Examination of Everyday Memory in an Elderly New Zealand Population: Improving the Utility of the Rivermead Behavioural Memory Test

A Thesis Presented in Partial Fulfilment of the Requirements

for the Degree of Masters of Science in Psychology at

Massey University, Palmerston North, New Zealand

Sean D. Fraser

1996

Abstract

With the increase in the numbers of elderly in the population and the recent identification of diverse dementias, a need has arisen for improved assessment of memory for this population. The Rivermead Behavioural Memory Test (RBMT) is one of the major tests for working memory and is well suited for use with the elderly. However, normative data for the elderly is limited and the measure has not been assessed for use with a New Zealand population. This study reports RBMT normative data for 138 elderly, non-dementing, community dwelling volunteers in New Zealand, in 3 age specific groups; 60-69, 70-79, 80-89 years.

Results showed significant differences (p=0.05) between the data collected in Oxford and New Zealand, with New Zealand results generally higher on most sub-tests. This was considered to be due to a combination of factors including; cultural differences, screening methods for dementia and attention to test anxiety. In addition, a significant difference (p=0.05) was observed on 1 of the sub-tests (*Appointment*) when comparing test scores across the age groups.

Acknowledgments

I would like to convey my thanks and appreciation to my first supervisor; Dr. Janet Leathem whose expertise, time and guidance was essential to the successful completion of this study.

The assistance and support of my second supervisor; John Glass of Taranaki Base Hospital was invaluable in collection of the data and went well beyond the call of duty. Many thanks to John and the staff of Taranaki Base Hospital's Ward 20.

I would also like to thank Dr. John Spicer for his assistance with the analysis of the data.

Thanks also to all the volunteers who made this study possible and to the family and friends who provided their essential support.

Table of Contents

List of Tables:

List of Figures:

List of Appendices

CHAPTER 1:

Introduction:

The increase in average human life expectancy from less than 50 years at the turn of the century to almost 80 years now has increased the impact of age related dementias on individuals, families, caregivers and professionals. Dementia is a mind robbing, body sparing condition, responsible for large health care expenses and results in considerable emotional trauma, disability, and death in developed countries (Whitehouse, Lerner & Hedera, 1993). The increase in cases of dementia has resulted in the condition being referred to as the epidemic of the century (Plum, 1979).

Although there is currently no cure for dementia, it is generally agreed that early diagnosis is essential to plan the most appropriate treatment for the best possible outcome for the individual. Memory loss is a primary requirement for diagnosis and must be associated with at least one of four other disturbances: aphasia, apraxia, agnosia or a disturbance in executive functioning (American Psychiatric Association, 1994. *Diagnostic and Statistical Manual of Mental Disorders,* fourth edition.). The diagnosis also relies heavily upon clinical examination, CT scanning and neuropsychological testing (Kaszniak, 1986).

With memory identified as an important feature of dementia, it follows that neuropsychological assessment is playing an increasing role in diagnosis. Neuropsychological assessment with the elderly however is recognized as one of the greatest challenges facing the neuropsychologist, (Loewstein, Argüelles, Argüelles & Linn-Feuntes, 1994) and this is especially so for those where dementia

is suspected. The challenge is also in controlling for the likely interference and confounding of factors such as heightened performance anxiety and difficulty in seeing the point of testing (Beech & Harding, 1990). Despite the obvious need for assessment, there are surprisingly few tests suitable for assessing an elderly population (Lezak, 1995). A further possible confound to results than is the use of assessment measures designed for a younger populations.

Although the use of measures with high face validity would overcome one of the difficulties with testing the elderly (Beech & Harding, 1990) there are very few available. One that is widely used however, is the Rivermead Behavioural Memory Test (RBMT). This measure addresses the problem of face/ecological validity through the use of sub-tests that simulate everyday situations and focus on the practical effects of impaired memory, eg., the ability to remember a name belonging to a face. An additional feature of the RBMT is that it has four parallel forms (A, B, C & D) which allows the repeated administration of the test to the same subject without a practice effect. This is useful for assessing the rate of deterioration of progressive disorders such as Alzheimer's disease and in aiding the differentiation between vascular and non-vascular dementias (Glass, 1996).

There are, however disadvantages associated with the RBMT. The RBMT was developed and standardized in Oxford (England) by Wilson, Baddeley, Cockburn & Hiorns (1985). Accordingly its suitability for a New Zealand population is assumed not proven. This is important as normative data must accurately represent the population being tested (van Balen, Westzaan & Mulder, 1996). There are also concerns surrounding the screening of the original normative

sample and the presumption that a homogenous 70+ years category is suitable for the elderly of all ages.

The purpose of this study was to consider these issues by administering the RBMT to a large New Zealand community dwelling sample aged between 60 and 90 years. The sample would be screened for dementia using a 12 item version of the Mini Mental State Exam (MMSE) before completing the RBMT. Further it was planned to present the resulting data in separate age groups. The significance of the differences between the Oxford and New Zealand data, the new normative data for age groupings and additional results produced by this study are presented in Chapter 6 of this thesis and discussed in Chapter 7.

Earlier chapters provide background and context to the study. Chapter 2 covers the definitions, and expands on the physiological and cognitive effects of dementia. The factors that need to be taken into account in assessments of the elderly, to ensure valid and reliable results are considered in Chapter 3 together with guidelines for the assessment of the elderly. Chapter 4 covers the RBMT; its development, its features, strengths and weaknesses, psychometric properties and its suitability for assessment of the elderly. Chapter 5 covers the purpose and formulation for this research, and gives an outline of the specific hypotheses tested.

CHAPTER 2:

Normal Aging & Clinical Cognitive Decline:

> *There are more older people who behave like the young than young people who behave like the old.* (Shonfield, 1974).

Normal Aging:

At about age 25 years humans have reached their maximum physical, sexual, reproductive and cognitive capacity. There is still no one decisive answer as to what initiates the process of senescence, although the hypothesis that a biological clock is written into our genes seems to have the most support at present. As yet though, the genes responsible have not been located (Lewin, 1995). However broadly defined, the process of aging may be considered to begin at fertilization and all the genes that are responsible for particular aging effects are present at conception. Humans do not remain exactly the same at any succeeding time interval, as the appearance of the effects of these genes depends on the age of the individual (Strickburger, 1985). In other words genes reveal their codes at particular stages of development. These successive presentations or phenotypes are loosely referred to as aging.

There are a significant number of physical changes that are associated with age. As with most other organs of the body, the brain shows significant indications of degeneration with increasing age. The correlations between these structural changes of the brain and elderly behaviour, have not been conclusively documented (Lezak, 1995).

After the age of approximately 55 years, brain volume starts to decrease at an accelerating rate. This shrinkage is as a result of both neuron loss and shrinkage of neural cells, although the extent of each factor is still controversial as these processes seem to take place at different rates in different areas of the brain (Lezak, 1995). Associated with this shrinkage is cortical atrophy which begins in the fourth decade (Kemper, 1992), ventricular dilation which increases in rate for men from age 40 and woman from age 50 (Oken & Kaye, 1992) and other changes (Lezak, 1995), details of which extend beyond the scope of this study. Other physiological functions of the brain effected by aging are cerebral blood flow, measures of which indicate progressive decline with age, brain wave frequency which reduces in variability when compared to brain waves on younger individuals (Shearer, Emmerson & Dustman, 1989) and evoked potentials which reduce in velocity of signal transmission (Polich & Starr, 1984. [cited in Lezak, 1995]). The physical aspects of aging are more obvious and easy to define than cognitive decline which will be the focus of this study.

