611; p<.05).

Discussion

Using the Iowa Screening Battery for Mental Decline as a predictor of functional impairment appears to be possible according to the results of this pilot project. The statistical analyses suggest that the ISBMD composite score, along with the component scores of the Benton Visual Retention Test and the Controlled Oral Word Association, are more sensitive to predicting the functional scores obtained through the use of the Functional Independence Measure rather than the Activities of Daily Living Scale and the Instrumental Activities of Daily Living Scale. This difference in sensitivity may be due to a number of reasons. First and foremost, the outpatients' caregivers rated the perceived functional level and six of the nine participants were rated at optimal functioning levels on both scales, thereby causing a ceiling effect. According to Mangone, et al. (1993) caregivers have a tendency to *underestimate* the patient's functional

level, so we do not feel that the lack of significant results were due to any type of reporter bias. The small sample size and the lack of variance among functional participants may have contributed to these findings as well.

The Functional Independence Measure includes the evaluation of all tasks which are incorporated into the Activities of Daily Living Scale; however, the FIM also includes many areas not included in the ADL. The wider area of tasks assessed, as well as the fact that the FIM is administered as a performance test, make it more accurate in its assessment of actual functional level. The tasks labeled A-M on the FIM scale are those which we had hoped would be strongly correlated to the ISBMD scores and component scores. Tasks A-M, including eating, grooming, bathing, etc., are those tasks which would significantly impact the decision whether or not the Iowa Screening Battery should be implemented as a predictor of functional impairment. Tasks N-R, including communication and social cognition tasks, are important for functioning, although, they represent the same types of areas being measured by the ISBMD itself. In other words, it is obvious that one needs to have an adequate memory capacity to do well on the Benton Visual Retention Test and adequate comprehension and expression skills to achieve well on the Controlled Oral Word Association.

We found it interesting that the most highly correlated task on the entire FIM evaluation was the independence level of eating. This may possibly be due to the fact that eating is an action which is

performed on the self. It has been noted that as the level of mental decline increases there is a greater disturbance in self-awareness and internal awareness (Schacter & Prigatano, 1991). Another influential factor may be that as one becomes increasingly cognitively impaired, there is a greater chance for swallowing disorders.

There are several limitations to this study which must be addressed before the ISBMD can be implemented into the clinical setting as a predictor of functional impairment. The analysis of the data suggests that the ISBMD is able to account for only a limited amount of the variance seen in the FIM scores. For example, only 55% of the total FIM score at the initial evaluation is explainable by the ISBMD composite score.

The main limitation of the present study is the small sample size. Additional studies, incorporating a much larger number of participants, are necessary to determine the true predictive power of the ISBMD composite score and its component subtests.

The sample acquired in the inpatient setting was not controlled as to primary diagnosis. The presence of some participants suffering from orthopedic diagnoses may have weakened the predictive ability of the ISBMD. The FIM scale takes some functional impairments into account in that assessment of locomotion is based on either independent walking, walking with the aid of a walker, or confinement to a wheelchair; therefore, on this measure one is evaluated on his or her level of independence with the form of locomotion he or she is presently using. Other than this task, however,

if a patient is unable to perform a task due to the risk it may cause, the patient is automatically given a score of 1, corresponding to total assistance. Future research may be better designed to focus on specific clinical groups, thereby achieving higher levels of predictive ability of the ISBMD.

Another limitation was the inability to perform reliability checks on the FIM ratings. The occupational and physical therapists are each trained identically, yet no measure was done to assess interrater reliability.

From the present study, it is obvious that there is a definite need for physicians to be aware of the need for cognitive assessment in a rehabilitation population even when the presenting diagnosis is seemingly unrelated to cognitive impairment. The sheer fact that of thirteen participants, five came out as highly probable demented and three others performed in the range of questionable performance, suggests that there is a great need for cognitive testing, particularly in the geriatric population. Those patients who performed poorly on the ISBMD are currently undergoing further analysis to determine the underlying etiologies of their cognitive impairments. A more comprehensive battery of neuropsychological tests is needed to determine the specific impairments in each patient. Again, it is important to note that the Iowa Screening Battery for Mental Decline is strictly for screening purposes, not diagnostic purposes.

The results of this study provide support for using the ISBMD as a predictor of functional impairment pending further research. The

Iowa Screening Battery for Mental Decline provides a brief way of measuring cognitive level, but may also provide information as to the functional level of each patient. Activities of daily living necessary for independence are evaluated in the rehabilitation population on a regular basis, but the cognitive level of the patient may provide some insight as to the possibility for recovery, whether that be a return to full or partial independence.

Ideally, this study will be continued to determine a number of clinically important implications. For instance, it appears as if the Iowa Screening Battery for Mental Decline may be able to predict location of discharge for the inpatient rehabilitation population. This type of information gleaned from the administration of one 15 minute screening battery may be very useful in the therapeutic interventions utilized in the treatment of each patient as well as planning for appropriate care upon discharge.

References

American Psychiatric Association. (1994). Diagnostic and statistical manual of mental disorders (4th ed.). Washington, DC.

American Psychological Association. (1992). Ethical principles of psychologists and code of conduct. American Psychologist, 47, 1597-1611.

Barberger-Gateau, P., Dartigues, J. F., & Letenneur, L. (1993). Four Instrumental Activities of Daily Living Score as a predictor of one-year incident dementia. Aging, 22 (6), 457-463.

Benton, A. L., Eslinger, P. J., & Damasio, A. R. (1981). Normative observations on neuropsychological test performances in old age. Journal of Clinical Neuropsychology, 3 (1), 33-42.

Benton, A.L., & Hamsher, K. Multilingual Aphasia Examination. Iowa City: The University of Iowa Hospitals and Clinics, Department of Neurology, 1978.

