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The Use Of The Cognitive Status Examination In Detecting Cognitive Impairment In Elderly People

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The Use of the Cognitive Status Examination in

Detecting Cognitive Impairment in Elderly People

by

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Abstract

Dementia is a growing social problem in Australia because as the population ages, the incidence of dementia increases. While the prevalence rates are only about 1% at age 65, they double every five years until by 85 years of age the rate is over 24%. It is expected that by the year 2030, the number of elderly people with dementia will increase by 200%. Dementia is easily recognized in its advanced stages but can be overlooked in the early phase. Family members, care-givers and even the treating medical practitioner may mistakenly attribute the early decline in mental function to the normal aging process. A diagnostic instrument that is easy to administer and score yet is sensitive and specific to the detection of cognitive impairment in the elderly may prove to be of significant benefit to clinicians and assist care-givers and family members in treatment decisions, accommodation requirements and the timely provision of a range of support services.

This study investigates the use of the Cognitive Status Examination (CSE) for detecting brain impairment in elderly people. The Cognitive Status Examination comprises the Cognitive Difficulties Scale and a Letter Symbol Substitution Task. It was developed as a screening instrument to detect Alcohol Related Brain Impairment and has proved to be 80% sensitive and 88% specific in detecting brain impairment in that group.

This study extended those results to males and females aged 65 years and over with early dementia. A sample of 58 community-dwelling, elderly people aged 65 years and above and a clinical sample of 44 in-patients who were diagnosed with early dementia completed the Cognitive Status Examination. An existing groups, quasi-experimental research design was used. The Cognitive Status Examination proved to be marginally useful as a screening instrument for detecting cognitive impairment in elderly people with early stage dementia with a sensitivity of 59% and a specificity of 93% when the original cut-off scores were used. A revised cut-off score, determined by trial and error, was developed. This resulted in a sensitivity of 86.2% and a specificity of 77.3%, but even with such ad hoc adjustments the CSE fell marginally short of the required 80% for both specifications. Use of the CSE may enable clinicians to utilize existing resources more effectively by referring elderly people in need to appropriate medical care, accommodation and community support services, but further research is required to confirm the revised cutting scores for the CSE. Regression analysis showed that a combination of the raw LST score and the BDI score gained over 90% sensitivity and specificity, and such an actuarial approach also shows promise for future development.

DECLARATION

I certify that to the best of my knowledge and belief that this submission

does not:

1. Incorporate without acknowledgement any material previously
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ACKNOWLEDGEMENTS

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CHAPTER ONE

Introduction

1.1   Background Information

With increasing age, many age-related changes to cognitive functioning occur.

The changes to attention, memory and executive function may occur in healthy

adults (Pachana, Marcopulos, & Leatham, 1998). Age-related changes in both

fluid and crystallized intelligence were due in part to declines in attentional

flexibility, concentration and search (Stankov, 1988). Pachana et al. (1998) found

that memory performance declined with age, as did executive functions such as

planning, problem-solving, implementing actions and maintaining emotional self-

control and goal-directed behaviours. The point at which this becomes a disease

process, known as dementia, is often difficult to determine, especially in the

initial stages (Rabbitt, 1993).

Dementia is characterized by "the development of multiple cognitive

deficits manifested by both (1) memory impairment (impaired ability to learn new

information or to recall previously learned information) and (2) one or more of

the following cognitive disturbances: (a) aphasia (language disturbance), (b)

apraxia (impaired ability to carry out motor activities despite intact motor

function), (c) agnosia (failure to recognize or identify objects despite intact

sensory function), (d) disturbance in executive functioning (i.e., planning,

organization, sequencing, abstracting" (American Psychiatric Association, 1994,

p. 155). Additionally, the cognitive deficits each cause significant impairment in

social or occupational functioning and represent a significant decline from a

previous level of functioning" (American Psychiatric Association, 1994, p.155).

In more general terms, dementia is a "progressively deteriorating

condition that has a severe impact on all aspects of the person's life and that of the

carers" (Thom & Blair, 1998, p.61). It represents one of the greatest fears of the

elderly population because of the many negative effects it causes in those that it

affects. For example, as each person is the sum of a lifetime of experiences, the

loss of memory may be regarded as the loss of individuality (Youngjohn &

Crook, 1996). The potential loss of intellectual functions and the capacity to

perform all of the usual activities of daily living are of great concern to the elderly

(Yellowlees, 1997).

Prevalence rates for dementia rise from 1.4% at age 65 to 23.6% at age 85

and above (Henderson & Jorm, 1998). The increase is exponential and doubles

every five years. Due to the progressive aging of Australia's population, the

number of people with dementia is expected to double over the next thirty years.

In 1995, it was estimated that there were approximately 130,000 people with

dementia in Australia. Henderson and Jorm estimated that there will be 260,000

people in Australia with dementia by the year 2030. Sammut & Wall (1999)

estimated that by the year 2011, the number of people with dementia will almost

double from the 1995 figure to 210,000 people.

Cognitive impairment has been described as an invisible disability with

deficits of memory, planning, organization, problem solving, learning, concept

formation, and complex perceptual and motor functioning that may be coupled

with changes in personality and socially inappropriate ways of thinking and

behaving (Glass, 1991). Cognitive impairment is a basic precondition for the

condition known as Acquired Brain Impairment. Acquired Brain Impairment

(ABI) occurs across all age groups, but with different levels of incidence for the

three major types: Traumatic Brain Injury (TBI) is more common in the age group

up to 35 years of age, (approximately 33% of all ABI), Alcohol Related Brain

Impairment (ARBI) is more evident in the 35 to 65 year old group

(approximately 33% of all ABI), while dementia is most common in the post 65

years of age group (about 33% of all ABI) (Da Silva Carduso, 1996).

In Australia, just over half of the people with moderate to severe dementia

live in the community. According to statistics provided by Sammut and Wall

(1999), 51% live in the community, 37% reside in nursing homes, and 9% live in

a hostel or similar facility. Of those people that reside in nursing homes, 60%

have dementia while the percentage of people with dementia in hostels is lower at

30%. Sixty percent of cases of dementia are irreversible, 25% are controllable and

15% are reversible (Hage, 1991). Dementia affects about 20% of people over the

age of 65 years with approximately 5% rated as severely impaired and 15% as moderately impaired. Further to these statistics, it is estimated that 20% of people over the age of 80 years have severe dementia (Parks, Zec, & Wilson, 1993).

Dementia of the Alzheimer's Type (DAT) appears to be the most common form, accounting for 50% of all cases. Vascular Dementia is the second most prevalent cause (10% to 20 %); other causes include drugs and other toxins (1% to 5%), intracranial masses, including tumours (1% to 5%), neurodegenerative disorders including Parkinson's disease, Huntington's disease, Pick's disease and Wilson's disease (1% to 5%), normal pressure hydrocephalus (1%), infections, including AIDS-related (1% to 5%), and nutritional disorder such as Wernicke-Korsakoff Syndrome (2% to 3%) (Kaplan, Sadock, & Grebb, 1994).

In the United States of America, it is estimated that Dementia of the Alzheimer's Type occurs in 45 per cent of patients with dementia and in 5 to 10 percent of the total population over the age of 65 years (Martin, 1998). However, definite confirmation of the diagnosis has only been possible at autopsy as this reveals the characteristic brain damage (Narayan, 1998). The major changes include three different neuro-pathologies. These are the loss of cholinergic neurons that are located in the forebrain, the loss of neurons in the hippocampus and the microscopic plaques and tangles that occur throughout the cortex (Narayan, 1998).

In the early stages, cognitive impairment is often very subtle. Family, friends and even the family doctor may rationalize the person's unusual behaviour (Hage, 1991). Marital problems may result as the partner may consider that the affected spouse is unable to accept family responsibilities, is difficult to communicate with, is unable to follow through with simple requests, appears confused and easily stressed, has trouble with planning and organization, or becomes frustrated and angry (Hage, 1991).

Establishing the evidence of dementia from such symptoms is an important first step if the affected person is to be referred to a suitable medical, psycho-geriatric or community service. The functions that may be seriously affected include abstract thinking; speech production; capacity to read and to write; make judgements; identify familiar objects; and perform voluntary tasks (Digiovanna, 1994).

It is often difficult to differentiate between the mental changes associated with normal aging and the early stages of dementia (Rabbitt, 1993). This is particularly true in the early stages of dementia as the changes to memory and cognitive functioning are very obvious with moderate to severe cases of dementia (Narayan, 1998). In addition, a similar diagnosis may be erroneously given to a person suffering from pseudodementia, or as the condition is sometimes known, dementia syndrome of depression (Gilley, 1993). This is because the two

conditions share the same clinical features, the major difference being that the dementia syndrome of depression is potentially reversible (Gilley, 1993).

Sammut & Wall (1999) stated that although the doctor-patient relationship is the basis of effective information gathering, assessment, diagnosis and management of patients with dementia, the cognitive impairment attributed to dementia might alter the patient's perception of reality and reliability as an informant. Information from the primary care-giver is regarded as an important adjunct for the assessment and treatment of the patient. However, Sammut & Wall (1999) did not offer any comment on patients who live alone and do not have a primary care-giver or on patients who reside in aged-care facilities and may receive assistance from a range of care-givers and still not have an identified primary care-giver.

Although there is value in the use of self-reports in psychological assessment, Jorm (1996) found evidence of reliability but poor validity when self report was used for cognitive assessment. Jorm found that observations by clinical staff of every day behaviours as demonstrated by patients and residents in hospitals and residential aged-care facilities to be useful when assessing cognitive function. For people who resided in the community, informant reports provided very useful information that assisted the clinician with cognitive testing.

Early diagnosis of dementia depends to a large extent on information supplied by informants such as primary caregivers, particularly family members.

In addition to information, a number of instruments have been developed for diagnosing dementia on the basis of informant data. Jorm (1996) reported that informant–based assessment was able to measure a person's ability to perform everyday cognitive tasks. Jorm concluded that "informant-based measures tap a global factor of cognitive impairment, are highly reliable, correlate with cognitive tests and discriminate demented from non-demented subjects"(p.51). This data can complement other cognitive tests and have proven useful in the diagnosis of early dementia. Informants are often family members and are usually primary care-givers and are often the first to obtain evidence of cognitive decline.

In the absence of epidemiological studies, estimates of the percentage of the population who have diagnosed dementia may vary (Jorm, 1996), especially in the early stages. This is partly due to family members accepting the cognitive decline of loved ones as being a normal aspect of the aging process. Often, the early signs of dementia are misdiagnosed by the general practitioner as depression or the side effects of a physical illness or related to the use of some medications (Kane, Ouslander, & Abrass, 1994).

According to the meta-analysis conducted by Henderson & Jorm (1998), the estimated prevalence of dementia in Australia in 1995 in people below the age of 65 years is low, with a rate of approximately 0.7%. This rate rises progressively with age, doubling every five years until the age of 85 years when the prevalence is 23.6%. This equates to approximately 130,000 people. However,

these statistics are expected to change dramatically over the next 40 years as
Australia's population progressively ages. There is a far greater prevalence of
dementia in the 'old old', i.e. those who are 85 years and over and it is this
segment of the aged that is increasing at a faster rate than the total population or
the 'young old', which is the age category of 65 to 74 years (Henderson & Jorm,
1998). The prevalence rate of dementia for age 75 to 79 years is estimated to be
5.6%, rising to 11.1% for age 80 to 84. If the prevalence rate remains unchanged,
then the percentage increase of people with dementia will be 200% by the year
2030.

   One factor that may change the prevalence may be improvements in
techniques to detect dementia (Henderson & Jorm, 1998). If early detection can
be done accurately and at a low cost, then the use of appropriate screening tests
will become widespread. If effective treatments become available, then the early
detection of dementia may also lead to better quality of life for those people with
treatable forms of dementia. Early detection should assist families to cope with
dementia because it provides a reason for the affected person's decline in mental
and social function (Backman & Hill, 1996).

   Selection of the appropriate test to detect early cognitive impairment is a
critical issue. As changes in memory are among the first signs of dementia, many
screening tests of memory processes are based on memory tests. Memory
complaints may predict cognitive decline and dementia. Elderly people may

experience deficits in their memory prior to the detection of impaired cognitive functioning (Geerlings, Jonker, Bouter, Ader, & Schmand, 1999). The information-processing paradigm of memory processes focussed on a sensory information store, primary memory and secondary memory (Larrabee & Crook, 1998). Tests such as digit span have been used to assess primary memory while word lists, paired associate learning or facial memory have been used to assess long term memory. Other mental processes such as attention, perception, speed of memory processing and encoding of information have proven more difficult to assess in clinical as opposed to laboratory settings. Wilson, Bacon, Kaszniak, & Fox (1982) distinguished between semantic and episodic memory. The distinction is that semantic memory is relatively context free whereas episodic memory is dependent on temporal, spatial, and autobiographical contexts.