Lezak (1983) highlights four main cognitive areas which decline with age; memory, conceptualization, mental flexibility and information processing speed.

1. Information processing speed:

General behavioral slowing effects cognitive, perceptual, memory and psychomotor abilities (Lezak, 1983). This slowing is observed through the administration of timed tests of cognitive function such as the Block Design and Digit Symbol sub-tests of the Wechsler Adult Intelligence Scale - Revised (WAIS-R) (Kramer & Russel, 1979) where lower scores have been obtained from older age groups even after the time element has been removed (Botwinick, 1978).

2. Conceptualization:

Diminished ability for abstract and complex conceptualization is common in the elderly (Denney, 1974). But, some of the difficulty is due to the manner in which the problem is presented (Botwinick, 1978). The best measures for assessing problem conceptualization would address this threat to validity perhaps by ensuring that the task parameters are clearly understood prior to commencing with the task.

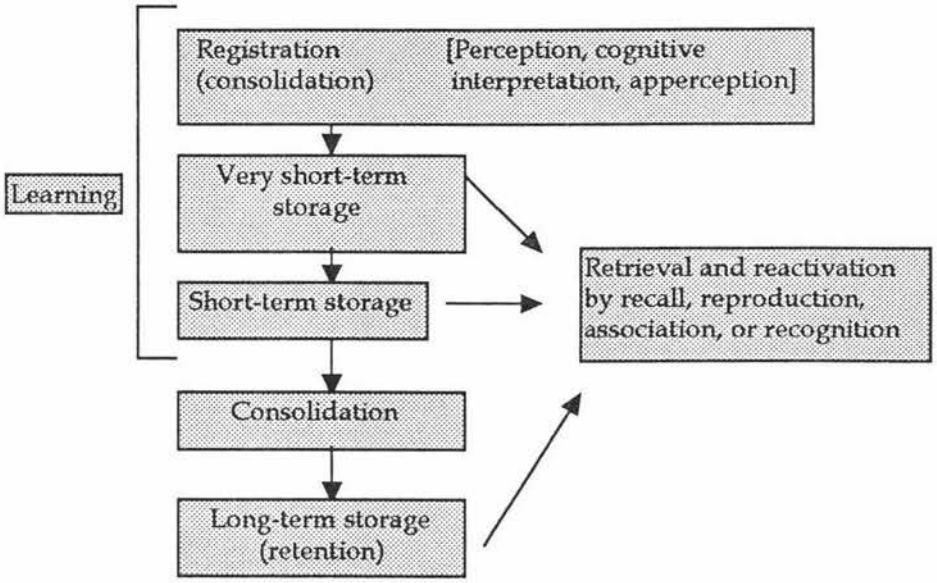
3. Cognitive Flexibility:

Cognitive flexibility (i.e. the ability to adapt to changing situations), also declines with age and is characteristic of the intellectual impairment of the elderly (Lezak, 1983). On the Stroop Color-Word Test for example, Comalli, Wapner & Werner (1962) reported a significant increase in the time taken by 60-85 year old participants to complete the task.

4. Memory:

To describe age-related memory changes, terminology should be kept as constant as possible and a model of memory, such as is outlined in figure 1, is useful (Cronholm & Schalling, 1987).

Figure Example 1. Hypothetical Memory Process.



From "Cognitive Decline with Aging, and Working Capacity," by, B. Chronholm, & D. Schalling, 1987,. In: *Society Stress and Disease, Old Age, 5,* 227-235.

Although there is a general decline in memory with increasing age (Heilman & Valenstein, 1993), aspects of memory differ in how they hold up to the effects of aging (Lezak, 1995). At one end of this continuum lie the very age resistant, over-learned processes stored in long term memory, while at the other end are the age sensitive processes involving mental manipulation and new learning. The learning of new material at speed is especially vulnerable to aging.

Memory tasks that require manipulation of information are more likely to be troublesome in later years than those requiring the use of acquired knowledge (Jutigar, 1994). Cronholm & Schalling (1987) report a very significant decline in the processes necessary for adequate registration and/or short term storage. Short term storage is particularly vulnerable to aging effects when the task requires much effortful processing. This is seen in studies involving the reversing of a

string of digits (Craik, 1991). Similarly, multi-tasking involving the remembering of material while involved in another activity is increasingly compromised with age. In addition the amount of information that is to be learnt, influences the performance of the elderly relative to younger adults. When the primary storage capacity of six or seven items is exceeded for example, there is a notable reduction in memory abilities in the elderly versus younger adults (Craik, 1977). Tactile, auditory, visual, verbal memory, spatial memory tasks (Lezak, 1995) all involve the need to perceive relationships or manipulate information and fall into the broad category that Jutigar (1994) defines as *fluid intelligence* which peaks at age 20 before starting a decline which results in significant loss of ability by 60 years of age.

At the same time, sensory memory is the very transient registration of stimuli and seems unchanged with an increase in age (Lezak, 1995). Information that has been incorporated into long term memory seems similarly resilient to aging effects (Craik, 1991). Historical information that has been retained through the life span is mostly unaffected by the aging process, although recall of autobiographical information seems to be more fragile than memory of public events (Sagar, 1990). This general information store, referred to by Jutigar (1994) as *crystallized intelligence,* seems unchanged until age 70 after which a gradual decline begins (Jutigar, 1994).

Other problems affecting memory include:

- Reduced remembering strategies (Botwinick, 1978). The elderly use less effective learning strategies, e.g.: less elaborate encoding (Lezak, 1995).

- Reduced utilization of contextual information in the retrieval process has also been proposed as the cause of normal memory problems related to aging (Burke & Light, 1981).
- Conservation of mental energy in the elderly has also been suggested as a contributing factor to reduced memory with age. Studies have shown that elderly subjects perform, on memory testing, in similar ways to intoxicated, distracted or fatigued younger counterparts and researchers suggest that the reduced amounts of mental energy in these altered states are causing the reduced remembering abilities (Burke & Light, 1981).

Memory deficits are more complex to quantify and assess than most other cognitive functions due to the large number of variables e.g., the type of memory, material being presented, strategies used, concentration levels and relevance of information to be remembered (Lezak, 1983). Given that deterioration with age is so debilitating it is essential that appropriate memory assessment is available. This includes a clear understanding of the areas most effected by aging, both normal and disease related.

In acknowledging that all these processes contribute to reduced functioning associated with normal aging, the difficulty of defining abnormal aging becomes apparent. The accurate diagnosis of dementia and other conditions associated with clinical decline is especially important as early identification of dementias is one of the most useful tools of intervention. There are however, some criteria which guide this evaluation and these follow.

Clinical Cognitive Decline:

Dementia can be defined as the abnormal decline in intellectual functioning in old age (Beech & Harding, 1990). It has many different forms, but dementia of the Alzheimer type (DAT) is by far the most common cause of intellectual deterioration in the aged (Cummings, 1989). In fact, the prevalence of DAT has been estimated at 5%-10% for individuals over the age of 65 years (Rocca, 1986). This increases to almost 50% in individuals over the age of 85 years (Evans, Funkenstein, Albert, Scherr, Cook et al., 1989). There are still no conclusive estimates of the prevalence of dementia as many different findings have been reported. Roelands, Wostyn, Dom & Baro (1994) for example, report that the age-specific prevalence of dementia increases from 0.6% for younger participants (aged 65-69 years) to 33.6% for older participants (aged 85+ years) and that age-specific prevalences of moderate and severe dementia range from 0.3% to 25%. However, studies seem to agree that the prevalence of dementia (including mild dementia) increases progressively with age in both men and women, and that prevalence is higher in women at all ages. Further, Stern, Mohs, Davidson, & Schmeidler, (1994) have found that gender, age at onset, and family history of dementia have no effect on the rate of cognitive deterioration.