DeBettignies, B.H., Mahurin, R.K., & Pirozzolo, F.J. (1990). Insight for impairment in independent living skills in Alzheimer's disease and multi-infarct dementia. Journal of Clinical and Experimental Neuropsychology, 12 (2), 355-363.

Eslinger, P. J., Damasio, A. R., & Benton, A. L. (1984). The Iowa Screening Battery for Mental Decline Manual.

Eslinger, P. J., Damasio, A. R., Benton, A. L., & Van Allen, M. (1985). Neuropsychological detection of abnormal mental decline in older persons. Journal of the American Medical Association, 253 (5), 670-674.

Fitz, A. G., & Teri, L. (1994). Depression, cognition, and functional ability in patients with Alzheimer's disease. Journal of the American Geriatric Society, 42 (2), 186-191.

Folstein, M. F., Folstein, S. E., & McHugh, P. R. (1975). Mini-Mental State: A practical method for grading the cognitive state of patients for the clinician. Journal of Psychiatric Research, 12, 189-198.

Forette, F., Henry, J. F., Orgogozo, J. M., Dartigues, J. F., Pere, J. J., Hugonot, L., Israel, L., Loria, Y., Goulley, F., Lallemand, A., & Boller, F. (1989). Reliability of clinical criteria for the diagnosis of dementia: A longitudinal multicenter study. Archives of Neurology, 46, 646-648.

Haley, W.E., Levine, E.G., Brown, L.S., & Bartolucci, A.A. (1987) . Stress, appraisal, coping, and social support as predictors of adaptational outcome among dementia caregivers. Psychology and Aging, 2 (4), 323-330.

Khachaturian, L.S. (1985). Diagnosis of Alzheimer's disease. Archives of Neurology, 42, 1097-1105.

Lawton, M.P. (1969). Assessing the competence of older people. In D.P. Kent, R. Kastenbaum, & S. Sherwood (Eds.), Research, Planning and Action for the Elderly. New York: Behavioral Publications.

Lawton, M. P., & Brody, E. M. (1970). Assessment of older people: Self-maintaining and Instrumental Activities of Daily Living. 179-186.

Mangone, C. A., Sanguinetti, R. M., Baumann, P. D., Gonzalez, R. C., Pereyra, S., Bozzola, F. G., Gorelick, P. B., & Sica, R. E. (1993).

Influence of feelings of burden on the caregiver's perception of the patient's functional status. Dementia, 4 (5), 287-293.

Mattis, S. (1976). Mental status examination for organic mental syndromes in the elderly patient. In L. Bellak, T.E. Karasu (Eds.), Geriatric Psychiatry. New York: Grune & Stratton.

Nadler, J.D., Richardson, E.D., & Malloy, P.F. (1994). Detection of impairment with the Mini-Mental State Examination. Neuropsychiatry, Neuropsychology, and Behavioral Neurology, 7 (2), 109-113.

Nelson, A., Fogel, B. S., & Faust, D. (1986). Bedside cognitive screening instruments: A critical assessment. The Journal of Nervous and Mental Disease, 174 (2), 73-83.

Pfeffer, R. I., Kurosaki, T. T., Harrah, C. H., Chance, J. M., & Filos, S. (1982). Measurement of functional activities in older adults in the community. Journal of Gerontology, 37 (3), 323-329.

Procedures for scoring the Functional Independence Measure (FIM). Guide to the Uniform Data Set. (1990). Research Foundation, State University of New York.

Reisberg, B., Ferris, S. H., De Leon, M. J., & Crook, T. (1982). The Global Deterioration Scale for assessment of primary degenerative dementia. American Journal of Psychiatry, 139 (9), 1136-1139.

Schacter, D. & Prigatano. (1991). Forms of awareness. In D. Schacter & Prigatano (Eds.), Awareness of deficits after brain injury: Clinical and theoretical issues. Oxford University Press.

Seidel, G. K., Millis, S. R., Lichtenberg, P. A., & Dijkers, M. (1994). Predicting bowel and bladder continence from cognitive status in geriatric rehabilitation patients. Archives of Physical Medicine Rehabilitation, 75, 590-593.

Strain, J. J., Fulop, G., Lebovits, A., Ginsberg, B., Robinson, M., Stern, A., Charap, P., & Gany, F. (1988). Screening devices for diminished cognitive capacity. General Hospital Psychiatry, 10, 16-23.

Appendix A

The following is the Activities of Daily Living Scale taken from Lawton and Brody (1969).

	Score
A. Toilet	
1. Cares for self at toilet completely, no incontinence.	1
2. Needs to be reminded, or needs help in cleaning self, or has rare (weekly at most) accidents.	0
3. Soiling or wetting while asleep more than once a week.	0
4. Soiling or wetting while awake more than once a week.	0
5. No control of bowels or bladder.	0
B. Feeding	
1. Eats without assistance.	1
2. Eats with minor assistance at meal times and/or with special preparation of food, or help in cleaning up after meals.	0
3. Feeds self with moderate assistance and is untidy.	0
4. Requires extensive assistance for all meals.	0
5. Does not feed self at all and resists efforts of others to feed him.	0

C. Dressing

1. Dresses, undresses, and selects clothes from own wardrobe.	1
2. Dresses and undresses self, with minor assistance.	0
3. Needs moderate assistance in dressing or selection of clothes.	0
4. Needs major assistance in dressing, but cooperates with efforts of others to help.	0
5. Completely unable to dress self and resists efforts of others to help.	0

D. Grooming (neatness, hair, nails, hands, face, clothing)

1. Always neatly dressed, well-groomed, without assistance.	1
2. Grooms self adequately with occasional minor assistance, e.g. shaving.	0
3. Needs moderate and regular assistance or supervision in grooming.	0
4. Needs total grooming care, but can remain well-groomed after help from others.	0
5. Actively negates all efforts of others to maintain grooming.	0

E. Physical ambulation

1. Goes about grounds or city. 1

2. Ambulates within residence or about one block distant. 0

3. Ambulates with assistance of another person, railing, cane, walker, or wheel chair. 0

4. Sits unsupported in chair or wheelchair, but cannot propel self without help. 0

5. Bedridden more than half the time. 0

F. Bathing

1. Bathes self (tub, shower, sponge bath) without help. 1

2. Bathes self with help in getting in and out of tub. 0

3. Washes face and hands only, but cannot bathe rest of body. 0

4. Does not wash self but is cooperative with those who bathe him. 0

5. Does not try to wash self and resists efforts to keep him clean. 0

The following is the Instrumental Activities of Daily Living Scale from Lawton and Brody (1969).