In the context of the Cognitive Status Examination (CSE), the ability of a subject to generate or define words demonstrates semantic memory while learning the symbols associated with a letter in the Letter Symbol Task demonstrates episodic memory since that task occurs only in the specific context of the assessment. As both episodic and semantic memory are affected by dementia, the CSE should be a useful test in detecting cognitive impairment.

Spreen & Straus (1998) argued that it has become increasingly important that a simply administered, quickly scored and easily interpreted cognitive screening instrument is adopted for use by clinicians in the field of geriatric care.

Such screening instruments share the common problems found in the assessment

of cognitive decline. This topic is reviewed before the discussions of screening

tests.

Chapter Two

Review of the Literature

2.1   Assessment of Cognitive Decline

Measurement of neuropsychological deficits has always presented test

developers with difficulties. According to Lezak (1976), one of the major

problems is that there is great inter-individual variability in the expression of

cognitive dysfunction. Another major difficulty has been to establish precisely the

level of pre-morbid functioning. While the clinician has been able to establish the

current level of functioning by the use of neuropsychological tests, it is important

to know the degree of loss by comparing current performance with pre-morbid

mental performance (Lezak, 1995).

Loberg (1986) reported a pattern of cognitive problems experienced by the

elderly who were diagnosed with dementia, consistent with the diagnostic criteria

for dementia. These problems included difficulties in maintaining a cognitive set,

a lack of persistence, poor visual tracking, impaired motor coordination,

perceptual motor problems, and difficulties in memory, planning and

organization. While neuropsychological test batteries such as the Halstead-Reitan

Battery have well documented success in the diagnosis of acquired brain

impairment (Reitan & Wolfson, 1996), the cost involved in the administration and

scoring limits the extensive use of these tests. Groth-Marnat (1997) recommended the use of a battery for neuropsychological impairment that included tests for visuoconstructive abilities, attention and speed of information processing, memory and learning, verbal functions and academic skills, motor performance, executive functions and emotional status. Groth-Marnat stated that the use of only one screening test is likely to assess only a narrow range of cognitive deficits and result in a high number of false negatives. However, the cost of administering a comprehensive battery might be prohibitive. Groth-Marnat estimated that 8 hours of time would be required for the administration of the recommended comprehensive battery. At a current hourly rate of $155 per hour (Australian Psychological Society, 1999), this would cost at least $1240. This expense may result in under-utilization of comprehensive neuropsychological test batteries despite the higher accuracy of the results over single screening tests.

2.2   Screening Tests

Screening tests need to be sensitive and specific in order to be cost effective. Sensitivity is defined as the percentage of correctly predicted positives while specificity is the percentage of correctly predicted negatives (Hasselblad & Hedges, 1995). According to Berg, Franzen, & Wedding (1994), a good screening test should be quick and easy to administer and score while maximizing the information gathered from the major cognitive functional area such as lateral

dominance, motor functioning, language skills, general information and memory processes.

A selective review of cognitive screening tests was conducted to determine the use of the tests in detecting general cognitive impairment. This review was not complete but it did reveal many shortcomings with a number of these cognitive tests, particularly with the sensitivity and specificity of these instruments. Crowe (1995) stated that there was not a single test in existence that could detect all forms of brain impairment, and that many cognitive screening tests have significant flaws. Chandler & Gerndt (1988) reported that screening instruments that detect cognitive deficit commonly have high false negative and false positive rates, i.e. poor sensitivity and specificity. The false positives were more likely to be found in people with dementia or closed head trauma who were less educated and those inclined to have schizophrenia.

Health professionals from a variety of disciplines need to have access to a screening test that is sensitive and specific to cognitive impairment. While there has been a number of screening tests developed to assess cognitive difficulties of elderly people, many of these instruments have faults (Spreen & Straus, 1998). These faults are illustrated in the case of the detection of dementia. Atkins (1997) reported that clinicians fail to detect an estimated 21% to 72% of patients with dementia. The significance of early symptoms may be underestimated or mistakenly attributed to "normal aging", while some patients may deliberately

minimize their symptoms to avoid the label of Alzheimer's disease. Atkins considered that most screening instruments for detection of dementia had a low predictive value. He provided evidence that the Mini-Mental Status Examination (Folstein, Folstein, & McHugh, 1975) had a positive predictive value of 48% when the prevalence of dementia was 10% (in a population of 75-84 year olds), but this rose to 73% when the prevalence rate was 25% (in a population over the age of 85 years). Screening instruments can be used to filter people for more expensive neuropsychological test batteries (Drachman & Swearer, 1996). That is, if a person tests positive to dementia or is borderline based on the results of a screening test, then the clinician would refer the client for more comprehensive assessments.

Despite its shortfalls, the Mini-Mental State Examination (MMSE) is one of the most widely used cognitive function screening tests. It is easy and quick to administer and was initially reported to be 87% sensitive and 82% specific in detecting dementia and delirium (Folstein et al., 1975). However, the MMSE was later reported to have a false positive rate of up to 39% with people whose education levels were less than year nine (Anthony, Le Resche, Niaz, Van Koff, & Folstein, 1982). The MMSE was found to be insensitive to the early stages of dementia and tends to pick up only people with more severe cognitive impairment. Lezak (1995) regards the test as only able to pick up the more severe forms of cognitive impairment and to have an unacceptably high false negative

rate. From this it was concluded that the MMSE is an imperfect screening

instrument due to poor sensitivity and specificity, particularly when used in the

early stages of dementia or mild cases of cognitive impairment.

Flicker, Ames, Carlin, & Logiudice (1997) investigated the predictive

value of dementia screening instruments in two different clinical settings, patients

referred to a memory clinic (MC) and to an aged-care assessment team (ACAT).

The Abbreviated Mental Test (ABT), the Mini-Mental Status Examination

(MMSE) and the Informant Questionnaire for Cognitive Decline in the Elderly

(IQCODE) were compared. There was a high correlation between the ABT and

MMSE (0.87) in the MC sample and 0.86 in the ACAT sample. There was a

much lower correlation between the MMSE and the IQCODE (-0.65 for the

ACAT sample and -0.56 for the MC sample) while for the AMT and the

IQCODE, the correlation was -0.62 for the ACAT sample and –0.54 for the MC

sample. Flicker et al. reported a sensitivity of 78% and a specificity of 88%, and

found that the positive predictive value of the MMSE varied between 70% for

patients admitted to acute teaching hospitals to 88% for patients referred to

ACATs. However, it was only 45% for the general community. Hence, they

recommended that these screening tests should only be used with a clinical

population and were inappropriate to use with the general elderly community due

to the high number of false positives.

Another screening instrument, the Psychogeriatric Assessment Scales

(Jorm & Mackinnon, 1994), aimed to assess symptoms of stroke, depression and

cognitive impairment. By assessing symptoms of cerebrovascular disease, Jorm &

Mackinnon considered that this would indicate whether cognitive impairment

might be due to Alzheimer's Disease or Vascular Dementia. The profile of the test

placed people on a continuum from zero to 100 for symptoms of stroke,

depression and cognitive impairment. This method was considered superior to

placing people on a dichotomous scale; i.e. people may have some degree of

cognitive impairment, some level of depression and some symptoms of

cerebrovascular disease rather than the presence or absence approach. Jorm &

Mckinnon stated that the advantage of considering disorders such as dementia and

depression on a continuum is that it is likely to reveal similarities between the

conditions. Validity of the PAS was assessed against clinical diagnoses of

dementia and depression using receiver operating characteristic analysis. The

Cognitive Impairment and Cognitive Decline scales were found to perform well

as screening tests for dementia while the Depression scale performed well as a

screening test for depression. Jorm & Mackinnon obtained further evidence of

validity from correlations with other cognitive impairment screening tests. They

reported that the Cognitive Impairment Scale correlated 0.80 with the MMSE and

0.45 with the IQCODE. The Cognitive Decline scale correlated 0.48 with the

MMSE and 0.78 with the IQCODE.

The Symbol Digits Modalities Test (SDMT, Smith, 1982) and the Mini-Mental Status Examination (Folstein, et al., 1975) were compared for their utility in detecting cognitive dysfunction in the elderly by Basso, Roper, Bieliauskas, Hook, Griffen, Herlands, & Daubel (1994). Basso et al. found that the MMSE was a more sensitive screening instrument than the SDMT in this group. The SDMT was less sensitive with increasing age but was more specific. Basso et al. suggested that if the diagnostic goal was to minimize false positives, then the SDMT was the better test. However, they concluded that both the SDMT and the MMSE used young samples when the cut-off criteria for brain impairment was established and both screening tests were reported to have satisfactory diagnostic accuracy in that case. However, with aged people, the suggested cut-off values have been repeatedly shown to be relatively insensitive and inaccurate.

Other cognitive dysfunction tests have been considered deficient because they have failed to (a) distinguish between different types of cognitive deficits and (b) elicit significant performance differences across the stages of diseases such as Dementia of the Alzheimers Type (DAT). To overcome these problems, the scores of the Blessed Information, Orientation, Memory and Concentration Test (Blessed, Tomlinson, & Roth, 1988) were combined with the Mini Mental State Exam (Folstein, et al., 1975). It was found that by combining the two scores, the cognitive test results that were derived assisted care-givers of Alzheimer's patients by allowing improved prediction of the level of care required by

individual patients (Weiler, Chiriboga, & Black, 1994). However, the tests were difficult to score and administer and elderly subjects with Alzheimer's Disease demonstrated a relatively high rate of non-compliance.

The National Adult Reading Test (NART) was developed by Nelson & O'Connell (1978) as an instrument to assess cognitive decline in organic mental disorders. It was considered that it was a particularly useful test for clinicians working with elderly people including those with dementia. The NART is a test of word reading ability and is made up of fifty irregular words with a scoring system that records whether the words are correctly pronounced or not. Scores are then converted to an estimate of intelligence, which is considered a good predictor of performance on a wide range of cognitive functions. Lezak (1995) considered that there was a strong correlation of IQ scores as estimated by the NART and those obtained from the WAIS-R. Although Lezak (1995) considered that the NART was a good predictor of pre-morbid intelligence, problems may arise as the test requires verbal responses. The NART may be inappropriate for people from non-English speaking backgrounds who have some difficulties with the English language as well as people with left hemisphere brain impairment.

In summary, most screening tests for dementia in the elderly appear to lack specificity and report an unacceptable level of false positives (Berg et al., 1994). A large number of false positives reflects low specificity and this suggests

that the test has difficulty in successfully identifying normally functioning aged people.

This emphasizes the specialized nature of geriatric assessment and provides the basis of support for this current project to replicate the results of previous research into the sensitivity and specificity of the Cognitive Status Examination (Crowe, 1995) and to extend the data to include elderly people.

2.3   Detecting Dementia.

Dementia is easily recognizable in the moderate to advanced phases but can be difficult to detect in the early stages. Clinicians fail to detect between 21% and 72% of patients with dementia, especially when the disease is in its early course (Atkins, 1997). As noted above, this may indicate a lack of sensitivity and specificity in any screening tests that are useful for this purpose. Atkins also reported that a significant number of patients are incorrectly diagnosed as having dementia due to the low specificity of the screening instrument.

Sbordone & Long (1996) reported that neurological tests such as EEG, MRI and PET may accurately diagnose the location and extent of brain impairment, but they are unable to provide information about the functional consequences. Neuropsychological tests, although expensive, remain the only assessment that evaluates a person's functional skills, provides a basis for

treatment options, and considers the potential for further rehabilitation and optimal living arrangements.

Not only should neuropsychological tests evaluate a person's current level of function, they should also predict the subject's future behaviour, intellectual capacity and personality changes (Sbordone & Long, 1996). Screening tests, such as the Cognitive Status Examination, do not have this capacity, but the detection of brain impairment is important as cognitive deficits can affect the person's ability to understand and deal successfully with environmental demands. According to Sbordone & Long, the accuracy of the test to predict future behaviour depends on the ecological validity of the test or the extent to which the test measures the behaviour to be predicted. Ecological validity was defined as the "functional and predictive relationship between the patient's behaviour and a set of neurological tests and the patient's behaviour in the real world." (Sbordone, 1996, p.16).