Dementia is characterized by numerous cognitive deficits resulting from direct physiological reasons such as lesions, long term substance abuse or a multitude of combinatory effects (American Psychiatric Association, 1994). The *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) lists twelve different types of dementia with their discerning characteristics which highlights the complexity of this disorder.

All the dementias have memory loss in common (American Psychiatric Association, 1994) and impairment of memory is necessary before dementia can be suspected. It is, however, difficult to delineate the boundary between memory loss related to normal aging and that of early dementia (Heilman & Valenstein, 1993). In order to make a conclusive diagnosis of dementia, memory impairment has to be associated with at least one of the following cognitive deficits: apraxia, agnosia, aphasia or a disturbance in executive functioning (Heilman & Valenstein, 1993). These functions must have declined from a higher level and this decline must be significant enough to interfere with social or occupational functioning. However, Park (1994). reporting a study on age related to occupational ability, suggests that occupational ability should be carefully observed when dementia is suspected or memory loss identified, so as to minimize the possible masking of a diagnosis by these compensatory strategies i.e., in coping strategies, job selection and improved cognitive schemes of the elderly.

Causes of Dementia:

In the 1960's and early 1970's, dementia was generally believed to be the result of cerebrovascular disease and brain ischemia. Today the vast majority of individuals with dementia are known to suffer from Alzheimer's Disease rather than acquiring their dementia from chronic ischemia. However, although this first view was not accurate, it was a big step forward in the recognition of dementia from the previous beliefs that it was merely a natural consequence of aging (Thal, 1989).

1. Dementia of the Alzheimer's Type (DAT):

Many findings on a biochemical level have isolated changes in the brain related to dementia. Choline acetyltransferase (CAT) has been detected in much lower concentrations of the brain of individuals suffering from DAT than a normal brain. Of all the other changes noted in the DAT suffers, the lowered CAT levels are the most consistent. In addition CAT changes are the only neurotransmitter changes that have been strongly correlated with memory loss (Thal, 1989).

Further studies on a molecular level have revealed some concordance between the cognitive decline of Alzheimer's disease and that resulting from trisomy 21 of Down's Syndrome. In a study of a 45 year old woman with only partial translocation of chromosome 21 and who had no mental retardation, Schapiro, Kumar, White, & Fox (1990) found that the genes responsible for mental retardation and cognitive deterioration were shown to be at separated loci of chromosome 21. Serial neuropsychological testing over 2 years showed progressive cognitive decline, while brain computerized tomography (CT) and positron emission tomographic (PET) scans revealed progressive, Alzheimer's like, abnormalities. The development of typical Alzheimer's disease and lack of mental retardation in this case suggests that the genetic determinants of dementia in Down's Syndrome may not be identical to those responsible for other characteristics of Down's Syndrome, but may be the same as those responsible for Alzheimer's disease. This genetic link indicat

es a need to observe family history in the assessment on Alzheimer's sufferers, a finding wholly supported by the findings of La-Rue, O'Hara, Matsuyama, & Jarvik, (1995) who report that the age and rate of onset of relatives who also

suffered from the disease may have valuable prognostic powers for the disease course of the patient.

The major pathological changes in DAT consists of neuronal loss and the presence of characteristic neuronal plaques and neurofibrillary tangles (Katzman, 1986). The causes of the memory loss may be related to the nature of the plaque formation in that plaques are characteristically seen in the hippocampus together with cell loss in a pattern that may isolate the hippocampus from its many connections. In addition the entorhinal cortex and amygdala are common sites of plaque formation (Thal, 1989).

2. Vascular Dementia:

Vascular dementia is the next most prevalent form of dementia next to DAT (25-30% of cases of dementia) (Thal, 1989). CT and MRI scans usually reveal the presence of multiple vascular lesions of both white and gray matter. Focal lesions may also be revealed through EEG assessment. There are a number of different types of vascular dementia, but the majority have a characteristic stepwise deterioration of cognitive functions with an abrupt onset (although a gradual decline has also been noted). Evidence of long-standing arterial hypertension. Early detection of vascular dementia and treatment for hypertension may prevent further progression of the disorder (American Psychiatric Association, 1995).

In summary, the complexities of normal aging on both physiology and cognition, coupled with the difficulties in diagnosing the increasing numbers of people suffering under the effects of dementia and other age related disorders, makes assessment of decline important. The unique attributes of the aging

population requires the use of specialized assessment procedures that take all these attributes into account. These procedures are the subject of the following chapter.

CHAPTER 3:

Cognitive Assessment in the Elderly:

Old age hath her victories no less renowned than youth. (Davies, 1974, p. 5).

Introduction:

The significant increase in the elderly population has highlighted the necessity for appropriate, adequate and accurate assessment procedures (Beech & Harding, 1990). In addition, assessment of cognitive impairment in the older adult has been referred to as one of the greatest challenges facing the neuropsychologist, and is an area in urgent need of further research (Loewstein, Argüelles, Argüelles & Linn-Feuntes, 1994).

Assessment is usually conducted to facilitate a judgment of an individual relative to the larger population. The reasons for the assessment of the elderly can be grouped into three broad categories. These are: (1) assessments targeted towards suitability for independent living, (2) assessment for the development of individual remedial programmes, which includes the evaluation of the progress of remedial techniques to ensure they are functioning as planned and are best suited to the client, and (3) diagnostic assessments (Lezak, 1995).

Assessments can be conducted in one of two broad ways: observations of the individual in his/her home or work environment or the less individual, more standardized approach of using tests with comparative norms.

1. The standardized approach: This involves the comparison of the individual with a like set of individuals within the general population. Assessment in this way relies on the presence of sound normative data that is accurately representative of the population with which the client is being compared. Once established, the standardized nature of such a test makes it far quicker to administer and far cheaper overall than the former, individual based observation assessments. (Baddeley, 1984).

As memory decline is the most reported form of cognitive decline in the elderly, (particularly for day to day living) and is indicative of early dementia (Beech & Harding, 1990), effective methods for assessing of memory in the elderly are essential. Formal assessment holds the potential for the early detection of dementia provided that normative data is available on the specific populations of the elderly and sequential testing of the elderly may allow the early detection of incipient dementia especially of the Alzheimer's type (Kendrick, 1982). This form of assessment often requires a longitudinal test/re-test design and tests with parallel forms are preferred. Memory loss related to normal aging may be very different from the path of dementia related memory loss and needs special consideration (Kendrick, 1972). Standardized memory tests allow the detection of warning signs for dementia and are frequently used by Occupational Therapists designing individual rehabilitation programmes. Testing will then form the basis for teaching and therapy programmes to help the dementia sufferers (their caregivers and family) cope with everyday living. Diagnostic assessment is then very valuable in ensuring the rehabilitation is working as planned and is best suited to the client (Pearson, in press).