	Score
A. Ability to use telephone	
1. Operates telephone on own initiative-looks up and dials numbers, etc.	1
2. Dials a few well-known numbers.	1
3. Answers telephone but does not dial.	1
4. Does not use telephone at all.	0
B. Shopping	
1. Takes care of all shopping needs independently.	1
2. Shops independently for small purchases.	0
3. Needs to be accompanied on any shopping trip.	0
4. Completely unable to shop.	0
C. Food preparation	
1. Plans, prepares and serves adequate meals independently.	1
2. Prepares adequate meals if supplied with the ingredients.	0
3. Heats and serves prepared meals, or prepares meals but does not maintain adequate diet.	0
4. Needs to have meals prepared and served.	0

D. Housekeeping

1. Maintains house alone or with occasional assistance (e.g., "heavy work-domestic help").	1
2. Performs light daily tasks such as dishwashing, bedmaking.	1
3. Performs light daily tasks but cannot maintain acceptable level of cleanliness.	1
4. Needs help with all home maintenance tasks.	1
5. Does not participate in any housekeeping tasks.	0

E. Laundry

1. Does personal laundry completely.	1
2. Launders small items - rinses socks, stockings, etc.	1
3. All laundry must be done by others.	0

F. Mode of transportation

1. Travels independently on public transportation or drives own car.	1
2. Arranges own travel via taxi, but does not otherwise use public transportation.	1
3. Travels on public transportation when assisted or accompanied by another.	1
4. Travel limited to taxi or automobile with assistance of another.	0
5. Does not travel at all.	0

G. Responsibility for own medications

1. Is responsible for taking medication in correct dosages at correct time. 1

2. Takes responsibility if medication is prepared in advance in separate dosages. 0

3. Is not capable of dispensing own medication. 0

H. Ability to handle finances

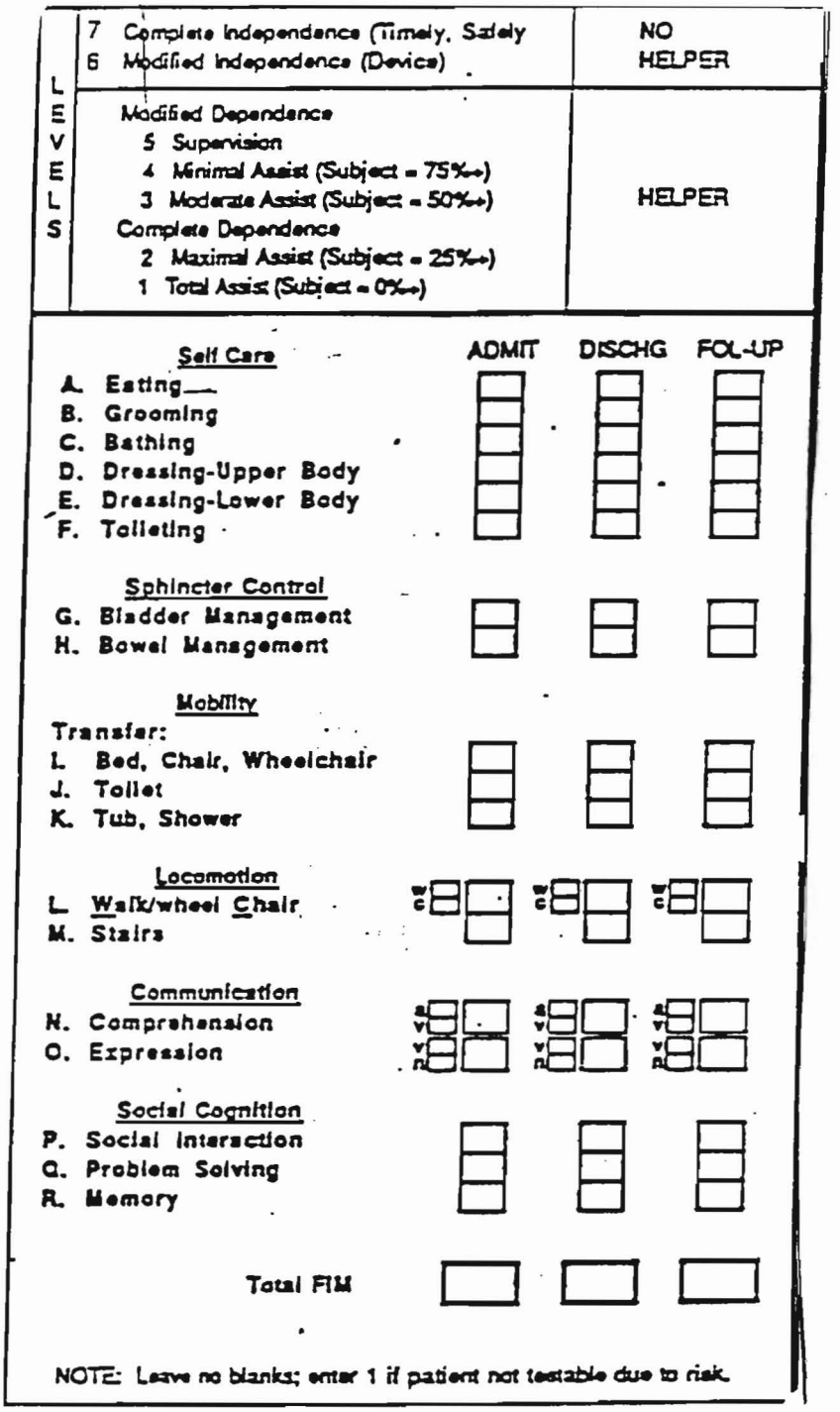
1. Manages financial matters independently (budgets, writes checks, pays rent, bills, goes to bank), collects and keeps track of income. 1