Even though neuropsychological tests may be of great value to the clinician, the costs may be prohibitive to the medical insurers who may choose to fund only medical tests such as the MRI, PET or CAT. Because of the cost factors and the perceived power of the insurance companies, there appears to be an increasing need for valid reliable screening instruments that are sensitive and specific to cognitive impairment as the results may provide sufficient information for a clinician to make an informed decision on further diagnostic test options.

Chapter Three

An Example of a New Cognitive Screening Test

3.1   The Cognitive Status Examination

The Cognitive Status Examination (CSE) was developed by Crowe

(1995), partly in response to the Australian National Policy on Services for People

with Acquired Brain Injury (1994) which stated that "At all stages, it is essential

for people with Acquired Brain Impairment, their families and carers to have

access to appropriate information, guidance and counselling and advocacy

support" p.51. The CSE was primarily developed as a screening tool to detect

alcohol-related brain impairment in problem drinkers. According to Crowe

(1995), there are a number of difficulties in developing an instrument that detects

Acquired Brain Impairment in individuals in the community. This is because: "1)

There are numerous types of brain impairment, all of which have a different

pattern of presentation.

2) No single instrument has so far proven capable of detecting brain injury

with the necessary levels of reliability.

3) The closest approximation to a successful means of determining brain

impairment has been by neuropsychological examination which requires from two

to eight hours of intensive testing." (Crowe, 1995, p.3).

Sbordone (1996) also considered that it was very difficult to construct a neuropsychological test that accurately measured the full complexity of everyday task performance. He provided evidence that there is a significant correlation (0.2 to 0.5) between a person's capacity to complete tasks such as activities of daily living and cognitive performance. However, while direct observation, self-report or even an informant report may be reliable in discriminating dementia from non-dementing patients, a screening instrument that quickly and accurately provides information on cognitive impairment may have advantages.

The Cognitive Status Examination (Crowe, 1995) is a screening instrument comprising a short questionnaire on the subject's medical, psychological and substance use history, the Cognitive Difficulties Scale (CDS) (McNair & Kahn, 1984) and a Letter Symbol Task (LST).

3.2   The Cognitive Difficulties Scale

The Cognitive Difficulties Scale (CDS) was reported to have a test-retest reliability of 0.77, but its validity was not specifically stated other than it had near significant correlations with three cognitive function tests, the Memory Scan (Sternberg, 1975), the Continuous Performance Test (Mirsky & Orren, 1977) and the Digit Symbol Substitution Test (Wechsler, 1981). Derouesne, Dealborto, Boyer, Lubin, Sauron, Piette, Kohler, & Alperovitch (1993) found the CDS to be sensitive and specific for detecting cognitive deficits in elderly people. Derouesne

et al. used the CDS to assess memory complaints in 1648 participants, aged 45 to 75 years who were devoid of severe medical or psychiatric disorder. All participants were recruited when visiting their general practitioner. Derouesne et al. did not include a specific clinical group in their research. They concluded that the CDS is a useful instrument to screen elderly people for age-associated memory impairment. The diversity of items in the CDS could increase its sensitivity to a variety of types of brain impairment.

3.3   The Letter Symbol Task

The Letter Symbol Task (LST) developed by Crowe (1995) is a series of letters from "J" through to "R", each of which is paired with a symbol. It is a timed test of 90 seconds duration. Crowe (1995) stated that "previous work with these types of task indicate that it is very sensitive to dysfunction in any part of the central nervous system, (p.4)." The LST is similar to the Symbol Digit Modalities Test (Smith, 1982), in which numbers are substituted for geometric designs. The Symbol Digit Modalities Test (SDMT) is also a timed test of 90 seconds duration and has proven sensitive (66.7%) and specific (85.2%) to detecting cognitive impairment in a sample of elderly people (Smith, 1973). Whereas the SDMT has well-established normative data, as well as sound evidence of reliability and validity, the LST is less well supported.

Crowe performed a field trial, administering the Cognitive Status Examination to 63 subjects. The results of the tests indicated that the CSE was capable of detecting cognitive impairment in 80% of brain impaired individuals. Although cognitive screening tests are noted for high rates of false positives and low rates of false negatives, this information was not provided by Crowe for the CSE. Crowe's research used only alcohol-related brain impaired subjects. The current project aims to determine whether performance on the CSE is specific to cognitive impairment as it is possible that scores may be affected by different levels of depression, intelligence and age (Derouesne et al., 1993). As there is a lack of normative data for elderly people (over 65 years of age) and a poverty of information on the validity and reliability of the CSE, this project aims to test the sensitivity of the CSE with elderly people with cognitive impairment and to determine its specificity or ability to correctly identify those who are unimpaired.

These factors and others are known to influence cognitive performance on screening tests. The brain's ability to acquire, process, integrate, store and retrieve information declines with age even in the absence of depression or dementia. Degenerative changes to the brain occur in many people over the age of 65 years who appear cognitively intact (Oxman & Emery, 1993). The challenge is to differentiate between normal aging and dementia (Nararyan, 1998). This can be a difficult task as many of the degenerative brain changes are not specific to dementias such as Alzheimers or vascular dementia. Cognitive functions can be

affected by both depression and dementia. To add to the difficulty of a diagnosis of dementia is the condition known as pseudodementia in which cognitive deficits observed in depressive disorders appear to copy dementia (Franzen & Martin, 1996). The biological mechanisms that cause depression, such as neurotransmitter deficits, can also lead to cognitive impairment (Oxman & Emery, 1993). Thus, a depressed person may not perform as well as expected on a cognitive screening test. Similiarly, people with low levels of education do not perform well. Anthony et al. (1982) reported that there was a false-positive rate of 39% on the MMSE with people with fewer than nine years of education. As levels of intelligence affect performance on neuropsychological screening tests, it is considered important to distinguish between age-related changes of intellectual functioning and the changes due to disease processes (Franzen & Martin, 1996).

3.4 Depression

High rates of depression in the elderly may result in impaired performance on cognitive function tests (Spreen & Strauss, 1998). It is estimated that the prevalence of depression in elderly people is between 9% and 23% (Bowler et al., 1994). Dick & Gallagher-Thompson (1996) reported that late-life depression is under-reported and that virtually no screening for depression is completed for elderly people with a serious physical illness. To control for the possibility of depression influencing scores on the Cognitive Status Examination, a screening

test for depression will be administered concurrently with the CSE. Levels of depression will be assessed using the Beck Depression Inventory (BDI). The BDI has excellent psychometric properties including validity, reliability and normative date (Beck & Steer, 1993).

3.5 Intelligence

As levels of intelligence can affect the subject's performance on neurological screening tests (Mitrashima, Boone, & Elia, 1999), an estimate of pre-morbid intelligence will be obtained by using the Vocabulary Sub-test of the Wechsler Adult Intelligence Scale-Revised (WAIS-R, Wechsler, 1981). This sub-test is highly resistant to neurological deficit and psychological disturbance and is regarded as being the best single indicator of general intelligence of the WAIS-R sub-tests (Groth-Marnat, 1997).

3.6 Education

The level of a person's education may impact on their performance on cognitive screening instruments (Lezak, 1995). Low levels of education have been found to be a risk factor in the development of dementia, particularly Alzheimer's disease (Pedersen, Reynolds, & Gatz, 1996). They reported a strong association between poor performance on the MMSE, low levels of education and the prediction of dementia and conversely there was an association between higher education and improved scores on the MMSE. Touchen & Ritchie (1999) reported

that signs of cognitive impairment could be detected two years before formal

clinical diagnosis of Alzheimer's disease (AD) by using a brief cognitive test.

People with low education levels incurred significantly greater cognitive decline

while people with higher education prolonged their level of competence,

particularly on verbal tasks. Similiarly, Stockden, Cohen-Mansfield, & Billig

(1998) reported that all levels of educational experience were predictors of

performance on cognitive assessment instruments and that fewer years of

education was a risk factor for dementia. Reading ability and educational

attainment have been found to be independent predictors of performance on the

MMSE, which in turn predicted the level of cognitive impairment (Albert &

Teresi, 1999). Cognitive performance, as measured by the MMSE, was positively

correlated with the level of education and inversely correlated with age. In the

study by Forette et al., (1998), the incidence of dementia was significantly related

to poor performance on the MMSE. Anthony et al. (1982) stated that performance

on the MMSE may be influenced by the education level and found that a high

false-positive rate of 39% was entirely due to subjects with less than nine years of

education.

In summary, there is ample evidence to support the premise that low levels

of education are associated with poor performance on cognitive screening tests

that may predict the presence of dementia. However, caution may need to be

exercised with the interpretation of performance on the MMSE by people with

less than nine years of education.

Chapter Four

4.1 Research Objectives of the Current Study

Crowe (1995) found that the Cognitive Status Examination (CSE) was a useful screening instrument for detecting cognitive impairment in people with Alcohol Related Brain Impairment. This study extends the use of the CSE to detect cognitive impairment in people over the age of sixty-five years. Another purpose of the study was to determine the sensitivity and specificity of the Cognitive Status Examination in the elderly. In order for the Cognitive Status Examination (CSE) to be deemed a useful screening instrument for detecting cognitive impairment in the elderly, the obtained values of sensitivity and specificity will have to be in excess of 0.80 using the criteria of Crowe (1995). Crowe used the cut-off criterion of a score of 50 or more on the Cognitive Difficulties Scale (CDS) combined with a score of 3 or more on a measure defined as years of Education minus the Letter Symbol Task Standard Score (AdjLST). Using these criteria, he was able to correctly classify people with brain impairment (sensitivity) and those did not have brain impairment (specificity) in 80% of cases of Alcohol Related Brain Impairment. The CSE will be evaluated to determine if a 0.80 sensitivity and a 0.80 specificity can be attained for the discrimination between a clinical (early stage dementia diagnosed) and a non-clinical (no diagnosis of dementia) in people over the age of 65 years.

The CSE is a screening instrument that provides a binary positive or negative prediction of the presence of cognitive impairment. The present study also examined if either of the two components of the CSE, the Cognitive Difficulties Scale (CDS) or the adjusted Education minus Letter Symbol Task Standard Score (AdjLST), were as good or better predictors of cognitive impairment than the overall CSE. If either the CDS or the AdjLST were as good or better predictors of cognitive impairment than the CSE combined score, then the time required for the administration and marking of the test could be reduced substantially by using only the better predictor.

While much of the limited evidence points towards the use of the Cognitive Difficulties Scale and the Letter Symbol Task as effective measures of cognitive impairment, there are still a number of other variables that may assist in the detection of dementia. Multiple regression analysis is used here to assess the relationship between the independent variables of age, education, intelligence and depression and the dependent variable, the presence of dementia. As these variables have a well-established relationship with the presence of dementia, they should form the basis of any level of comparison of prediction of dementia. The CSE may only be of use if the CDS and the LST can perform better than these more established variables. In this case, the raw LST score was used as the predictor, as the adjusted LST contains an adjustment for years of education, a variable that was already used in the prediction equation. It is predicted that the

CDS and the raw LST will provide a better indication of the presence of dementia than age, education level obtained, intelligence (as measured by the vocabulary sub-test of WAIS-R) and depression (as measured by the Beck Depression Inventory).

The three major hypotheses to be tested in this study therefore are that:

- the Cognitive Status Examination can discriminate between a clinically diagnosed group of dementia sufferers from a normal group of people aged 65 years and over with 80% sensitivity and 80% specificity;

- the Cognitive Difficulties Scale and the adjusted Letter Symbol Task scores would not discriminate as well as the total CSE;

- the Cognitive Difficulties Scale and the raw Letter Symbol Task are better predictors of dementia than age, education level, depression, intelligence.

Chapter Five

Method

5.1   Research Design

As the primary aim of the project was to study the use of the Cognitive

Status Examination in detecting cognitive impairment in the elderly, a natural

groups quasi-experimental research design was used. The two existing groups

were a group of 58 elderly people aged 65 years and above, who resided in the

community and a comparison group of 44 in-patients aged 65 years and above,

who were clinically diagnosed with early dementia. The total Cognitive Status

Examination was obtained by combining the score on the Cognitive Difficulties

Scale (CDS) and the score derived from the years of Education minus a standard

score obtained from performance on the Letter Symbol Task (AdjLST), as used

by Crowe (1995). Four variables were included as possible confounding

variables: age; pre-morbid intelligence as measured by the Vocabulary Sub-test of

the WAIS-R, the level of depression as evaluated by the Beck Depression

Inventory and years of education. While the main study focussed on the use of the

Cognitive Status Examination (CSE) as a single instrument, it also examined the

use of the major components, the Education Minus Letter Symbol Task (AdjLST)

and the Cognitive Difficulties Scale (CDS).