2. The non-standardized, observation approach: Observation, i.e. the collection of real data in the real world, is concerned with the person's abilities to carry out everyday life. It is a highly individual process, carried out over a long period of time and does not require the presence of extensive normative data. Observation based assessments need not be dismissed, but become impractical when faced with a large number of clientele, for both financial and time related reasons.

In everyday living people constantly utilize complex forms of memory to accomplish even the most basic tasks. Making a cup of tea for example, involves a specific sequence of steps. The task is a relatively safe one and forgetting the sugar should not be a cause for alarm. However, there are other daily tasks like cooking in which forgetting to turn off the oven may have dire consequences. It is as a result of possible memory lapses that assessments must be thorough and accurate, so as to strike a balance between the need to ensure the safety of the client and yet avoid the removal of independence from a capable client, unnecessarily.

For in as much as assessments can be beneficial to the professional and/or the individual in directing the decisions of a particular course of action, an inaccurate assessment can be very damaging. The individual may become a victim from an assessment as is illustrated by the periodic institutionalization of an elderly person with the assumption, based on an assessment, that he/she was unable to live independently.

Issues for Consideration prior to Assessment of the Elderly:

In recognizing the specific needs of the elderly, Krans (1980) outlined some guidelines for the assessment of the elderly:

1. Any print must be large and of good contrast.
2. Answer sheets should be eliminated and replaced with tests involving visual search dimensions.
3. Tests for the elderly must have high face validity and
4. Appropriate norms must be available.

In addition to the guidelines mentioned above, there are other factors that be taken into consideration when assessing the elderly so as to improve the accuracy of assessments (Schaie, 1973). This is especially important as failure to acknowledge their impact or influence may result in false diagnosis. These factors include education and learning skills, lack of motivation, poor health, lack of practice in cognitive skills (Perlmutter, 1982). In addition, assessments are generally greeted with apprehension or anxiety. This apprehension often affects performance and should be taken into account in order to enhance the accuracy of the assessment.

1. Motivation:

With increasing age there seems to be a greater selectivity in what is stored as memory and what is filtered out (Kendrick, 1982) and as a result of this "energy saving" mechanism effortful processing is only utilized when real life problems are encountered. On the other hand, well practiced tasks require little energy and can be executed effortlessly (Rabbit, 1977).

Effective processing is not always used spontaneously which may account for spuriously low assessment results and needs to be taken into consideration when assessing memory of the elderly. In addition malaise and lack of motivation is

often associated with the presence of a chronic illness or terminal disease which affect a large number of the elderly (Lezak, 1995).

2. Sensory Motor Changes:

Age has associated physical decline leading to possible impaired eyesight, mobility and hearing for example. All these physical complaints must be recognized, accommodated and as far as possible compensated for in order to ensure the accuracy of assessments. If a client has hearing difficulties for example, listening aids can be employed together with the practice of looking directly at the client when speaking and not mumbling when using verbally based tests. The examiner should always check if corrective eye wear is required as only 10% of 80 year olds have 20/20 vision corrected. These physical changes can lead to anxiety, which along with any other emotional factors being experienced by the client should also be addressed before testing commences. In addition the physical comfort of the client should always be appraised prior to testing, for example, those in poor health (arthritis for example) may require comfortable chairs with good back support to reduce distractibility and help keep discomfort and anxiety to a minimum.

3. Medication:

The increased incidence of physical and mental illness in the elderly results in a corresponding increase in levels of medication. Those involved with the assessment of the elderly should be aware of the possible effects of medication (Beech & Harding, 1990). A selection of many examples of medications that may interfere with assessments are as follows: H2 blockers are frequently administered for gastrointestinal complaints, but have the potential side effect of confusion in

the client; cardiovascular disorders are commonly treated with digoxin which can cause visual disturbance and antihypertensives can cause depression, headaches and other side effects; antihistamines administered for respiratory problems can cause sedation; drugs used for central nervous system problems from benzodiazepines to antiparkinsonian drugs all have significant effects such as: confusion, ataxia, insomnia, vertigo, which may impair test results. Antibiotics can cause headaches and anti-viral drugs my lead to fatigue; corticosteroids as used for endocrine complaints can cause weakness and confusion and anti-gout medication may also cause vertigo in the client (*New Ethicals Catalogue,* 1996). These potential problems are greatly increased by synergistic effects where polypharmacy or alcohol is involved (Lezak, 1983).

4. Education:

Having been educated in a different era may be associated with different methods of learning, such as: rote learning and "old math". As a result, the education system of the time may be the cause of less effective information processing in the elderly (Kendrick, 1982). It is also suggested that older persons are less practiced in remembering academic things and lack the strategies for effective remembering because of the large time gap between their academic days and the stage of assessment (Craik & Byrd, 1981). In addition the number of years of education varies greatly in that age group and may influence the results of testing.

5. Depression:

Depression is the most frequently encountered emotional disorder in the elderly. This often follows a stressful event such as the loss of a loved one, or is associated with other age related changes such as loss of status, health problems and loss of

meaningful activity after retirement. The result of such depression can mimic or exacerbate the symptoms of progressive dementing problems as well as reduce attention span, impair concentration and affect memory (Lezak, 1995). For this reason accurate assessment of depression is essential in the older adult.

These factors highlight the specificity of the elderly population and the need for special consideration in their assessment. Awareness of these factors coupled with the selection of a measure where they are kept to a minimum as is the case with the Rivermead Behavioural Memory Tests (RBMT) which provides the potential for accurate and efficient assessments of the more mature age groups. The study which follows is an evaluation of the RBMT, especially of its normative data and psychometric properties. Accordingly, the measure is presented and discussed in the next chapter as context to the formulation and purpose of the study outlined in Chapter 5, rather than later in the method section.

CHAPTER 4:

The Rivermead Behavioural Memory Test:

The Rivermead Behavioural Memory Test (RBMT), was developed in Oxford, England by Barbara Wilson, Janet Cockburn and Alan Baddeley in 1985. It was designed to measure and monitor verbal and visual memory in subjects with acquired brain damage and is essentially an atheoretic test. It assesses working memory and has high face validity which differentiates it from most other memory tests. Since performance anxiety is of special concern when testing the elderly (Beech & Harding, 1990 & Koenders, Passchier, Teuns & van-Harskamp, 1993) and as the high face validity associated with the RBMT probably results in lowering the anxiety of the respondent, the RBMT would appear to be well suited for testing the elderly. In addition, although designed as a screen, the RBMT has the potential to provide more qualitative information than most screens (e.g. the MMSE) which is an adjunct to quantitative information used in diagnosis.

Another advantage of the RBMT is that changes in memory can be assessed using one of the four alternate forms of the measure. This allows the re-testing without the concern of practice effects confounding results. The RBMT also assesses immediate and delayed recall, which is not possible with many other memory tests.

Materials:

The RBMT consists of a procedures manual, scoring sheets (Appendix, V) and a supplement of psychometric properties. Two sub-tests have a set of cards including line drawings and photographs of people. In addition there is a timer, a sheet of four short stories (each duplicated for delayed and immediate recall) an envelope and a tape of a sample administration.

The sub-tests are comprised of:

First and second name; in which the client must remember the name of a person in a photograph and recall it at the end of the test.

Belonging; involves the hiding of an object belonging to the client at the start of the test. This object must be of limited value (e.g. a pen or handkerchief) and the client is required to recall the object and its whereabouts at the end of the test.

Appointment; This sub-test assesses the clients response to cueing. A timer is set for 20 minutes at the beginning of the test and the client is required to repeat a pre-specified sentence (e.g. When is my next appointment?) when the timer sounds.