2. Manages day-to-day purchases, but needs help with banking, major purchases, etc. 1

3. Incapable of handling money. 0

Appendix B

The following represents the Functional Independence Measure tasks and the independence level needed for each rating (Procedures, 1990).



Appendix C

The following represents an excerpt of the standardized administration of the Iowa Screening Battery for Mental Decline as it appears in the manual (Eslinger, Damasio, & Benton, 1984).

Test 1. Temporal Orientation. This test asks a series of questions regarding the month, day of month, year, day of week, and time of day. The record form contains exact scoring procedures, which have been well standardized. If the patient spontaneously corrects himself or herself, score as correct. If there is any doubt that the patient is displaying true temporal disorientation as opposed to, say, momentary inattention (e.g., patient says March 5 rather than March 15), repeat questioning a few minutes later and score as normal if patient is correct.

Performance on this test by normal subjects is quite accurate (94-97% scoring 0, -1, or -2). A very high percentage of normal older subjects were also found to perform accurately on this test (96% scoring 0, -1, -2).

CLASSIFICATION: Scores of 0, -1, and -2 are considered within the normal range. Scores exceeding this range (-3 or worse) are considered abnormal and leads a subject to be classified as abnormal on the screening test, regardless of any other scores.

Test 2. Visual Retention. This test requires the subject to reproduce a series of 10 geometric designs from memory. The ISBMD uses the format of Administration A, which calls for exposing each design for ten seconds, followed by the immediate reproduction of the design

from memory. Each reproduction is scored in all-or-none fashion as correct (a correct reproduction equals score of 1) or incorrect (score=0). Unless all aspects of a design are correctly reproduced, the response is considered incorrect. For instance, errors of omission, size, placement, shape, internal detail or angulation lead to a score of zero. The ISBMD uses only the Number Correct score (maximum=10), although analysis of number and type of errors may be informative. If unfamiliar with the scoring principles, the examiner should consult the manual of Benton. The Number Correct score of this test is inserted into the linear discriminant function on the record form.

Test 3. Controlled Oral Word Association. This subtest of the Multilingual Aphasia Examination requires the subject to orally generate as many words as he or she can which begin with a certain letter of the alphabet. As per the record form, three letters are successively presented, with a response period of one minute each. All responses are recorded. Compute the total number of correct responses, add correction as indicated on the record form, and determine the Final COWA Score. Insert this value in the linear discriminant function on the record form.

Appendix D

Iowa Screening Battery for Mental Decline Record Form (Eslinger, Damasio, & Benton, 1984).

Name_____ Age_____ Sex_____

Date_____

Place of testing_____

Test 1. Temporal Orientation

WHAT IS TODAY'S DATE	Patient Response	Correct Response	Score
Month: -5 for each month (max:-30) Give full credit if within 15 days of correct date.	_____	_____	_____
Day of month: -1 for each day (max:-15).	_____	_____	_____
Year: -10 for each year (max:-60) Give full credit if within 15 days of correct date.	_____	_____	_____
Day of week: -1 for each day (max:-3).	_____	_____	_____
Time of day: -1 for each 30 min. from correct time (max:-5).	_____	_____	_____
		TOTAL ERROR SCORE	_____

Interpretation

0, -1, -2	Normal Range
-3, -3+	Abnormal Range

Test 2. Visual Retention Test

Design	Score (0 or 1)	Errors	Design	Score (0 or 1)	Errors
1	_____	_____	6	_____	_____
2	_____	_____	7	_____	_____
3	_____	_____	8	_____	_____
4	_____	_____	9	_____	_____
5	_____	_____	10	_____	_____

TOTAL NUMBER CORRECT _____

Test 3. Controlled Oral Word Association

C:_____ _____ _____ _____

_____ _____ _____ _____

_____ _____ _____ Sum C _____

F:_____ _____ _____ _____

_____ _____ _____ _____

_____ _____ _____ Sum F_____

L:_____ _____ _____ _____

_____ _____ _____ _____

_____ _____ _____ Sum L_____

Correction

Education Level

	6-8	9-11	12-15	16+
Female	+9	+6	+3	0
Male	+11	+6	+4	0

Cumulative Raw Score _____

Correction _____

Final COWA Score _____

SUMMARY

a) Temporal Orientation Score = _____

b) Discriminant Function Formula:

(VRT Score) + (.0765 * COWA Score) - 5.1572 = Composite Value

If composite value is zero or less, classify as highly probable dementia.

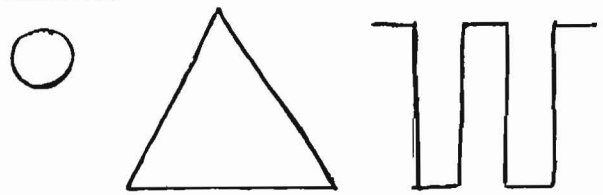
If composite value is between zero and +1.52, classify as questionable performance.