5.2   Participants

People diagnosed with early-stage dementia were recruited from Psychogeriatric Services, Alma Street Centre. The Consultant Psychiatrist, Dr S. Chawla, and his clinical staff classified patients as clinical if they met the criteria of dementia as stated in DSM-IV or ICD-10. An additional criterion was that the subjects were considered to be in the early stage of dementia but were able to comprehend the material contained in the CSE.

Over a period of ten months, a total of 44 elderly people with cognitive impairment were recruited. The researcher attended regular meetings, i.e. Ward Rounds, with Dr Chawla and his clinical team to identify suitable participants. The criteria for inclusion were a diagnosis of early stage dementia (as defined by DSM-1V or ICD-10), an age of sixty-five years and over, and stable physical and mental states. All existing and new patients were screened and assessed for their suitability for inclusion in the study. Statistics were not kept for patients who were screened but not included in the study.

Each identified participant was approached, and the purpose of the study, the tasks involved and the time required were carefully explained. The participants were invited to volunteer if they were interested and willing to complete the testing. These people formed the group known as the clinical group. None of the prospective participants who was approached declined to be tested

after the purpose of the testing was carefully explained, although two sought advice from their daughters before agreeing to participate.

The community group comprised 58 participants. The community-dwelling elderly people were recruited through an article in the Fremantle community newspaper (Appendix B). The main criteria were that they had to be sixty five years of age or older and without a prior history of head injury, stroke, epilepsy or other conditions that were likely to affect their performance on a cognitive screening test such as the CSE. All subjects volunteered to participate and all came from the local government municipalities of Fremantle, East Fremantle and Melville. This covered a broad range of socio-economic areas and participants could be considered to be a fairly representative sample of their age group as defined by socio-economic status, level of education and intelligence. The community sample was drawn from the same catchment area as the Psychogeriatric Service, Fremantle Hospital and Health Service. This should have ensured approximately matched samples for the clinical and community participants, at least for the variables of socio-economic circumstances, age, education and intelligence.

A reasonable balance of participants was obtained of people living independently in their own homes (75%) and living independently in aged–care facilities (25%).

A structured interview was administered as part of the CSE. Participants were asked if they had a previous head injury, past or current illness, psychiatric treatment, alcohol problems and use of other drugs. This information was to be used to complement performance on the CSE. As the screening test is capable of detecting cognitive impairment but not the cause, it was considered important to use the information obtained from the structured interview to note possible reasons for a positive score on the CSE.

5.3 Measures

5.3.1 The Cognitive Status Examination

The Cognitive Status Examination (CSE, Crowe, 1995) is a screening test that comprises a short questionnaire to obtain biographical data, the Cognitive Difficulties Scale and a Letter Symbol Task (see Appendix A for CSE). Crowe used two instruments as he believed that the numerous types of brain impairment have different patterns of presentation, and that no single instrument has proven capable of detecting brain impairment with the necessary levels of reliability.

5.3.2 The Cognitive Difficulties Scale

The Cognitive Difficulties Scale (CDS) was originally developed by McNair & Kahn (1984). It was developed as a self-report instrument to measure cognitive difficulties in elderly people who were taking tricyclic anti-depressants. The CDS comprises 39 scale items derived from existing tests such as the Mini Mental State Examination (Folstein, Folstein, & McHugh, 1975), assorted geriatric rating scales, memory tests and the Minnesota Multiphasic Personality Inventory (MMPI). McNair & Kahn claimed a test-retest reliability of 0.77 and this was considered satisfactory. Although McNair & Kahn did not specifically mention validity, they stated that the CDS had small but significant correlations with three cognitive tests: the Memory Scan (Sternberg, 1975), the Continuous Performance Test (Mirsky & Orren, 1977), and the Digit Symbol Substitution

Subtest from the WAIS-R (Wechsler, 1981). The CDS was empirically evaluated

for its efficacy to measure memory complaints by Derousne et al. (1993). In a

study that involved 1648 participants aged from 45 to 75 years, Derousne et al.,

(1993) demonstrated that the CDS was an effective instrument for assessing

cognitive complaints in elderly people. Derousne et al. developed a shorter 26

item scale, and provided psychometric information in support of the modified

CDS.

To make the CDS easier to score, Crowe deleted one more item from the

scale to make it a 25 item test. Derousne et al. (1993) completed factorial analysis

and clearly demonstrated that 26 statements out of the original 37 contributed to

the solution of the six factors which produced the majority of the variance in the

CDS. These factors were attention-concentration, language; praxis; delayed recall;

orientation for persons; temporal orientation and prospective memory The 26-

item score showed the same relationships with other variables as the 37-item

CDS. The shortened version of the CDS was considered easier to administer. One

item was removed by Crowe (1995), to allow the maximum score to be out of

100. It is possible that the psychometric properties may have been compromised

and certainly the normative data of McNair & Kahn (1984) would no longer be

applicable. The participant is asked to respond to the 25 items concerning the

difficulties that were observed in the previous two weeks. A scale of 0 = never to

4 = very often is used. The score is the total number of points scored on the 25 items.

The version of the CDS that was used by Deroeusne et al. (1993) proved useful in detecting cognitive impairment. Crowe (1995) used his own version of the CDS and developed the LST from similar types of tests. The combined scores were used to indicate a high likelihood of cognitive impairment or not. Crowe determined the cut-off of 50 points or above for the CDS and 3 or more on the LST. Crowe used two instruments as he believed that the numerous types of brain impairment have different patterns of presentation, and no single instrument has proven capable of detecting brain impairment with the necessary levels of reliability. Crowe found the CDS and the AdjLST were both responsive to brain impairment. However, Crowe's field study lacked normative data due to the changes that he made to the CDS and the relatively small sample size of 63 participants. In addition, he did not report on the ages of the participants.

5.3.3 The Letter Symbol Task

The Letter Symbol Task (LST) was developed by Crowe (1995) and is a series of letters from 'J' through 'R', each of which is paired with a symbol. The test is thus very similar to the Symbol Digits Modalities Test and Digit Symbol tests and could be considered have comparable psychometric properties. Crowe (1995) claimed that these types of tasks are very sensitive to any cognitive

dysfunction but did not provide any evidence of the psychometric properties of the LST. The score obtained on the LST is the number of correct symbols recorded in a 90 second timed trial. The raw score is converted to a standard score using Crowe's table (Appendix 1). The validity of the LST is unknown but it may be in the same range as similar tests, such as the Symbol Digit Modalities Test, (SDMT, Smith, 1973), the Digit Symbol Sub-test of the WAIS-R (Wechsler, 1981) and the WISC-R (Wechsler, 1974). With the SDMT, numbers are substituted for geometric designs whereas with the LST (Crowe, 1995), symbols are substituted for letters. Smith (1973) provided comprehensive normative data including sound reliability and validity figures. Smith also provided strong evidence that the SDMT was sensitive to brain impairment.

5.3.4 The Cognitive Status Examination

The Cognitive Status Examination (CSE) score is obtained by taking the difference between the number of years of education and the standard score on the Letter Symbol Task (AdjLST) and considering this score in conjunction with the score on the Cognitive Difficulties Scale (CDS). If the difference in the years of education minus the standard score was equal to or greater than three, and the score on the CDS was equal to or greater than 50, then the client's score was regarded as positive (i.e. reflected cognitive impairment). Unless the participant's

score equalled or exceeded the cut-off criteria on both the CDS and the AdjLST, then the CSE classified the participant as negative to cognitive impairment.

The Mini-Mental Status Examination has low predictive value for dementia in samples with differences in culture and levels of education from the original sample (Tombaugh & McIntyre, 1992). Different cut-off points are needed for people with 5 to 8 years of education as compared to those with college education. This provides the rationale for Crowe (1995) to obtain a score using education minus the standard score of performance on the Letter Symbol Task. People with higher education levels would be expected to score higher on the Letter Symbol Task. Those who scored at the same or lower level than the person with fewer years of education could be suspected of having pathology, as performance on the Letter Symbol Task is positively correlated with years of education.

5.3.5 Screening for Depression

According to Olin, Schneider, Eaton, Zamansky, & Pollock (1992), the Beck Depression Inventory (BDI; Beck & Steer, 1993) has been used successfully with dementia sufferers as a screening instrument used for detecting levels of depression. Further research by Laprise & Vezina (1998) supported the use of the BDI with elderly participants. The BDI consists of 21 groups of four statements. After considering each group of statements, the subject circles 0,1,2, or 3 next to the one statement in each group which best describes the way that the participant

has been feeling in the past week. The administration and scoring was in accordance with the BDI Manual (Beck & Steer). Psychometric characteristics, as provided by the BDI Manual, included reliability estimates based on Cronbach's Alpha ranging from 0.79 to 0.90, considered as high internal consistency in both clinical and non-clinical populations. Evidence of content, discriminant, construct, concurrent and factorial validity was provided by Beck & Steer (see Appendix C for BDI).

5.3.6 Assessment of Pre-morbid Intelligence

The Vocabulary sub-test of the WAIS-R (Wechsler, 1981) is both a good predictor of premorbid intelligence and of the Full Scale Intelligence Quotient with correlations of 0.80 and 0.89 respectively (Groth-Marnat, 1991). The Vocabulary sub-test consists of 35 words to which participants provide meanings. The test was administered and scored in accordance with the WAIS-R Manual (Wechsler, 1981). Raw scores were converted to scaled scores for data analysis (see Appendix D for Vocabulary sub-test).

5.3.7 Demographic Information

Demographic information was obtained through the questionnaire on age, education, previous head injury or neuropsychological disorder, psychiatric illness, family history of illness and details of alcohol and substance use.

5.3.8 Procedure

Prior to commencing the testing of subjects, the project was approved by the Ethics Committee of the Edith Cowan School of Psychology and the Human Research Ethics Committee of Fremantle Hospital and Health Service.

The clinical group of elderly subjects with dementia was tested in an assessment room at the Psychogeriatric Ward, Alma Street Centre, Fremantle Hospital and Health Service. The community group of subjects was tested in a quiet room at their own homes or place of residence such as an aged care facility. The study was explained in detail to each participant, carer or spouse in the following order. First, rights and responsibilities of the participant and the researcher were discussed and the opportunity was provided for questions or concerns to be raised. Feedback was sought from subjects to ensure that all questions and concerns had been addressed to the satisfaction of the participant. All prospective participants agreed to proceed with testing after all matters of concern were satisfactorily responded to. A participant information sheet (Appendix D), which gave details of the aims and objectives of the project was provided to each volunteer. A signed informed consent form (Appendix E) was obtained from each participant and this was co-signed by the researcher. Although none of the participants required the consent of a legal guardian, two participants requested that their daughters read the participant information sheet and the informed consent document prior to agreeing to sign the form.

All subjects were administered the Cognitive Difficulties Scale, followed by a standard, short structured interview, the Letter Symbol Task, the Vocabulary Sub-test of the WAIS-R and the Beck Depression Inventory in that order. The average time of testing was about 45 minutes but this varied from 30 to 60 minutes. The only test that required that strict time limits were observed was the Letter Symbol Task with the timed trial component taking exactly 90 seconds.

5.3.9 Administration and Scoring

The CDS was administered first. After reading each statement, the participants were asked to circle a number from 0 to 4 that best represented the difficulties that they observed over the past few weeks. The participants were asked to turn the page and answer a number of questions to provide biographical information concerning medical, family, and alcohol and drug-taking history. The participants were asked to turn the page and complete the LST. The LST is a timed task of 90 seconds duration. Participants were asked to match 9 symbols that are paired from the letter "j" through to the letter "r".

Scoring was completed according to Crowe's (1995) Cognitive Status Manual. All participants were classified as cognitively impaired or not according to Crowe's cut-off scores. That is, if the subject scored 3 or more on the difference between years of education and the standard score on the LST and scored 50 or more on the CDS, then the participant was regarded as impaired.

The Vocabulary sub-test was administered verbally in accordance with the WAIS-R Manual (Wechsler, 1981). As part of the standard administration, responses were recorded verbatim by the tester and scored as directed by the instructions in the WAIS-R Manual. Finally, the Beck Depression Inventory was administered in accordance with the BDI Manual (Beck & Steer, 1993).

Chapter Six

Results

6.1   Data Analysis

Pearson correlations were obtained between the variables of age, education and intelligence and performance on the CDS and the LST. Sensitivity and specificity were calculated from the fourfold table of diagnostic group and cognitive impairment as determined by the CSE. Logistic regression was used to predict group membership from scores on the independent variables, the CDS and the LST, following the predictions from the confounding variables of scores on the BDI, Vocabulary Sub-Test, age and years of education.