Pictures; 10 presentation cards are shown individually to the client. After a distraction task these 10 cards have to be identified out of a larger set of recognition cards containing a number of distracter cards.

Faces; This sub-test is similar to the picture cards except the cards are of peoples faces which must be identified out of a larger selection of recognition cards after a distraction task.

Short Story; This involves both an immediate and delayed recall of a short story that is read to the client. Each is scored separately.

Route Delayed/Immediate; Here the examiner traces a short route around the room. There are 5 stages to the route (e.g. door, window, Table, chair and door) which the client is required to follow first immediately after the examiner and then later in the test.

Message; The client is required to take a message (envelope) with them on the route around the room and is scored for spontaneous pick-up as well as leaving the message at the correct location.

Orientation; 9 questions pertaining to the client's present situation are asked (e.g. "Which city are we in?")

Date; This is questioned together with Orientation, but scored separately.

Scoring:

A raw score is obtained and converted to both a standard profile score and screening score. The screening score is calculated on a simple pass/fail basis with no borderline passes resulting in a possible maximum of 1 for each sub-test. Since there is no normative data on screening scores and as qualitative information is lost in the simplification of the results to a pass or fail, the RBMT manual suggests that profile scores should be used. Further, the correlations between test results using profile scores is higher than the inter-test correlations using the screening scores suggesting that the 'finer-grained' Profile score may give a more reliable estimates of memory (Wilson, Baddeley, Cockburn & Hiorns, 1985). In addition, only standard profile scores have been published for the elderly population studied in the Oxford research, making it the only information available for comparisons. As a result, profile scores will be used to assess the data of this

study. The total profile score is a standardized score out of a total of 24 made up of 2 (normal), 1 (borderline) and 0 (abnormal) for each sub-test.

Psychometric properties:

1. Reliability:

Inter-rater reliability was assessed using 10 different raters (psychologists and psychology students) who administered the test to 40 participants. Each participant was scored separately but simultaneously by 2 raters. The results showed 100% inter-rater reliability for both profile and screening scores.

Parallel-form reliability was assessed by administering 2 versions of the test to 118 participants. All completed version A and a third completed each of the other 3 versions (B, C & D). Results from the correlations between version A and B, C & D are 0.86, 0.83 & 0.88 respectively, indicating that the RBMT is reliable. Only one of the sub-tests (Remembering a belonging) showed a significant difference ($p<$ 0.001) in the first and second testing. In this sub-test 28% of the participants improved while the results of only 7% deteriorated (Wilson, et al., 1985).

2. Validity:

Validity was assessed for the RBMT's memory testing ability and its assessment of everyday memory.

Correlations between the RBMT profile scores and 8 standardized memory tests were highly significant ($p<0.001$) for six of the eight memory tests: (Recognition memory test for words, faces, digit span (forward and backwards), Corsi block technique for spatial span and paired associate learning sub-test . The

remaining 2 comparisons (the Collins and Quillian sentence verification tasks) also correlated significantly, but with $p<0.01$ (Baddeley, 1984).

The validity of the RBMT as a test for everyday working memory was assessed by correlating test performance with the therapist observations of memory lapses.

Therapists treating patients at the Rivermead Institute completed a checklist, comprising 19 separate areas, at the end of each session for 80 patients over a two week period. The checklist was adapted from a design by Sunderland, Harris and Baddeley (1983). The questions involved and reasons for their inclusion have not been reported. The results were correlated with the individual's RBMT scores and a correlation of $p<0.001$ was reported (Baddeley, 1984). In addition the results of the RBMT were much more significant than the comparisons made with the examiners rating checklist and other tests of memory. RBMT results were also correlated with subjective ratings made by participants and relatives. Again the results of the RBMT correlated highly ($p<0.001$) and were higher than the correlations with the other memory tests. These results all suggest that the RBMT is a valid measure of everyday memory (Wilson, Baddeley, Cockburn & Hiorns, 1985).

The RBMT does however have some shortfalls. The lack of normative data for an elderly New Zealand population, reduces the confidence of interpreting results obtained from testing this population. The aim of this study is to obtain this data.

CHAPTER 5:

Purpose and Formulation:

As has been stated, there is a rapidly growing elderly population in New Zealand. This in turn has resulted in an increase in the number of cases of dementia and an increased need for suitable assessments for dementia. As memory loss is a primary criterion for a diagnosis of dementia (American Psychiatric Association, 1994), there is a high need for valid and reliable assessment instruments. However, the elderly are a specific population, with specific needs which must be addressed in any testing situation. This, and the fact that dementia is difficult to diagnose, coupled with the complicating factors associated with normal aging and threats to validity associated with aging subjects makes assessment difficult. Yet neuropsychologists are increasingly being asked to contribute to such testing whilst maintaining practice standards. Few tests, however are designed to specifically assess memory in the elderly (Lezak, 1995). The Rivermead Behavioural Test (RBMT) is a reliable and valid test of everyday memory (Wilson, Cockburn Baddeley & Hiorns, 1985) and is one of the major memory tests likely to be utilized in psychology departments (Mayes & Warburg, 1992). It is a verbally based test with high face validity and would appear to be well suited to an elderly population. An essential requirement of all standardized quantitative test, such as the RBMT, is that appropriate normative data is available for the population being assessed. The normative data for the RBMT that are

currently available for the elderly are limited and have not been assessed for a New Zealand population.

The purpose of this study then was to provide a reliable, thorough and statistically powerful set of normative data for the RBMT for an elderly New Zealand population. The RBMT would be administered to a sample of volunteers aged from 60-90 and the results obtained reported for separate age groups. Besides the provision of normative data, the following hypotheses would be examined:

Hypotheses:

1. There will be significant differences between the New Zealand and Oxford data.
2. There will be significant decline in all sub-test means with increasing age. Three age groups (60, 70 and 80 year olds), would be compared.

CHAPTER 6:

Method:

Setting:

Participants were seen either in an office at Taranaki Base Hospital or in their homes. The office was a quiet, well lit room in Ward 20 of the Taranaki Base Hospital. A large window overlooked a relaxed garden scene. Participants were seated in comfortable armchairs on one side of a movable writing table. Tea and coffee was set out on the desk, to the side of the testing area, to reduce the official atmosphere and enhance comfort. It was important for the 'route sub-test' that participants were able to move freely around the room. For this reason, any excess furniture and obstacles were removed from the room.

When testing participants in their homes, it was not possible to rearrange the testing room, but in all cases a large room (usually the lounge) was chosen to ensure a clear walking space for the 'route sub-test'. A Table was used for the presentation of the cards. If necessary lighting was enhanced by bringing in a lamp and where possible distracting noises were removed (such as; radio, TV, loud clocks, etc.).

Ethics:

Ethical approval was obtained from Taranaki Base Hospital. Anonymity was assured by the use of scoring sheets numbered for identification. The data will be

kept in locked storage at Taranaki Base Hospital, for 7 years in the event that it might be useful for further research at a later date.

Participants:

The sample consisted of 120 community dwelling participants. In an attempt to maximize the heterogeneity of the sample, participants were recruited by a number of methods. The majority of the first 50 participants were recruited by speaking to community groups (such as; Active in Age and The Probus Club) and advertisements which were placed in the local news paper and selected newsletters (Appendix, II). Each person tested was asked to recruit a few other people if possible. This resulted in the gathering of a number of people who would not usually volunteer which in turn increased the heterogeneity of the sample. Response to the advertisements and word of mouth contacts were received in the form of letters and/or phone calls. Each respondent was telephoned and an appointment made to see them in their home or at Taranaki Base Hospital, based on their preference, i.e. some participants did not have transport or were reluctant to travel to the hospital and as a result, were tested in their homes.