If composite value is +1.52 or greater, classify as highly probable normal.

c) Final Classification _____

Appendix E

An example of a design found within the Benton Visual Retention Test is as follows:



Possible errors on the Benton Visual Retention Test are classified into different categories which are summarized below.

Omissions. These are defined by the absence of either a major figure or peripheral figure.

Additions. These are defined by the addition of a figure which was not present in the original design.

Distortions. These are defined as inaccurate reproductions of either a major figure or a peripheral figure.

Perseverations. These are defined as the inclusion of a substitution or addition of a figure which was seen in the previous design.

Rotations. These are defined by the change in orientation of a major figure or a peripheral figure.

Misplacements. These are defined as a misrepresentation of spatial relation ships between two major figures, peripheral figures, or a combination of the two.

Size Errors. These are distortions in relative sizes of major and peripheral figures.

Table 1

Pearson Product-Moment Correlations Between the ISBMD Subtests and the Functional Surveys

	ISBMD	BVRT	COWA
TOT. ADL	.557	.533	.437
TOT. IADL	.645	.660	.430
	**p<.01	*p<.05	

Table 2

Pearson Product-Moment Correlations Between the ISBMD Subtests and the FIM Scores at Initial Evaluation

	ISBMD	BVRT	COWA
A-M FIM	.584*	.647*	.112
N-R FIM	.635*	.453*	.653*
TOT. FIM	.742**	.709**	.383
	**p<.01	*p<.05	

Table 3

Spearman Rank Correlations Between the ISBMD Composite Score and the Functional Independence Measure Tasks

FIM TASK	ISBMD
Eating	.6894**
Grooming	.5380
Bathing	.3431
Upper Body Dressing	.2573
Lower Body Dressing	.3489
Toileting	.0257
Bladder Management	.3681
Bowel Management	-.0562
Bed, Chair, Wheelchair Transfer	.2380
Toilet Transfer	.3619
Tub, Shower Transfer	.4520
Locomotion	.2267
Stairs	.3145
Comprehension	.5083
Expression	.5458
Problem Solving	.6143*
Memory	.6082*

**p<.01 *p<.05

Figure 1. The Pearson product-moment correlation scatterplot between the Iowa Screening Battery for Mental Decline composite score and age of the inpatients.

Figure 2. The Pearson product-moment correlation scatterplot between the Iowa Screening Battery for Mental Decline composite score and the total Functional Independence Measure score at initial evaluation.

Figure 3. The Pearson product-moment correlation scatterplot between the Iowa Screening Battery for Mental Decline composite score and tasks A-M on the Functional Independence Measure at initial evaluation.

Figure 4. The Pearson product-moment correlation scatterplot between the Iowa Screening Battery for Mental Decline composite score and tasks N-R on the Functional Independence Measure at initial evaluation.

Figure 5. The Pearson product-moment correlation scatterplot between the Benton Visual Retention Test number correct score and the total Functional Independence Measure score at initial evaluation.

Figure 6. The Pearson product-moment correlation scatterplot between the Benton Visual Retention Test number correct score and tasks A-M on the Functional Independence Measure at initial evaluation.