6.2   Data Screening

Prior to analysis, all variables across the 108 cases were screened for accuracy of data entry, missing values and assumptions of multi-variate analysis. In testing the assumptions of normality which underlie the use of multiple regression four cases were identified as outlier values. Although deletion of these cases to minimize their influence was considered, a decision was made to include these participants by correcting the outliers to the next most extreme value. These were changed to allow the data to be used. Two had extremely low scores of 1 on the Vocabulary Sub-test and these were changed to 6 and included. There was one

case of missing data, a score for performance on the Vocabulary Sub-test, the

mean value of 10 was given and the case retained.

Six participants from the community group who stated that they had a

previous head injury or a stroke were not included as it was considered that their

results might be confounded. The remaining cases included 44 participants from

the clinical group and 58 from the community group.

6.3   Preliminary Analysis

The means and standard deviations for age, education level, pre-morbid

intelligence and level of depression, as well as the CSE variables are presented in

Table 1.

Table 1.
The Means and Standard Deviations for Age, Education Level,Vocabulary,
Depression(BDI), Cognitive Difficulties Scale, the Letter Symbol Task, and the
Letter Symbol Task adjusted for education level.

Variable	Community	Clinical	Probability of Difference
Age (years)	74.22 (7.31)	76.4 (7.3)	n.s.
Education (years)	10.74 (1.45)	9.27 (1.19)	0.001
Vocabulary	12.03 (2.58)	8.73 (2.61)	0.001
BDI	6.40 (4.52)	8.68 (6.46)	0.05
CDS	28.45 (14.13)	50.52 (24.38)	0.001
LST	35.26 (9.11)	8.48 (9.08)	0.001
Adj. LST	5.48 (2.01)	8.30(1.64)	0.001

As can be seen from Table 1, the clinical group was less educated, had

lower scores on the Vocabulary sub-scale, were more depressed, scored higher on

the Cognitive Difficulties Scale, had lower scores on the Letter Symbol Task and

higher scores on the adjusted Letter Symbol Task. Many of these differences are

consistent with dementia in the clinical group. There was an insignificant

difference in the ages of the two groups. The large standard deviation of the CDS

of the clinical group probably reflects the sensitivity of this measure to the

variability of cognitive function of this group.

There was a moderate correlation, shown in Table 2, between the Adjusted Letter Symbol Task (AdjLST) and Cognitive Difficulties Scale scores in the combined community and clinical samples of the CSE measures of age and education. Correlations within both the community and the clinical samples alone were less frequently significant (Tables 3 and 4) than in Table 2. This finding is not surprising, as restricted ranges in one or both variables will reduce the correlation (Grimm, 1993). As expected there were correlations between age and all three measures of cognitive ability (CDS, LST, AdjLST), but no significant correlations between depression and any measures of cognitive ability.

Table 2
Correlations between Age, Depression (BDI), Education, Cognitive Difficulties Scale, letter Symbol Task and the Adjusted Letter Symbol Task in both the community and clinical sample (N=102).

	AGE	BDI	ED	CDS	LST
AGE	-				
BDI	0.03	-			
ED	0.09	0.09	-		
CDS	0.21*	0.14	0.33**	-	
LST	0.27**	0.08	0.48***	0.56***	
Adj. LST	0.28**	0.05	0.09	0.38***	0.80***

*p<0.05, **p<0.01, ***p< 0.001

Table 3.

Correlations between Age, Depression (BDI), Education, Cognitive Difficulties Scale, Letter Symbol Task, and the Adjusted letter Symbol Task in the community sample only (N=58).

	AGE	BDI	ED	CDS	LST
Age	-				
BDI	0.03	-			
ED	0.08	0.01	-		
CDS	0.12	0.09	0.09	-	
LST	0.32*	0.12	0.28*	0.56***	-
Adj.LST	0.25**	0.06	0.48***	0.08	0.66***

*p<0.05, **p<0.01, ***p<0.001

Table 4.
Correlations between Age, Depression(BDI), Education, Cognitive Difficulties Scale, Letter Symbol Task and the Adjusted letter Symbol Task in the clinical sample only (N=44).

	AGE	BDI	ED	CDS	LST
AGE	-				
BDI	-0.16	-			
ED	-0.08	0.01	-		
CDS	0.18	0.02	-0.17	-	
LST	-0.18	0.21	0.01	-0.39**	
Adj. LST	0.22	0.21	0.68***	0.17	-0.70***

*p<0.05, **p,0.01, ***p<0.001

Tables 3 and 4 show fewer significant correlations than Table 2, but this is due to the fact that within groups the scores cover a more restricted range. This usually results in smaller correlations contesting with larger values of probability

(Grimm, 1993). One notable issue is the significant correlation in the community

sample between education and letter symbol task (r=0.28, p<0.05), which does

not exist for the clinical group(r=0.01, n.s.). This finding indicates that age is a

determining factor in performance with normal elderly on the Letter Symbol Task

(i.e. as age increases, performance declines), until the onset of dementia when age

is no longer a determining factor in performance on the Letter Symbol Task.

6.4   Efficacy of LST, CDS, and CSE in predicting Dementia

A test is considered to be sensitive in detecting cognitive impairment if a

hit rate of 80% true positives is recorded. The scores of the Cognitive Status

Examination (CSE), and the adjusted Letter Symbol Task (Adj. LST) and the

Cognitive Difficulties Scale (CDS) were examined individually for their ability to

predict dementia. Tables 5,6 and 7 show the rates of correct and incorrect

prediction for both the clinical and community samples, using the Cognitive

Difficulties Scale, the adjusted Letter Symbol Task, and the Cognitive Status

Examination.

Table 5.

Classification figures for predicted dementia in the clinical and community
samples using the Cognitive Status Examination.

Prediction	Clinical (n=44)	Community (n=58)	Total (N=102)
Positive (dementia)	26	4	30
Negative (No dementia)	18	54	72

The results indicated that the CSE reached a sensitivity of 59.1% which

did not meet the criterion of 80% correct positives. The CSE was successful in

meeting the specificity criterion of 80% correct negatives, with 93.1 % of true

negatives detected.

Table 6.
Classsification figures for predicted dementia in the clinical and community
samples using the Adjusted Letter Symbol Task

Prediction	Clinical (n=44)	Community (n=58)	Total (N=102)
Positive (dementia)	44	47	91
Negative (no dementia)	0	11	11

Table 6 indicates that the adjusted Letter Symbol Task scores were 100%

sensitive in predicting the presence of dementia, but were lacking in specificity,

detecting only 19% of true negatives. The Letter symbol Task, adjusted for years

of education, appears to detect dementia in almost everyone tested, limiting its

usefulness in realistically predicting cases of early dementia.

Table 7.
Classification figures for predicted dementia in the clinical and community
samples using the Cognitive Difficulties Scale.

Prediction	Clinical (n=44)	Community (n=58)	Total (N=102)
Positive (dementia)	26	4	30
Negative (no dementia)	18	54	72

The CDS scores alone, as shown in Table 7, are identical to the CSE

scores presented in Table 5. The CDS does not meet the required 80% sensitivity

for true positives, with 59.1% detected, but is specific to cases of dementia with

93.1% of true negatives detected. The Cognitive Difficulties Scale is as good a

predictor of dementia as the full Cognitive Status Examination. Using the adjusted

Letter Symbol Task does not add any predictive ability to the Cognitive Status

Examination, as the adjusted LST tends to predict that almost everyone tested in

the sample had dementia.

6.5   Improving the CSE with altered criterion

The use of Crowe's CSE achieves insufficient specificity in the detection of

dementia. However, it is limited by the use of Crowe's previously set criteria, of

3 or greater in the Adj. LST, and 50 or greater in the CDS. The regression

analysis below (Table 11) indicates that the role of the LST in predicting

dementia is substantial, yet the contribution the Adj. LST alone makes to the CSE,

using Crowe's criteria, is weak. Ad Hoc alterations to the criterion of CDS and

LST leads to improved specificity without serious compromises to the sensitivity.

Table 8 shows that specificity can be improved to 77.3% with a change in the

CDS threshold from 50 or greater to 37 or greater, and a change in the Adj. LST

from 3 or greater to 6 or greater. With these alterations the sensitivity drops from

93.1% to 86.2%, still within accepted criterion for sensitivity.

Table 8.

Classification figures for predicted dementia in the clinical and community
samples using the altered criterion for the Cognitive Status Examination.

Prediction	Clinical (n=44)	Community (n=58)	Total (N=102)
Positive (dementia)	34	8	42
Negative (No dementia)	10	50	60

Unlike the original criteria for the CSE, both the CDS and the Adj. LST

contribute to the determination of the CSE. Previously only the CDS made any

substantive contribution to the CSE, but from Tables 9 and 10 it can be seen that

by using the altered criterion some cases are diagnosed by the Adj. LST and not

by the CDS.

Table 9
Percentage of correct positives(sensitivity) and correct negatives (specificity) for
the clinical and community samples using the Adjusted Letter Symbol Task
(Threshold of 6 or greater)

Prediction	Clinical (n=44)	Community (n=58)	Total (N=102)
Positive (dementia)	43	32	75
Negative (no dementia)	1	26	27

Table 10.
Classification figures for predicted dementia in the clinical and community
samples using the Cognitive Difficulties Scale (Threshold of 37 or greater).

Prediction	Clinical (n=44)	Community (n=58)	Total (N=102)
Positive (dementia)	35	18	53
Negative (no dementia)	9	40	49

While the contribution of the Adj. LST to the sensitivity of the overall test is quite
small, in failing to identify only 1 positive case of dementia its role in specificity
is much more important than the original CSE. The Adj. LST now increases the
specificity from the 69.0% of the CDS alone to the 86.2% of the CSE. Both parts
of the CSE play more active roles in the correct dementia with altered criterion.

6.6 Logistic Regression to Predict Dementia

While the use of the Adjusted LST and CDS create a predictive score
close to the required 80% sensitivity and specificity, the inclusion of other

variables may create a more sophisticated analysis. Using logistic regression analysis, in which multiple regression methods are used to predict a dichotomous variable (Tabachnick & Fiddell, 1989), the range of variables collected can be analysed for their relationship with the incidence of dementia. Logistic Regression exaggerates the variance to maximise the difference in variance between the two possible outcomes to gain greater predictive power. A hierarchical model was adopted, to account for the effect of the variables of age, depression, levels of education and the vocabulary sub-scale of the WAIS-R prior to the analysis of the effect of the LST and CDS in the prediction equation.

Table 11 shows the results of the hierarchical logistic regression. The liklihood ratio statistic, G^2, is distributed as Chi-square, so that the Chi-square tables are used to evaluate significance (Tabachnick & Fiddell, 1989). In the first model of the equation, it can be seen that depression ($p<0.05$), education level ($p<0.05$) and vocabulary score ($p<0.001$) are significant predictors of the clinical diagnosis of dementia, with the overall model being significant ($G^2=49.77$, df=2, $p<0.001$). These variables were able to successfully predict the membership of 78.43 % of subjects into either the clinical or community sample. The inclusion of the LST and the CDS also provided a predictive model ($G^2=69.98$, df=2, $p<0.001$), which was an improvement over age, depression, education level and vocabulary scores ($G^2=20.21$, df=2, $p<0.001$). As can be seen, BDI and LST remain the only significant variables in the equation ($p=0.024$ and $p<0.001$

respectively), while age and vocabulary are only just non-significant (p=0.085 and

p=0.058 respectively). Education level and CDS are not part of the equation.

Table 11.

Logistic Regression of sample membership (dementia diagnosed vs non-diagnosed) from Age, Depression, Education Level, Vocabulary, Letter Symbol Task and Cognitive Difficulties Scale (N=102).

	Variable	B	F	Sig	R
Model 1	Age	.04	1.25	.26	.00
	BDI	.12	4.08	.026	.12
	Ed.	-.52	6.48	.01	-.18
	Vocab	-.43	12.87	.003	-.28
	Constant	5.42	3.46	2.45	
			$G^2=49.77$		
			P<0.001		
Model 2	Age	-.19	2.96	.085	-.10
	BDI	.34	5.06	.024	.18
	Ed	.73	2.07	.150	.03
	Vocab	-.54	3.58	.058	-.13
	CDS	-.01	.05	.815	.00
	LST	-.57	9.35	.002	-.29
	Constant	24.06	4.99	.025	

$$G^2= 69.98$$

$$P<0.001$$

Table 12.

Frequency of observed and logistic regression predicted diagnostic cases of dementia, using age, depression, vocabulary, education level, the LST and CDS as predictors.