The following inclusion criteria were used:

1: Between 60 and 90 years of age.

2: No self report of problems in day to day memory.

3: No history heart problems in the past 3 years.

4: No history of significant cardiac or respiratory problems that may have resulted in hypoxia.

5: All ethnic groups of New Zealand Citizens or having lived in New Zealand for at least 20 years.

6: Community dwelling.

7: Literate

8: Score of 9 on the 12 Item version of Mini Mental State Examination.

The characteristics of the sample are presented in the following table:

Table. 1: *Frequency and Percent of Sample Assessed in Office & Home Setting:*

	Office		Home		Total	
Age	Male(%)	Female(%)	Male(%)	Female(%)	Male(%)	Female(%)
60-69	14 (10.1)	28 (20.2)	0 (0.0)	3 (2.2)	14 (10.1)	31 (22.5)
70-79	26 (18.8)	27 (19.6)	4 (2.9)	10 (7.2)	30 (21.7)	37 (26.8)
80-90	10 (7.2)	5 (3.6)	3 (2.2)	8 (5.8)	13 (9.4)	13 (9.4)
Total	50 (36.2)	60 (43.5)	7 (5.1)	21(15.2)	57 (41.3)	81 (58.7)

Examiners:

The current researcher was trained in the administration of the Rivermead Behavioural Memory Test (RBMT) prior to commencement of data collection. Some additional testing was conducted by John Glass, a psychologist working in the Assessment and Rehabilitation unit at Taranaki Base Hospital.

Measures:

1. 12 Item Version of the MMSE:

In order to ensure that the data collected was from a normal/non-dementing population, it was necessary to screen participants for dementia. This screen had

to be quick and easy to administer so as not to produce any fatigue effects for the RBMT which would follow. The MMSE is considered one of the most widely used brief screening instruments for dementia (Morris, Heyman, Mohs, 1989). It is a very brief, 20 item, measure taking only 10-15 minutes to administer and has no significant gender biases (Tombaugh & McIntyre, 1992). In addition it is regarded as a reliable and valid screen for cognitive impairment in the elderly (Folstein, Folstein & McHugh, 1975).

However, Braekhus, Laak & Engelkdal (1992) hypothesized that in the original 20 item MMSE not all the items were equally efficient in identifying cognitive impairment in subjects and conducted a study to isolate the most efficient of the sub-tests and delete those with low sensitivity to dementia. They concluded that 12 items were sufficiently sensitive as a screen for dementia and developed the 12 Item version of the MMSE (Appendix, I). The test was then even easier to administer and less strenuous on the respondent. The 12 item version of the MMSE was selected as it has specific sensitivity to dementia as well as fulfilling the criteria for effective testing of an elderly population (see Chapter 3).

All 12 items on the MMSE are scored binomially (0/1), with a maximum of 12, and the test takes about five minutes to administer. It was assessed with 831 participants with a mean age of 81.5 years (range 54-99) and a minimum of five years education. The 12 item version correlated with the full MMSE at 0.96. The cut-point of 9/10 was established because it gave the fewest misclassifications against the full MMSE with a sensitivity of 0.98 and specificity of 0.91. All participants in this study had to achieve this cut off in order to be included in the normative sample for the current study.

Regardless of MMSE scores, the Rivermead Behavioural Memory Test (RBMT), as described in the previous Chapter, was administered to all participants.

2. The RBMT:

This measure was discussed in Chapter 4.

Procedure:

As the elderly are very susceptible to performance anxiety in any test setting (Rabbit, 1977 & Koenders, Passchier, Teuns & van-Harskamp, 1993), special care was taken to keep anxiety levels of the participants to a minimum. Firstly the participants were engaged in general non test related conversation for a few minutes before being presented with a page of information (Appendix, IV) outlining the reasons for the testing and the process involved. Before being asked to complete a consent form each subject was given the chance to ask any questions and relay any concerns relating to the test. In addition, any hearing, sight or other discomforts that needed to be compensated for were attended to prior to testing. While completing the consent form each subject was offered tea or coffee from the selection of teas and coffees set out on the desk. On average one in every two participants accepted the offer of a drink.

A consent form (Appendix III) was completed by each participant. The date was already filled in by the examiner so that this did not confound the date sub-test of the RBMT. The MMSE was then administered. Those who did not obtain the cut-off for the MMSE were still asked to complete the RBMT, but their results

were not used in the final data pool. Any participants who were concerned about the test were offered the opportunity of a full cognitive assessment by John Glass (psychologist).

As the orientation questions asked in the MMSE are duplicated in the RBMT, the first few orientation questions of the MMSE were omitted in the administration, although they were included for scoring the MMSE. The participants were asked if they had any queries and were comfortable before beginning the RBMT.

Version B of the RBMT was administered to all participants based on the possible gender biases identified in version A. All sub-tests of the test were administered according to the manual. Once the RBMT was completed, each participant was invited to comment on the test and procedure. Those who were concerned about their performance were reminded of the option of additional testing at no expense. Each participant was thanked for their time and accompanied out. Communication between participants was kept to a minimum through requesting that the test not be discussed between participants prior to its administration so as not to allow some participants an unfair preparation advantage over others. In addition couples were tested consecutively to help to reduce the possibility of transferring information.

The tests were scored and additional qualitative notes recorded once the participants had left the office.

CHAPTER 7:

Results:

Hypothesis 1.

There will be significant differences between the Oxford and New Zealand data.

Because the data available for the Oxford sample is for a 70-90 year old population only the sixty year old age group was removed from the New Zealand data pool so that a direct comparison could be made. The comparison in Table 2 is then between 70-90 year olds with n=93 for the New Zealand sample and n=114 for the Oxford sample.

Table 2: *Comparing Oxford and New Zealand norms.*

	New Zealand(n=93)		Oxford(n=114)			
Sub-test	Mean	Std.Dev	Mean	Std.Dev	t-score	Sig
Names	1.06	.95	0.87	.93	1.44	N.S.
Belong	1.41	.81	1.20	.78	1.89	N.S.
Appnt	1.39	.79	1.16	.77	2.11	N.S.
Pictures	1.88	.41	1.71	.60	2.41	N.S.
Story.I	1.55	.68	1.13	.89	3.85	0.001
Story.D	1.78	.51	1.19	.89	5.98	<0.001
Faces	1.71	.56	1.53	.69	2.07	0.05
Route.I	1.55	.70	1.41	.79	0.10	N.S.
Route.D	1.53	.76	1.62	.69	0.89	N.S.
Messag	1.35	.84	0.86	.83	4.20	<0.001
Orientn	1.84	.42	1.46	.76	4.55	<0.001
Date	1.86	.48	1.35	.85	5.43	<0.001
Profile	18.80	4.20	15.54	5.54	4.81	<0.001

Preliminary analysis showed the sample did not represent a normal distribution which would make t-tests inappropriate. However, the reasons for using the t-test were outweighed by the reasons against (such as the significant loss of

statistical power using non-parametric statistics) and as the t-test is very robust it is suitable for use with this sample despite the deviation from a normal distribution (Keppel, 1973). The differences between the Oxford and New Zealand norms were explored on each of the 12 sub-tests as well as the total profile score. Five of the means of the twelve sub-tests showed significant differences (p =<0.05) *as* did the difference in the total profile score. The New Zealand means were higher than Oxford sample for all sub-tests, except the *Route Delayed,* which was higher (but not significantly so) in the Oxford sample.