Figure 1

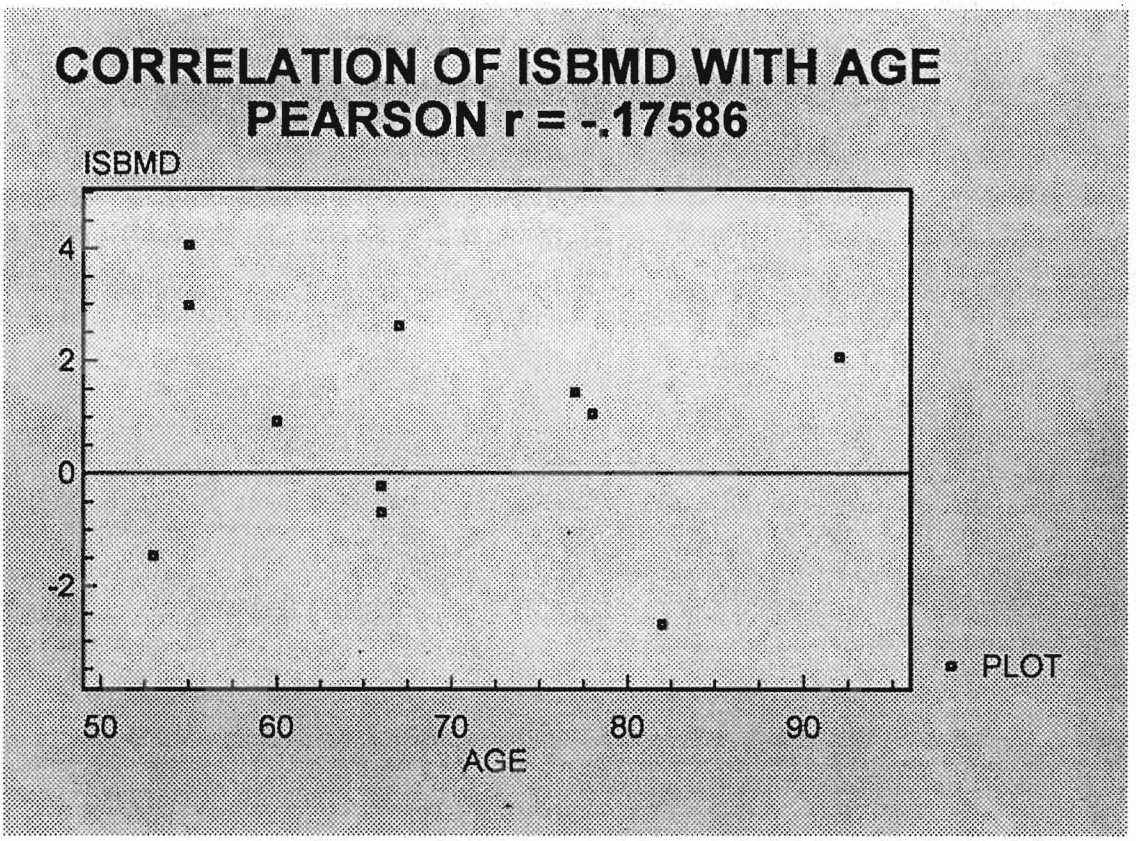

CORRELATION OF ISBMD WITH AGE
PEARSON r = -.17586
ISBMD
4
2
0
-2
50
60
70
80
90
AGE
PLOT

Figure 2

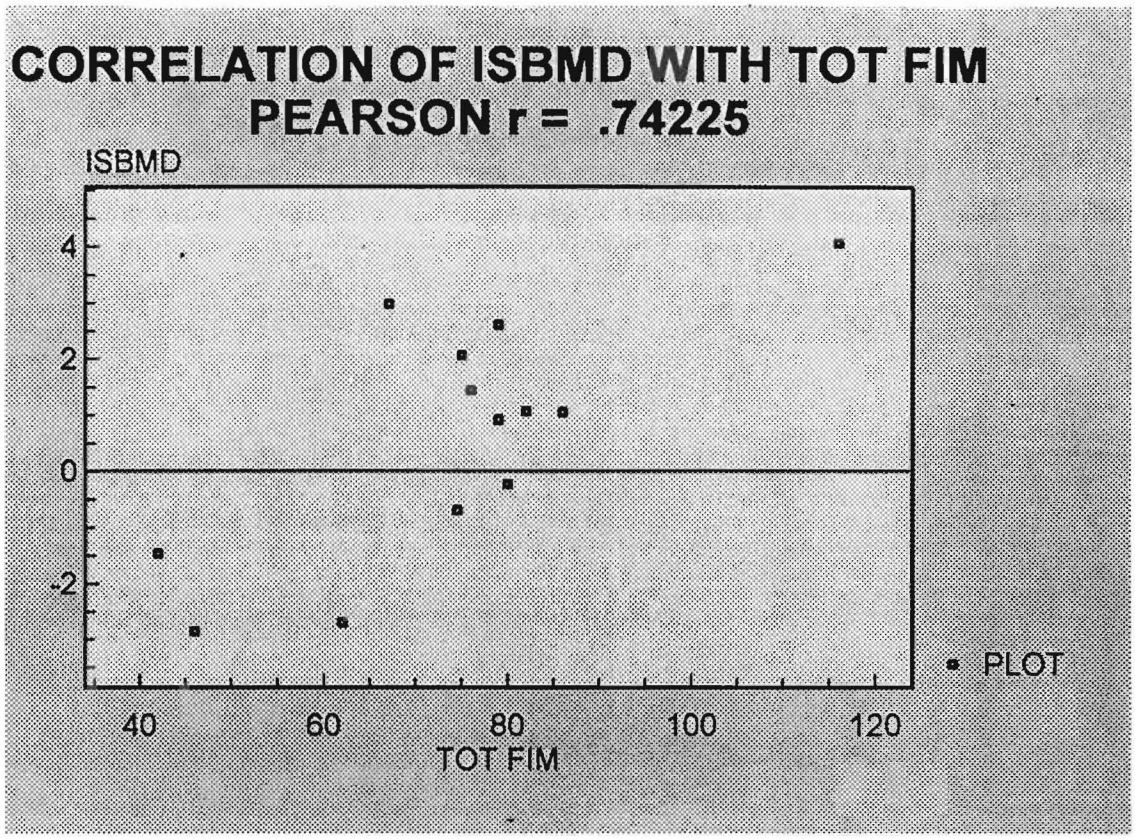

CORRELATION OF ISBMD WITH TOT FIM
PEARSON r = .74225
ISBMD
4
2
0
-2
40
60
80
100
120
TOT FIM
PLOT