	Observed		
Prediction	Clinical (n=44)	Community (n=58)	Total (N= 102)
Positive (dementia)	42	1	43
Negative (no dementia)	2	57	59

It can be seen from Table 12 that the resultant predictive power of the logistic regression equation is very high as would be expected with 42 out of 44 positive cases correctly diagnosed and 57 out of 58 negative cases correctly identified which provides 98.28% sensitivity and 94.45% specificity.

Chapter Seven

Discussion

The three primary hypotheses will be addressed before an examination of the methodological constraints on these findings. Finally, I will discuss the wider implications of these findings to the study of dementia.

7.1   The Cognitive Status Examination

It was predicted that the Cognitive Status Examination would discriminate between a clinically diagnosed group of people with dementia and a normal group of people aged 65 and over with 80% sensitivity and 80% specificity. The results show that the CSE was able to achieve 93.1% specificity, but only 59.1% sensitivity where Crowe's original (1995) cut-off scores were used. While this indicates that the CSE is in some ways a useful instrument for the early detection of dementia, it is complicated by the findings in relation to the Cognitive Difficulties Scale and the Adjusted Letter Symbol Task

By changing the thresholds of the CDS and the Adj. LST used to determine the CSE, the specificity of the test was improved without compromising the sensitivity. The altered cut-off score resulted in a sensitivity of 86.2% and a specificity of 77.3%, very close to the required rates of 80% for both. This resetting of the criterion was conducted on an ad hoc basis, without reference

to further theoretical rationale, and requires further testing before practical use. Although Derouesne et al.,(1993), found that the reduced 26-item version of the CDS was a good tool for assessing cognitive complaints in the elderly, the results of this study were not as supportive when using the original criterion.

7.2   The Cognitive Difficulties Scale and Adjusted Letter Symbol Task.

The prediction was that the CDS and the AdjLST would both be inferior to the CSE. The results found that the AdjLST was 100% sensitive to detecting true positives, but was only 19% correct in detecting true negatives. This is clearly inferior to the CSE, which gained 59.1% and 93.1% for sensitivity and specificity respectively with the original cut-off scores. Almost every case tested by the AdjLST was diagnosed as suffering from dementia, which makes it an extremely unspecific instrument for clinical purposes.

The CDS achieved results identical to the CSE with the original cut-off scores with 59.1% sensitivity and 93.1% specificity. This finding contradicts the hypothesis that the CDS scores would be inferior to the CSE scores as a useful predictor. From this it appears that the CSE provides no extra predictive ability than the CDS, and that the inclusion of the LST adds nothing to the power of the CSE. Therefore, the CDS, when used alone, is the best predictor of the presence of dementia. However, the CDS did not gain the required 80% scores for

sensitivity, so the CDS could not be considered to be a useful instrument based on this criterion with the original cut-off scores. This is in contrast to the Derouesne et al. (1993) which found that the CDS appeared to be a good tool for assessing cognitive complaints in the elderly. With the revised cut-off scores, there was a significant improvement in the performance of the adjLST to predict dementia.

7.3   Predictors of Dementia

It was hypothesised that the CDS and the LST would form the best predictors of the presence of dementia in a person. Regression analysis showed that the raw LST score, combined with the score on the BDI provided an excellent predictor of whether someone was in the clinical or non-clinical group, gaining over 90% sensitivity and specificity. The high correlation between the CDS and the LST (r = -0.56) has made much of the variance contributed by the CDS redundant in the regression equation. Some caution should be exercised in interpreting the depression component of the score as this may be related to lifestyle issues (e.g. living in an aged-care institution rather than with family and friends). However, this finding does suggest that the better predictors of dementia may be developed by using other variables, in conjunction with other inventories of depression or by including these factors in an expanded version of the CSE. Using Crowe's CSE, the CDS is the most accurate and important component in

diagnosing dementia, yet the regression equation indicates that the variability in the LST is the better predictor.

7.4 Methodological Issues

Several difficulties can arise when research is conducted on disorders such as dementia in a sample of the population of people aged 65 years and over. The selection of a relatively homogeneous sample of participants can be a major cause of restricted variance (Long, 1996). In this project, the issue was considered and the impact limited by choosing participants for both the clinical and community samples for the same postcode areas that covered a broad range of socio-economic levels. This ensured a similar mix of socio-economic levels and levels of education. However, there is almost always bias in subject selection as only subjects who willing and able usually volunteer to participate in research (Long, 1996).

There appears to be a general lack of normative data for psychological tests for people of 65 years of age and over. This applies to many of the cognitive screening instruments and the situation worsens with the more advanced years of age. There are even fewer data available for people over the age of 90 years (Mitrushina, Boone, & d'Elia, 1999). The question then arises as to what is the normal cognitive state in people who are elderly, given the relative paucity of normative data. Practitioners may question whether a person who performs poorly

on a neuropsychological screening test, such as the Cognitive Status Examination, is displaying symptoms of dementia, or whether that person is performing at a level that is considered to be age-appropriate. It is only through studies such as this that the body of knowledge can grow. However, the lack of suitable age-related normative data remains a problem for the general psychological assessment of elderly people.

The capacity of the Cognitive Status Examination to generalize to real life settings is also an issue. While the performance of the community sample could be generalized as the testing took place in their own homes or residences, the clinical sample was tested in the hospital environment under conditions that were distracting and contained many extraneous stimuli (Sbordone, 1996). Sudden and unexpected noises occurred and this may have caused a loss of attention and an increased level of anxiety (Kerns & Mateer, 1996). Fatigue, effects of medication and disease processes may affect a person's performance and lead to an underestimation of a person's functional status (Ward et al., 1990). The issue of the generalizability of the results of the clinical sample is an important one as a false positive result on a screening test such as a Cognitive Status Examination may result in referral to more expensive neuropsychological assessments when, in fact, the source of the variance may be the test environment.

The self-report nature of the Cognitive Difficulties Scale may have resulted in flawed test results. A person in the early phase of dementia may lack

insight as a function of their cognitive decline (Jorm, 1996). They may not be

aware that their forgetfulness is causing problems with their activities of daily

living. Confirmation of these difficulties may be sought by talking to support staff

and members of the family. The spouse may be aware but may prefer to ignore

rather confront the problems caused by the decline in cognitive function. A

person's motivation for answering truthfully may influence the outcome of the

test. For example, a participant from the clinical group may believe that a truthful

answer to some of the questions concerning their capacity to live independently

may result in a longer stay in hospital. The clinician may observe that the

response pattern belies the truth yet the person may respond positively to all

questions in the belief that early discharge will result. This can occur despite the

assurance by the tester that that the person's test performance will not influence

their treatment at the hospital.

The clinical cases were all in-patients from the Psychogeriatric Ward of

the Fremantle Health Service. This factor could influence the distinction between

in-hospital and those participants tested in residential settings. In a study

conducted by Ward, Ramsdell, Jackson, Renvall, Swart, & Rockwell (1990),

neuropsychological testing suggested that subjects who are tested in clinics can be

expected to perform five points lower than if they were tested at home. Ward et

al. administered the Mini-Mental State Exam (Folstein et.al., 1975) to 116

geriatric patients at the clinic and in their own residential settings. If the clinic

scores always underestimate a person's cognitive function, then decisions relating to a patient's care could be based on misleading information. Ward et al., acknowledged that these results may be specific to performance on the Mini-Mental State Exam and may not be generalized to other cognitive screening instruments.

While self-reports of mood and mental status are regarded as reliable, the evidence indicates that validity has been poor (Christensen et al., 1994). This may due to the cognitive impairment that may result in the inability to recall correctly or to evaluate their own cognitive function (Jorm, 1996).

One approach that may overcome some of the problems of self-report would have been to obtain a report from an informant. This information has proved to be a valuable complement to cognitive testing (Jorm, 1996). The informant could be a carer or close relative. Information in relation to the subject's performance on activities of daily living would be a valuable addition to the results of the subject's performance on the CDS.

Scores on performance tests such as the LST can be difficult to assess accurately due to possible complications caused by medication, anxiety and stress (Hartman, 1996; Lezak, 1995). Other complicating factors, such as pain, sensory impairments and orthopedic problems may also affect performance on a neuropsychological test (Sbordone, 1996). The extent to which these factors may have influenced test results is not known. Even though participants were asked to

list their current medications, many were unable to recall accurately the type, strength or dosage. Even the medication regime may be a source of variance. For example, if the participant usually takes an anti-depressant in the morning but forgot and took the medication at night and then experienced a poor night's sleep, test performance on the following morning could be adversely affected. The tester may ask the participant if they had taken their usual medication and may receive an affirmative response. Consequently, it is very difficult to control this potential source of variance with the community sample yet with the clinical sample, it could be safely assumed that the medication regime was strictly adhered to.

Participants from the clinical group were assessed as being suitable for testing by the hospital's clinical team but there were no checks on participants from the community group. Similarly, tests of levels of anxiety and/or stress were not completed although the participants from the clinical group were assessed as suitable for testing and were not experiencing a level of anxiety or stress that was likely to affect test performance. Participants from the community did not appear to be experiencing symptoms to the extent where performance might be affected. However, a possible weakness of this study is that measures of anxiety and stress were not obtained through the use of appropriate psychological tests. Other possible confounds such as pain, sensory impairments and orthopedic problems were observed and did not appear to affect results. However, the participants may have chosen not to reveal levels of current pain. It was noted that one participant

was hampered by a severe arthritic condition of her hands and her performance was lower than it otherwise might have been, especially on the speed-related Letter Symbol Task. Sensory impairments, particularly vision and hearing, made testing more difficult for several participants.

The Cognitive Status Examination is not a culture-free test. It requires that the subject is able to understand spoken English and is able to read written English. Even the use of the letters of the alphabet may cause difficulties for people from cultures that use a different alphabet or symbols to represent their written language. This unfamiliarity could result in a lowered performance leading to an erroneous classification of brain impairment. It was noted that several participants had some difficulties with comprehension of the English language. Records were not kept as these problems appear to have been overcome by careful use of the English language. Feedback was sought from participants when there appeared to be difficulties with comprehension to ensure that verbal and written components were understood.

Due to Australia's post Second World War immigration policies and the effects of the post-war baby boom, the number of people from non-English speaking backgrounds who are classified as elderly is expected to rise (Australian Bureau of Statistics, 1996). As the prevalence of people with dementia is rising as Australia's population is aging (Jorm, 1996), it is expected that an increasing number of people from non-English speaking backgrounds may require testing of

cognitive impairments. It is recommended that test developers construct culture-free tests and focus more attention on the current and future needs of this significant group of the population.

In summary, caution should be exercised when using the CSE with participants who may experience some difficulty in the comprehension or expression of the English language.

Finally, it is possible that some clinical subjects were misdiagnosed as having early dementia. In a study completed by Bowler, Boyle, Branford, Cooper, Harper, & Lindesay (1994), it was found that together, nurses and doctors correctly identified 75% of all cases of dementia. Separately, the percentage of correct identification dropped to 56% for doctors and 57% for nurses, indicating that pooled information does maximize identification. Bowler et al. examined the relationship between the use of brief screening instruments and the detection of cognitive impairment and found that correct identification of psychiatric disorders such as depression, delirium and dementia was improved when this information was pooled with observations by doctors and nurses.

The clinical team at the Psychogeriatric Ward were requested to identify patients with early dementia. It is not known if all the identified cases of dementia were in fact early dementia. There are no accurate data available for Fremantle Hospital that would provide data on the diagnostic accuracy of the Psychogeriatric Team. It is possible that some patients who may have been more

correctly classified as moderate to severe dementia were included, then the sensitivity of the CSE may have been compromised. Total reliance was placed on the clinical team's ability to correctly diagnose the severity of dementia and to classify the dementia as early phase or not. This factor may be the cause of a possible confound in the clinical sample. Similarly, even though the sample from the community was comprised of volunteers aged 65 years or above with no apparent thinking or memory problems, it is not known if any participants were experiencing any mild form of dementia. Reports by the participants and their spouses (where possible) were used to judge whether a subject was appropriate.

The CSE does not use informant reports to verify the loss of memory or other cognitive functions. However, other researchers have found considerable value with the use of informant-based measures. In a review conducted by Jorm (1996), four instruments were identified for diagnosing dementia on the basis of informant data. The following informant scales were compared with cognitive screening tests and were found to have significant correlations. The Geriatric Evaluation by Relatives Rating Instrument (Rozenbild et al., 1986); the Informant Questionnaire on Cognitive Decline in the Elderly (Jorm et al., 1989, 1991); and the Psychogeriatric Assessment Scales (Jorm & Mackinnon et al., 1995) were found to have significant correlations with the Mini-Mental State Examination (Folstein, Folstein, & McHugh, 1975), while the Short –Memory Questionnaire

(Koss et al., 1993) was significantly correlated with the Short Blessed Scale

(Blessed, Tomlinson, & Roth, 1968).