Hypothesis 2.

There will be a significant decline in all sub-test means when comparing the 3 age groups.

Normative data for 60, 70 and 80 year old age groups are represented on the following page, in Table 3. Both raw and profile means with standard deviations, are presented for each sub-test. The raw scores have been presented to allow comparisons that are removed from the information lost in transforming data to the standardized profile scores. Sub-test screening scores are not presented for reasons discussed in Chapter 4.

Table 3: *Raw and Profile norms for an Elderly New Zealand Population:*

	60-69				70-79				80-90			
Subtest	Raw		Profile		Raw		Profile		Raw		Profile	
	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev	Mean	Std.Dev
Names	3.38	(.25)	1.44	(.81)	2.68	(1.47)	1.04	(.97)	2.92	(1.29)	1.12	(.93)
Belong	3.44	(.76)	1.44	(.76)	3.29	(1.20)	1.46	(.82)	2.88	(1.48)	1.28	(.79)
Appnt	1.89	(1.37)	1.71	(.59)	1.47	(.76)	1.47	(.76)	1.20	(.87)	1.16	(.85)
Pictures	9.93	(.25)	1.91	(.29)	9.90	(.39)	1.90	(.39)	9.76	(.83)	1.84	(.47)
Story.I	6.67	(2.53)	1.56	(.69)	6.36	(2.54)	1.47	(.72)	6.70	(1.81)	1.76	(.52)
Story.D	5.61	(2.40)	1.80	(.50)	5.40	(2.22)	1.76	(.52)	5.26	(2.04)	1.84	(.47)
Faces	4.76	(.53)	1.76	(.53)	4.69	(.60)	1.72	(.54)	4.64	(.76)	1.68	(.63)
Route.I	4.69	(.56)	1.69	(.56)	4.51	(.70)	1.50	(.72)	4.76	(.52)	1.68	(.63)
Route.D	4.67	(.60)	1.67	(.60)	4.57	(.90)	1.50	(.76)	4.56	(.77)	1.60	(.76)
Mesge.	5.49	(.79)	1.47	(.81)	5.29	(1.16)	1.40	(.85)	5.08	(1.32)	1.24	(.83)
Orientn	8.87	(.40)	1.87	(.40)	8.78	(.62)	1.81	(.47)	8.92	(.28)	1.92	(.28)
Date	0.93	(.25)	1.91	(.29)	0.91	(.29)	1.84	(.50)	0.96	(.92)	1.92	(.40)
TotalProfile	20.22 (3.07)				8.87 (3.90)				19.00 (4.22)			
TotalScreen	9.31 (2.00)				8.68 (2.39)				8.52 (2.33)			

As suggested by Hypothesis 2, there is a general decline in sub-test means associated with increasing age, in 5 of the sub-tests. The significance of the differences in the means across the three age groups were assessed using one way analysis of variance (ANOVA). In addition a Tukey's honestly significant difference (HSD) test was also conducted to control for the possibility of making one or more type 1 errors. (As only pair-wise tests were conducted, Tukey's HSD test was preferred to Scheffe's test which provides a similar control, but is not as statistically powerful (Keppel, 1973)).

With a default set at p=0.05, the raw score means of two sub-tests showed significant differences; *Names* (F=0.0213) and *Appointment* (F=0.0172). The origin of

this difference was the assessed using t-tests: p=0.026 (grouped) and p=0.012 (ungrouped) between the 60 and 80 year old group for *Names* and p=0.006 (grouped) and p=0.003 (ungrouped) between the 60 and 70 year old group for *Appointment*. As ANOVA's are subject to a *homogeneity of variance assumption* (Kirk, 1990), a Levene's test for homogeneity of variance was conducted as it is not sensitive to departures from normality and test for violation of this assumption (Keppel, 1973). The results of this analysis were not significant for the *Appointment* sub-test, but were significant (0.001) for the *Names* sub-test. However, as the t-test results are very significant for this sub-test and the ungrouped p is even smaller than the grouped p, the Levene test result was not of concern.

Summary

Comparing the results for similar age groups revealed generally higher scores for the New Zealand study than the Oxford study, i.e., six of the thirteen comparisons showed significant differences, all of which were higher in the New Zealand sample. In comparing scores across the age groups, a general decline in scores is seen with an increase in age. However, this decrease is significant in only two of the twelve sub-tests and some sub-test results increase with an increase in age. The influence of these results on the two hypotheses is discussed in the following chapter.

CHAPTER 8:

Discussion:

Hypothesis 1.: There will be significant differences between the New Zealand and Oxford data.

A number of concerns regarding the Oxford data which may have confounded results were raised in Chapter 4. In recognition of these concerns and other differences between samples (such as cultures) it had been expected that there would be significant differences between the data obtained in the respective studies.

As expected, when like age groups were compared on each of the individual sub-tests, differences emerged. There were a number of factors which were thought to account for or contribute to these differences, some affecting all sub-tests, others influencing only specific sub-tests. These factors will be discussed individually.

Factors effecting all sub-tests:

1. Sample Population:

The participants making up the Oxford sample were all located through the register of a five doctor general practice. Of the 119 finally used in the data collection, 55% were not independent community dwelling, but fell into one of three groups including those in sheltered housing, attending the day hospital or in the community hospital. On average the sample population were receiving

regular assistance from a wide range of sources (Cockburn & Smith, 1989). The sample therefore represents a sub-population of individuals who were currently receiving medical attention , the majority of whom had lost a large degree of their independence. They are not therefore representative of a normal population of elderly people. By comparison, the New Zealand participants were community dwelling with those with possible early dementia screened out. The New Zealand group were therefore not truly representative of a normal elderly population either. While the UK sample would have had an over-representation of those with early dementia and who were unwell, the N.Z. sample would have an under-representation of such characteristics. If the purpose of using a measure of memory however is to determine the nature and extent that the scores of any one individual deviates from norms of a sample where memory is intact, then the N.Z. norms are more useful than those of the UK sample.

2. Culture:

The indiscriminate use of neuropsychological tests that have been standardized on specific populations may place individuals from diverse groups at a distinct disadvantage. This has been highlighted in the past by misclassification of individuals from diverse cultural groups as "intellectually inferior" because of a faulty assumption that the intelligence test used applied similarly to all those tested (Loewstein, ArgŸelles, ArgŸelles & Linn-Feuntes, 1994). Although the full effects of culture on memory testing falls beyond the scope of this study, it is important to mention that these effects are expected to influence the results obtained. These differences include variables such as education, living conditions, familiarity with testing and a large range of other factors. Information on these

variable were unavailable for the Oxford study preventing comparisons between the studies and examination of their possible influence. Recognition of these effects and provision of demographic data in the current study enables those assessing clients to work out how similar their client is to the New Zealand normative group. It should be noted however that the current data included only two Maori subjects.