Figure 3

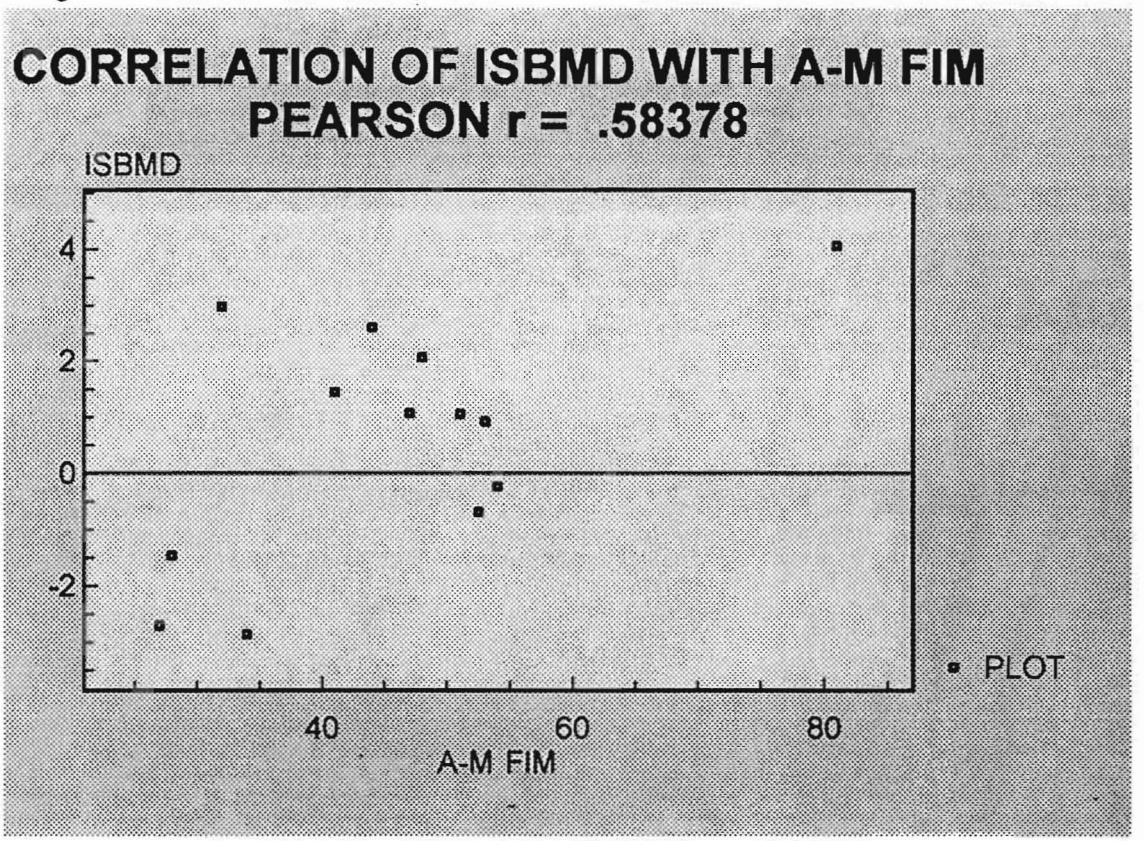

CORRELATION OF ISBMD WITH A-M FIM
PEARSON r = .58378
ISBMD
4
2
0
-2
40
60
80
A-M FIM
PLOT

Figure 4

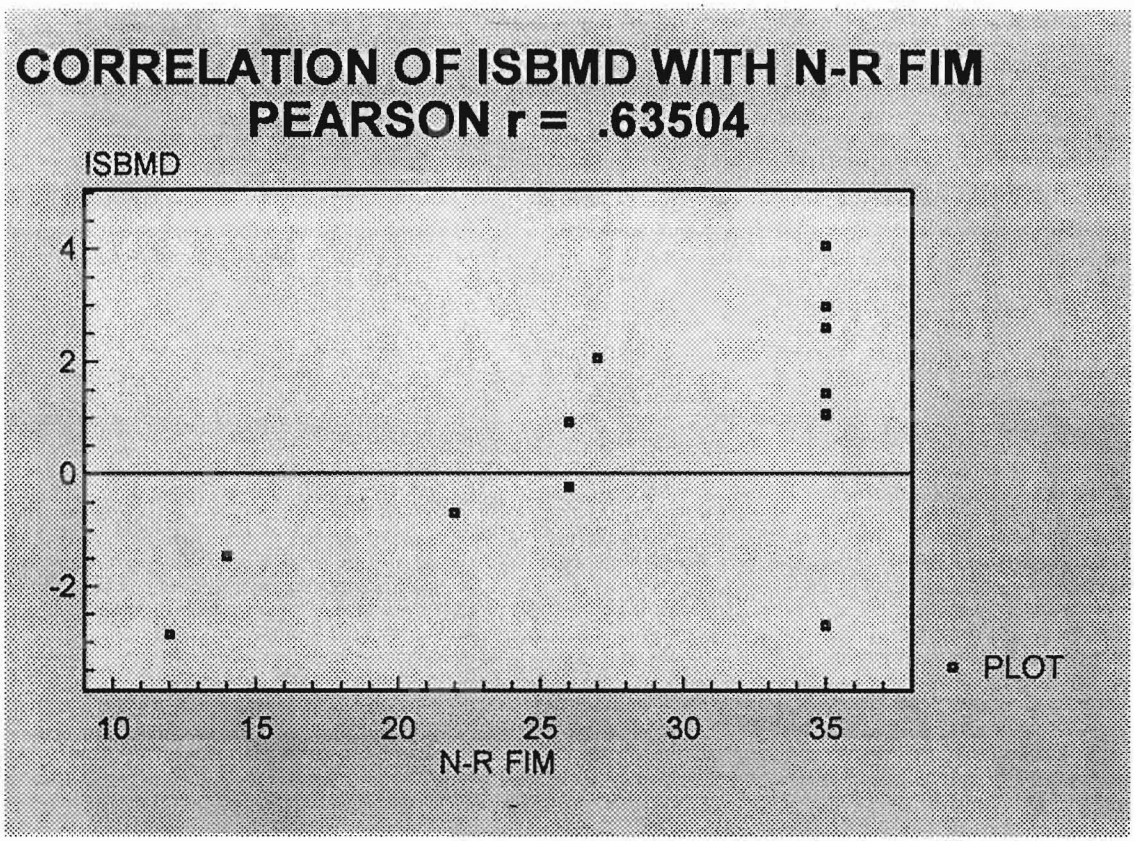

CORRELATION OF ISBMD WITH N-R FIM
PEARSON r = .63504
ISBMD
4
2
0
-2
10
15
20
25
30
35
N-R FIM
PLOT

Figure 5