7.5.   Summary and Conclusions

The Cognitive Status Examination, the Cognitive Difficulties Scale and

the Adjusted Letter Symbol Task, were unable to gain the 80% sensitivity and

specificity required for an effective diagnostic instrument if the original cut-off

scores are used. The CSE did not contribute any further information than the

CDS, while the adjusted LST provided too many positive diagnosis to be useful.

Adjusting the critical values of the CDS and the Adj LST brought about a revised

CSE with sensitivity of 77.3% and a specificity of 86.2%. Regression analysis

showed that a combination of the raw Letter Symbol Task and the Beck

Depression Inventory Score were the best predictors of the presence of dementia,

gaining sensitivity and specificity of over 90%. Both the use of adjusted criterion

for the Cognitive Status Examination and the use of the raw Letter Symbol Task

and the Beck Depression Inventory Score show a great deal of promise for further

development. However, it is important not to read too much into the present

results as the predictions are highly sample specific. Testing would be required in

samples with a larger range of demographics before these findings could be used

in clinical settings.

It was significant that both the AdjLST and the CDS appear to be independent of scores obtained on the BDI. This negates the need to administer a screening test for depression with the CSE. This should reduce testing time and stress on the client. However, the multiple regression analysis showed that depression combined with the raw LST scores to form the best predictor of all the variables measured.

It was clear that the CSE obtained a much greater utility with revised critical values for the CDS and adj. LST and that these improved cut-off scores simultaneously improved the sensitivity and specificity of the CSE.

The results extend the normative data for the Cognitive Status Examination to include males and females from age 65 to 92 years. As indicated, many variables influence performance on cognitive tests administered to the elderly to determine if dementia exists. Perhaps, cognitive screening tests such as the CSE should also include a structured interview of the spouse or carer. The very nature of dementia may result in the individual lacking the awareness and insight to realize that their memory, behaviours, ways of thinking and expressing emotion are not normal. An interview with a spouse or carer may verify the decline in cognition. Information could be gained in relation to the person's activities of daily living and capacity to function independently in the community and level of support that is needed to maintain their lifestyle.

The results did not support the use of the CSE, as constructed by Crowe (1995), in detecting early dementia in the clinical population of elderly people. However, only a small sample of 44 clinical patients was tested and the size of this sample may need to be increased before conclusions are made about the use of this test. *Ad hoc* adjustments were successful in increasing the specificity, approaching the benchmark requirement of 80%, but without an *a priori* framework. Some caution needs to be exercised as an individual's performance on a cognitive test may be adversely affected by the unfamiliar testing environment (i.e. the hospital ward), the current mental status of the participant, including the levels of anxiety, depression, psychosis, delirium, amnesia; and the effects of medication such as anti-depressants, anti-psychotics, anti-anxiety agents and anti-cholinergics.

It is hoped that correct early identification of cognitive impairment can lead to referral to an appropriate clinician for diagnosis and treatment. As many of the types of dementias can be stabilized and some can be reversed with proper treatment, it is hoped that many elderly people with early signs of dementia can be assisted to fulfil their potential to live independently. It is considered vital that elderly people who are correctly diagnosed as cognitively impaired can be provided with support to enable them to live in the community for as long as possible. This study shows that the Cognitive Status Examination shows promise for further development in gaining higher specificity, and that the combined use

of a depression screening test such as the Beck Depression Inventory with the

Letter Symbol Task may be developed into a powerful test. Further examination

of these issues is required in further studies.

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COGNITIVE STATUS EXAMINATION: Developed by Dr. Simon F. Crowe

NAME: _____

DATE OF BIRTH: _____

AGE: _____

SEX: Male Female

EDUCATION: Highest level successfully completed

       6   7   8   9   10 11 12 12+

COGNITIVE DIFFICULTIES SCALE

PLEASE CIRCLE THE NUMBER WHICH REPRESENTS DIFFICULTIES OBSERVED OVER THE LAST FEW WEEKS USING THE FOLLOWING SCALE:

NEVER = 0 RARELY = 1 SOMETIMES = 2 OFTEN = 3 VERY OFTEN = 4

1. WHEN INTERRUPTED WHILE READING. I HAVE TROUBLE FINDING MY PLACE AGAIN.   0 1 2 3 4

2. I NEED A WRITTEN LIST WHEN I DO ERRANDS.   0 1 2 3 4

3. I FORGET APPOINTMENTS, DATES, OR MEETINGS.   0 1 2 3 4

4. I FORGET TO RETURN PHONE CALLS   0 1 2 3 4

5. I HAVE TROUBLE GETTING MY KEYS INTO A LOCK.   0 1 2 3 4

6. I FORGET ERRANDS I PLANNED TO DO.   0 1 2 3 4

7. I HAVE TROUBLE RECALLING NAMES OF PEOPLE I KNOW.   0 1 2 3 4

8. I FIND IT HARD TO KEEP MY MIND ON A TASK OR A JOB.   0 1 2 3 4

9. I HAVE TROUBLE DESCRIBING A PROGRAMME I HAVE JUST WATCHED ON TELEVISION.   0 1 2 3 4

10. I HAVE TROUBLE EXPRESSING WHAT I MEAN TO SAY   0 1 2 3 4

11. I FAIL TO RECOGNISE PEOPLE I KNOW.   0 1 2 3 4

12. I HAVE TROUBLE GETTING OUT A WORD THAT'S ON THE TIP OF MY TONGUE.   0 1 2 3 4

13. I FIND IT HAD TO UNDERSTAND WHAT I READ.   0 1 2 3 4

14. I FORGET NAMES OF PEOPLE SOON AFTER BEING INTRODUCED.   0 1 2 3 4

15. I LOSE MY TRAIN OF THOUGHT WHEN I LISTEN TO SOMEBODY ELSE.   0 1 2 3 4

16. I FORGET WHAT DAY OF THE WEEK IT IS.   0 1 2 3 4

17. I CANNOT KEEP MY MIND ON ONE THING.   0 1 2 3 4

18. I HAVE TROUBLE MANIPULATING BUTTONS OR ZIPS.   0 1 2 3 4

19. I HAVE TROUBLE SEWING. MENDING. MAKING MINOR HOUSEHOLD REPAIRS.   0 1 2 3 4

20. I HAVE TROUBLE FIXING MY MIND ON WHAT I'M READING.   0 1 2 3 4

21. I FORGET RIGHT AWAY WHAT PEOPLE SAY TO ME.   0 1 2 3 4

22. I FORGET TO PAY BILLS, RECORD CHEQUES, OR MAIL LETTERS.   0 1 2 3 4

23. MY MIND JUST GOES BLANK AT TIMES.   0 1 2 3 4

24. I FORGET THE DATE OF THE MONTH.   0 1 2 3 4

25. I HAVE TROUBLE MANIPULATING TOOLS. SCISSORS. CORKSCREWS OR CAN-OPENERS.   0 1 2 3 4

TOTAL _____

MEDICAL:

Past illness: ....

Head injuries: ....

Pschiatric treatment: ....

....

Current illness: ....

....

FAMILY HISTORY:

Alcohol problems

MATERNAL GRANDPARENTS / PATERNAL GRANDPARENTS / MOTHER / FATHER / SIBLINGS

Psychiatric treatment

MATERNAL GRANDPARENTS / PATERNAL GRANDPARENTS / MOTHER / FATHER / SIBLINGS

DRINKING HISTORY:

Age of onset: ....

Pattern: ....

Type: spirits/beer ....

Amount daily/weekly: ....

LENGTH OF SOBRIETY: ....

OTHER DRUGS USED:

AMPHETAMINES   BARBITURATES   BENZODIAZEPINES   OTHER TRANQUILIZERS

CANNABIS   COCAINE   HALLUCINAGENS   OPIATES   TOBACCO   VOLATILE SUBSTANCES

OTHER

PREVIOUS TREATMENT/REHABILITATION:

No. of admissions

Detoxification (residential)   ....

Residential Rehabilitation   ....

Out patient counselling/treatment   ....

Self help group   ....

Other   ....

OTHER RELEVANT INFORMATION:

....

....

....

....

....

LETTER SYMBOL TASK

J	K	L	M	N	O	P	Q	R
\	+	⊏	⌐	⊖	⊓	∧	✕	∥

J	L	K	J	L	O	K	M	J	O	K	J	O	J	K

M	O	J	K	N	O	L	M	J	K	O	R	M	L	Q

M	N	P	Q	J	L	P	M	Q	N	K	R	L	M	P

K	M	N	J	O	M	J	N	O	P	R	Q	L	O	M

R	N	Q	L	O	P	M	N	K	L	P	R	K	Q	J

O	R	P	K	L	O	M	R	J	P	K	N	O	Q	N

K	R	P	R	L	P	Q	N	J	R	K	J	M	L	O

a) EDUCATION _____
b) TOTAL RAW SCORE _____
c) SCALED SCORE _____
DIFFERENCE (a-c) _____

2

BDI-II

Date:

Name: _____ Marital Status: _____ Age: _____ Sex: _____

Occupation: _____ Education: _____

Instructions: This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the one statement in each group that best describes the way you have been feeling during the past two weeks, including today. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure that you do not choose more than one statement for any group, including Item 16 (Changes in Sleeping Pattern) or Item 18 (Changes in Appetite).

1. Sadness
0   I do not feel sad.
1   I feel sad much of the time.
2   I am sad all the time.
3   I am so sad or unhappy that I can't stand it.

2. Pessimism
0   I am not discouraged about my future.
1   I feel more discouraged about my future than I used to be.
2   I do not expect things to work out for me.
3   I feel my future is hopeless and will only get worse.

3. Past Failure
0   I do not feel like a failure.
1   I have failed more than I should have.
2   As I look back, I see a lot of failures.
3   I feel I am a total failure as a person.

4. Loss of Pleasure
0   I get as much pleasure as I ever did from the things I enjoy.
1   I don't enjoy things as much as I used to.
2   I get very little pleasure from the things I used to enjoy.
3   I can't get any pleasure from the things I used to enjoy.

5. Guilty Feelings
0   I don't feel particularly guilty.
1   I feel guilty over many things I have done or should have done.
2   I feel quite guilty most of the time.
3   I feel guilty all of the time.

6. Punishment Feelings
0   I don't feel I am being punished.
1   I feel I may be punished.
2   I expect to be punished.
3   I feel I am being punished.

7. Self-Dislike
0   I feel the same about myself as ever.
1   I have lost confidence in myself.
2   I am disappointed in myself.
3   I dislike myself.

8. Self-Criticalness
0   I don't criticize or blame myself more than usual.
1   I am more critical of myself than I used to be.
2   I criticize myself for all of my faults.
3   I blame myself for everything bad that happens.

9. Suicidal Thoughts or Wishes
0   I don't have any thoughts of killing myself.
1   I have thoughts of killing myself, but I would not carry them out.
2   I would like to kill myself.
3   I would kill myself if I had the chance.

10. Crying
0   I don't cry anymore than I used to.
1   I cry more than I used to.
2   I cry over every little thing.
3   I feel like crying, but I can't.

Subtotal Page 1

Continued on Back

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11. Agitation

0   I am no more restless or wound up than usual.

1   I feel more restless or wound up than usual.

2   I am so restless or agitated that it's hard to stay still.

3   I am so restless or agitated that I have to keep moving or doing something.

12. Loss of Interest

0   I have not lost interest in other people or activities.

1   I am less interested in other people or things than before.

2   I have lost most of my interest in other people or things.

3   It's hard to get interested in anything.

3. Indecisiveness

0   I make decisions about as well as ever.

1   I find it more difficult to make decisions than usual.

2   I have much greater difficulty in making decisions than I used to.

3   I have trouble making any decisions.

I. Worthlessness

0   I do not feel I am worthless.

1   I don't consider myself as worthwhile and useful as I used to.

2   I feel more worthless as compared to other people.

3   I feel utterly worthless.

. Loss of Energy

0   I have as much energy as ever.

1   I have less energy than I used to have.

2   I don't have enough energy to do very much.

3   I don't have enough energy to do anything.

. Changes in Sleeping Pattern

0   I have not experienced any change in my sleeping pattern.

1a   I sleep somewhat more than usual.

1b   I sleep somewhat less than usual.

2a   I sleep a lot more than usual.

2b   I sleep a lot less than usual.

3a   I sleep most of the day.

3b   I wake up 1–2 hours early and can't get back to sleep.

17. Irritability

0   I am no more irritable than usual.

1   I am more irritable than usual.

2   I am much more irritable than usual.

3   I am irritable all the time.

18. Changes in Appetite

0   I have not experienced any change in my appetite.

1a   My appetite is somewhat less than usual.

1b   My appetite is somewhat greater than usual.

2a   My appetite is much less than before.

2b   My appetite is much greater than usual.

3a   I have no appetite at all.

3b   I crave food all the time.

19. Concentration Difficulty

0   I can concentrate as well as ever.

1   I can't concentrate as well as usual.

2   It's hard to keep my mind on anything for very long.

3   I find I can't concentrate on anything.

20. Tiredness or Fatigue

0   I am no more tired or fatigued than usual.

1   I get more tired or fatigued more easily than usual.

2   I am too tired or fatigued to do a lot of the things I used to do.

3   I am too tired or fatigued to do most of the things I used to do.

21. Loss of Interest in Sex

0   I have not noticed any recent change in my interest in sex.

1   I am less interested in sex than I used to be.

2   I am much less interested in sex now.

3   I have lost interest in sex completely.

4 5 6 7 8 9 10 11 12 A B C D E

_____ Subtotal Page 2

_____ Subtotal Page 1

_____ Total Score

WAIS-R RECORD FORM

CHSLER ADULT
ELLIGENCE SCALE—
VISED

TRALIAN ADAPTATION

UPATION

NTRY OF BIRTH

CE OF TESTING

ER INFORMATION

NAME

ADDRESS

SEX   AGE   MARITAL STATUS

EDUCATION

FIRST LANGUAGE

TESTED BY

	Year	Month	Day
Date Tested	____	____	____
Date of Birth	____	____	____
Age	____	____	____

TABLE OF SCALED SCORE EQUIVALENTS *

		RAW SCORE									
	VERBAL TESTS						PERFORMANCE TESTS				Scaled Score
Information	Digit Span	Vocabulary	Arithmetic	Comprehension	Similarities	Picture Completion	Picture Arrangement	Block Design	Object Assembly	Digit Symbol	
---	28	70	—	32	—	---	--	51		93	19
29	27	69	—	31	28	---	--	—	41	91-92	18
—	26	68	19	--	--	20	20	50	---	89-90	17
28	25	66-67	---	30	27	--	---	49	40	84-88	16
27	24	65	18	29	26	---	19	47-48	39	79-83	15
26	22-23	63-64	17	27-28	25	19	---	44-46	38	75-78	14
25	20-21	60-62	16	26	24	—	18	42-43	37	70-74	13
23-24	18-19	55-59	15	25	23	18	17	38-41	35-36	66-69	12
22	17	52-54	13-14	23-24	22	17	15-16	35-37	34	62-65	11
19-21	15-16	47-51	12	21-22	20-21	16	14	31-34	32-33	57-61	10
17-18	14	43-46	11	19-20	18-19	15	13	27-30	30-31	53-56	9
15-16	12-13	37-42	10	17-18	16-17	14	11-12	23-26	28-29	48-52	8
13-14	11	29-36	8-9	14-16	14-15	13	8-10	20-22	24-27	44-47	7
9-12	9-10	20-28	6-7	11-13	11-13	11-12	5-7	14-19	21-23	37-43	6
6-8	8	14-19	5	8-10	7-10	8-10	3-4	8-13	16-20	30-36	5
5	7	11-13	4	6-7	5-6	5-7	2	3-7	13-15	23-29	4
4	6	9-10	3	4-5	2-4	3-4	---	2	9-12	16-22	3
3	3-5	6-8	1-2	2-3	1	2	1	1	6-8	8-15	2
0-2	0-2	0-5	0	0-1	0	0-1	0	0	0-5	0-7	1

who wish to draw a profile may do so by locating the subject's raw scores on the table above and drawing a line to
nem. See Chapter 4 in the Manual for a discussion of the significance of differences between scores on the tests

SUMMARY

	Raw Score	Scaled Score
VERBAL TESTS		
Information	____	____
Digit Span	____	____
Vocabulary	____	____
Arithmetic	____	____
Comprehension	____	____
Similarities	____	____
Verbal Score		____
PERFORMANCE TESTS		
Picture Completion	____	____
Picture Arrangement	____	____
Block Design	____	____
Object Assembly	____	____
Digit Symbol	____	____
Performance Score		____

	Sum of Scaled Scores	IQ
VERBAL	____	____
PERFORMANCE	____	____
FULL SCALE	____	____

4. PICTURE ARRANGEMENT   Discontinue after 4 consecutive failures beginning with Item 2.

Arrangement	Order	Correct or Acceptable Order	Score (Circle)	Arrangement	Order	Correct or Acceptable Order	Score (Circle)
1. House 60"	1 / 2	CAP	0 1 2	6. Escape 90"		HUNT	0 2
				7. Hill 90"		HELPS	0 2
2. Flirt 60"		JANET / *JNAET* or *AJNET*	0 1 2	8. Fish 90"		ANGLER or ARNGLE / *AGNLER*	0 1 2
3. Romeo 60"		SHADE	0 2	9. Robber 120"		LUNCH	0 2
4. Louie 60"		ARGUES	0 2	10. Taxi 120"		SAMUEL or AMUELS / *SALMUE*	0 1 2
5. Enter 90"		OPENS / *OENSP*	0 1 2				

Note: Be sure to include scores for Items 1-5 in Total.

Total Max = 20

5. VOCABULARY   Discontinue after 5 consecutive failures.

	Score 2, 1, or 0
1. Bed	
2. Ship	
3. Penny	
4. Winter	
5. Breakfast	
6. Repair	
7. Fabric	
8. Assemble	
9. Enormous	
10. Conceal	
11. Sentence	
12. Consume	
13. Regulate	
14. Terminate	
15. Commence	
16. Domestic	
17. Tranquil	
18. Ponder	
19. Designate	
20. Reluctant	
21. Obstruct	
22. Sanctuary	
23. Compassion	
24. Evasive	
25. Remorse	
26. Perimeter	
27. Generate	
28. Matchless	
29. Fortitude	
30. Tangible	
31. Plagiarize	
32. Ominous	
33. Encumber	
34. Audacious	
35. Tirade	

Note: Be sure to include scores for Items 1-3 in Total.

Total Max = 70

Information Sheet

I am a student in the final year of my Master of Psychology at Edith Cowan University. For the completion of a thesis project as part of the requirements of the Masters Programme I have chosen to replicate the results of previous research on the use of the Cognitive Status Examination as a screening test to detect Acquired Brain Impairment. I am seeking elderly people who are willing to participate in my research and I would like to extend this invitation to you.

Previous research found that the Cognitive Status Examination was successful in detecting Acquired Brain Impairment in people with Alcohol Related Brain Impairment. This project will extend the use of the screening test to elderly people with dementia and it will include normal elderly people who will act as a control group. It is expected that the group of elderly people with dementia should test positive on the Cognitive Status Examination whereas the group of normal elderly should test negative.

Each participant will complete the Cognitive Status Examination. As previous research has indicted that a participants level of depression and intelligence can affect the way that they respond to a cognitive test, the Beck Depression Inventory has been included to determine the participants level of depression. The Vocabulary Sub-test of the Wechsler Adult Intelligence Scale has been included to provide a measure of intelligence.

The testing should take approximately thirty minutes. However participants are free to withdraw at any time. Participants will not be prejudiced to the routine standard or the the conventional medical management of their condition.

Although the testing should not impose any discomfort, there is a small risk that the test may wrongly identify some people as having brain impairment. However, any person who is identified as having previously undiagnosed brain impairment will be offered a referral to their General Practitioner for further testing in the first instance and on to a specialist if necessary.

Elderly people from the general community and elderly people who are patients at psycho-geriatric hospitals will be invited to participate in the study.

Edith Cowan University has effected public liability and professional indemnity insurance in the joint names of the University and the student. This provides the host organization or individual supervisor with protection if the student or the University is found to be negligent at common law. In addition, as a psychologist in private practice, I also carry my personal Combined Malpractice, Public and Products Liability Insurance for Psychologists via the Australian Psychologists Society.

My contact details are :
Geoff McCann
Telephone

Appendix E

Project Title: The Use of the Cognitive Status Examination in the Detection of Brain Impairment in the Elderly

Statement of disclosure and informed consent:

1. The purpose of the project is to investigate Cognitive Status Examination as a screening test to detect impairments in the way people think, solve problems and use their memories. This project will extend the use of the screening test to include elderly people as previous research was limited to people in the age group 35 to 50 years.

2. Although the testing should not impose any discomfort, there is a small risk that the test may wrongly identify some people as having problems with the way they think, solve problems or use their memory. Any person who is identified as having these problems will referred to other specialists for further testing.

3. The testing should take approximately 30 minutes. It involves an interview with the investigator to obtain some background information, completion of the Cognitive Status Examination, the Beck Depression Inventory and a short Vocabulary Test. As a person's mood may affect the way they answer questions, the Beck Depression Inventory is given as a measure of a person's mood. The way that a person may think or reason may also affect the answers that they give, so the Vocabulary Sub-Test is used to provide a good measure of the ability of a person to think and reason.

4. At any time during the testing and for any reason, the participant may withdraw.

The Use of the Cognitive Status Examination

5. Participants will not have any consequences if they do not want to participate.

6. The possible benefits to the individual are the early identification of problems with memory, thinking and problem solving. This should assist referral to more appropriate medical care as many of these problems can be stabilized or even reversed. It should also assist families and caregivers to make decisions about appropriate accommodation and support services that may be required. Benefits to society include a more economical use of services to elderly people as services need only be accessed as required.

7. If there are any questions that the participant has concerning the procedures or other aspect of the project please contact: Geoff McCann (Principal Investigator) of the Psychology Department, Edith Cowan University on 9400 5555 or Dr Ed Helmes, Associate Professor, Psychology Department, Edith Cowan University on 9400 5543.

Consent Form

PROJECT TITLE

The Use of the Cognitive Status Examination as a Screening Instrument to Detect Cognitive Impairment in the Elderly.

I   have read the information above (or have been informed about all aspects of the above research project) and any questions I have asked have been answered to my satisfaction. I agree to participate in this activity, realizing that I may withdraw at any time.

I agree that the research data gathered for this study may be published provided that I am not identifiable.

_____
Participant or authorised representative   Date

_____
Investigator   Date

FREMANTLE HOSPITAL

ALMA STREET. FREMANTLE. WESTERN AUSTRALIA
POST OFFICE BOX 480. FREMANTLE 6160
TELEPHONE: (09) 431 3333 FACSIMILE. (09) 431 2918

CONSENT FORM

PROJECT TITLE: The Use of the Cognitive Status Examination as a Screening Instrument to Detect Cognitive Impairment in the Elderly.

1. I have read the information sheet and understand all aspects of the research project entitled The Use of the Cognitive Status Examination as a Screening Instrument to Detect Cognitive Impairment in the Elderly.

2. I freely give my consent to participate in this study, entitled The Use of the Cognitive Status Examination in the Detection of Cognitive Impairment in the Elderly: I am over 18 years of age.

3. I understand and accept the nature of the study which has been explained to my satisfaction by Mr Geoff McCann.

4. If I have any further questions regarding the study I may contact Associate Professor Ed Helmes on phone number 9400 5543.

5. I have read a copy of the Information Sheet and Consent Form.

6. The confidentiality of the records will be maintained. All records will be kept in a locked steel cabinet located in my office for a period of five years before destruction. Only my supervisor, Associate Professor Ed Helmes and the examiner will have access to these records and only for assessment purposes.

7. Only data from the test material will be recorded. The identity of participants will not be associated with the data.

8. Any information will be published without revealing the identity of participants.

Signed _____   _____ Date _____

Signature of witness_____

Name and designation of witness_____(PRINT)_____

MELVILLE - FREMANTLE

Community

Stay in touch with your Community

West Edition

September 8—14, 1998

Phone 9239 1700 Fax 9239 1711

Elderly wanted

PSYCHOLOGIST Geoff McCann is looking for 90 people aged 65 and over to take part in a study investigating brain functions in elderly people.

His study, part of a masters degree thesis, will involve a short interview and test, taking about 30 minutes.

He is seeking people who do not have difficulty in remembering and others who may have memory and thinking problems.

The interviews will be held in the people's own home, retirement village or nearby seniors club.

If you can help please call 9400 5555 or 9410 0185 after 5.30pm.