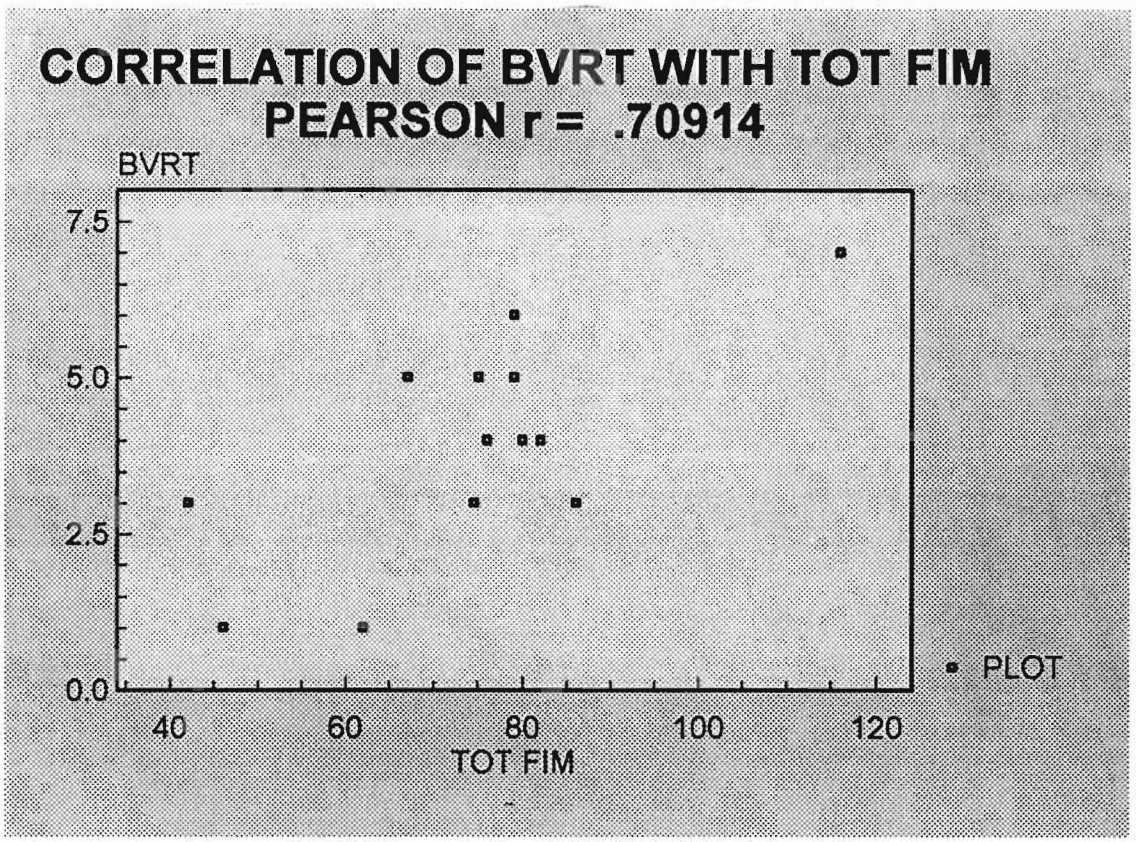
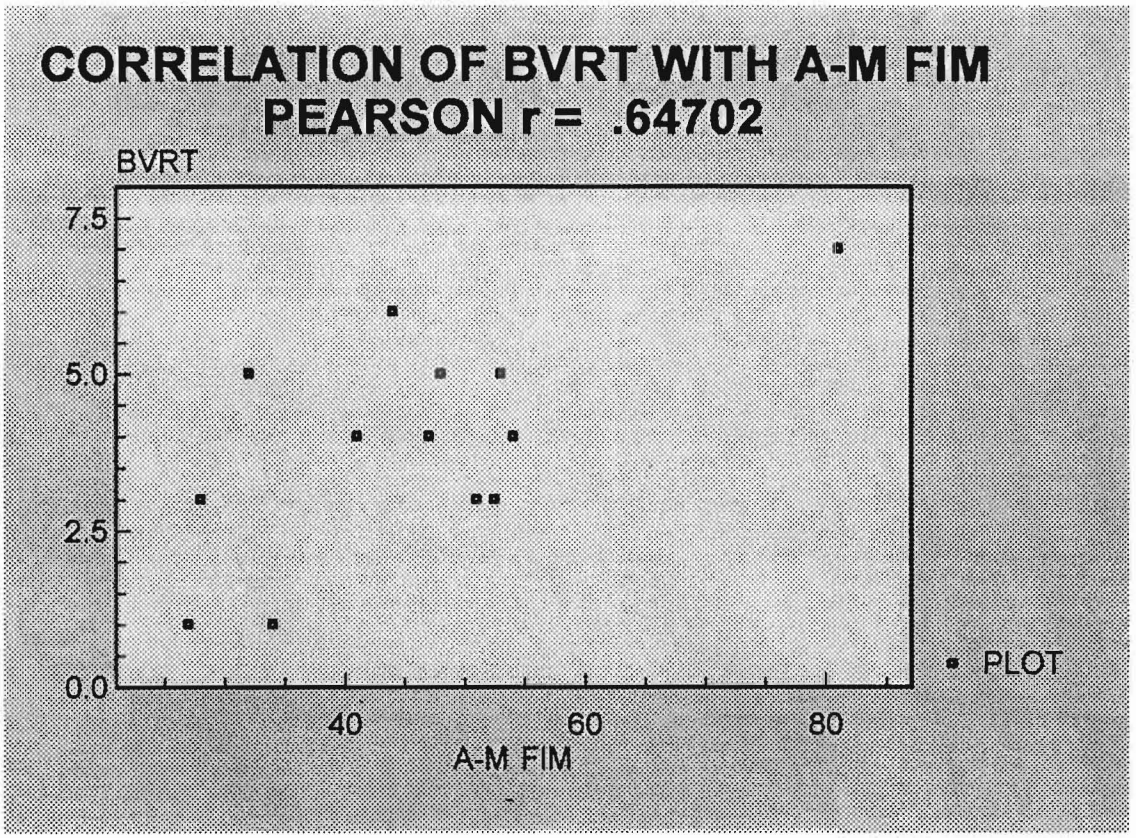

CORRELATION OF BVRT WITH TOT FIM
PEARSON r = .70914
BVRT
7.5
5.0
2.5
0.0
40
60
80
100
120
TOT FIM
PLOT

Figure 6


CORRELATION OF BVRT WITH A-M FIM
PEARSON r = .64702
BVRT
7.5
5.0
2.5
0.0
40
60
80
A-M FIM
PLOT