3. Anxiety:

The effects of anxiety on test performance have been well documented by many researchers (Beech & Harding, 1990; Koenders, Passchier, Teuns, & van-Harskamp, 1993). If any steps were taken to keep anxiety levels to a minimum in the study conducted in Oxford, they were not mentioned. The Oxford participants were asked to complete a battery of 5 comprehensive tests which took a total of 1.5 hours to complete (Cockburn & Smith, 1989). This may have resulted in an increase in anxiety levels. In the current study each participant was only asked to set aside 35 minutes for the assessment. Further, efforts were made to reduce the anxiety levels of the participants in a number of ways. The setting, for the large majority of the testing, was a quiet office, with a large window overlooking a garden. Participants were engaged in general conversation and offered tea, coffee or water prior to any testing and wherever possible comfort was enhanced (for example; adjusting the room temperature or seating to individual needs).

4. Screening:

As the process of collecting normative data essentially requires a sample of non-dementing or normal participants, it would seem essential that some process for screening out dementing participants be employed. As previously mentioned this

was addressed in this study through the administration of the 12 item version of the MMSE prior to RBMT testing. No mention is made of the Oxford sample being screened in this way. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-1V) (American Psychiatric Association, 1994), 2%-4% of the population over 65 can be expected to have Dementia of the Alzheimer's Type (DAT) and this increases to 20% or more over the age of 85 years. It can therefore be assumed that a number of the participants in the Oxford sample were in fact dementing and further, since many were not community dwelling, that number could be disproportionate and the sample not representative of a normal population. This would cause the overall results, depending on the number of dementing participants in the Oxford study, to be lower than that of the N.Z. study in which 5 participants (4.0%) were excluded from the final normative evaluation for suspected dementia based on the MMSE screening.

It is acknowledged that in screening out these subjects, the sample is not truly representative of the general population.

5. Year of Testing, the effect of Time:

Although no practice effects of the test was expected (as all participants were being administered the test for the first time) the effect of general test familiarity may be a contributing factor to the observed differences. That assessment is more commonplace now than when the Oxford data was collected and the fact that the New Zealand data was from a different generation (that is; 60 when the Oxford sample was 68), may have contributed to the higher test performance of the New Zealand population. This familiarity would lower anxiety levels due to some knowledge about what was likely to transpire.

So as to ensure that responses and scores are obtained from contemporaneous samples of the population, standardized measures are periodically updated (for example; WAIS-R and WISC-R).

Specific sub-tests:

In addition to the general problem areas mentioned above, the significant differences found between the groups, may have been accounted for by factors related to specific sub-tests which will be discussed separately.

1. Immediate and Delayed Story Recall:

The New Zealand sample obtained significantly higher means than the Oxford sample on both of these sub-tests. It is likely that a New Zealand sample would have increased familiarity with the subject matter in the story compared to the Oxford sample which would clearly advantage recall. The theme of the story in the sub-test is a scrub fire, which are common in New Zealand and of significant concern to most citizens. Having both personal interest and possibly previous experience, would place New Zealanders at an advantage, that is; make it easier remember the story compared to a population dwelling in Oxford.

2. Message:

This sub-test requires the participant to follow a route, then to leave the 'message' envelope in a specified place. In this study it was determined through qualitative questioning that a large number of the participants who 'incorrectly' brought the message back to the examiner, did so only out of courtesy and not because they were unable to remember the steps followed by the examiner. On questioning or spontaneously they were able to clearly point out where the message should have

been left, indicating no difficulty in their memory. Because of this, these participants were given the points for leaving at the correct location. There has been no mention of this possibility arising in the Oxford sample and it can be assumed that a large number of the participants who lost points on this sub-test, did so because they were trying to be courteous and not because of memory deficits. This had been earlier noted through personal communication in a number of subjects tested outside this particular study and in age groups well below 60 years.

3. Orientation:

The effect of the Oxford sample, being hospitalized or lacking independence would seem to be particularly significant to this sub-test. As a large proportion of the Oxford sample population were not community dwelling, their familiarity with news which features presidents and prime ministers and the relevance of the days of the week could have been reduced. It is expected that this reduced exposure to the information assessed in the Orientation sub-test would cause an overall reduction in the scores achieved in this sub-test relative to the community dwelling, New Zealand sample population.

4. Date:

Higher results in the New Zealand sample were also obtained in this sub-test. The consent form completed prior to testing is expected to have influenced these results. Each participant was required to complete a consent form prior to testing which was dated. Although the forms were dated by the examiner and not the participant, this date was located just adjacent to the space where the participants were expected to sign. This would have allowed the participants the opportunity

to read the date only 10 minutes before being asked to recite it. It is not known how the Oxford researchers dealt with consent forms and although this information has been requested of them, no response has been received yet. It can be assumed though that if no such forms were used, the New Zealand sample would have had an advantage over those assessed in Oxford.

The effect of the sample population selected in Oxford is also expected to have influenced *Date* in much the same way as the *Orientation* sub-test mentioned above, in that the date may have much less significance to a hospitalized sample than to an independent, home dwelling sample.

Summary:

Comparisons between the Oxford and New Zealand results supports *Hypothesis 1*, that is; that there is a significant difference between these groups. This is no doubt due to a combination of age of test, characteristics of participants on which the RBMT was originally administered, different administration style and familiarity with test content (that is; *Story delayed and immediate*). It is suggested that the norms reported here for New Zealand subjects are more suitable for assessment of memory function than the Oxford norms, but that this applies strictly to New Zealand populations.

Hypothesis 2.: There will be significant decline in the sub-test means between the 3 age groups (60, 70 and 80 year olds).

No significant decline across the age groups was found with the overall profile scores, but the change, with age, in profile scores of 2 of the twelve sub-tests were

significant: *Names* and *Appointment*. The raw mean for *Names* decreased sharply from the 60 to the 70 age groups, but then increases again in the 80 year-olds. The raw mean for *Appointment* showed a constant and significant decrease from the 60 year old group through to the 80 year old group. It would therefore appear that the *Appointment* sub-test is the only sub-test out of a total 12 sub-tests that supports hypothesis 2.

These findings are contradictory to the findings of Balen, Westzaan & Mulder (1996) who conducted a study similar to this one in the Netherlands. In their study the decline with an increase in age was found to be significant in both *standard profile scores* and *screening scores.*

Details regarding the method of sample collection and the screening involved in the Oxford study are not available, but it is suggested that this may be the cause of the discrepancy. Despite all efforts to collect a random sample (for example: advertising in newspapers and newsletters, appealing directly to different groups, randomly approaching individuals and by asking those who had already volunteered to ask friends and family to volunteer.). It is possible for example, that the group of very old people in the current study, (80+), represents a population of people who felt confident to volunteer based on relatively high impression of their remembering ability. This is supported by the knowledge that fear of failure is especially high in the very old (Beech & Harding, 1990) and as a result those who felt they would perform poorly did not volunteer. This would also account for the higher than expected results in the 80+ age group and the absence of the expected significant decline with an increase in age.

Re-sampling this age group with revised sample collection methods that overcome the issue of fear of failure and control for some of the other influential variables in the very old may reveal differing results, but this is an area for further research.

Summary:

The expected decline with increasing age is not observed in these results with only two of the thirteen comparisons showing significant differences and only one of these two differences resulting from a decline with an increase in age. *Hypothesis 2* was therefore rejected.

Conclusions and areas for further research:

The RBMT remains a useful clinical measure for use with an elderly population. The 138 elderly participants of the current study were relaxed and comfortable with the testing. No testing took longer than 35 minutes, including the screenin0g for dementia and participants remarked that they found it enjoyable, even recommending it to their friends. These features (short and non-stressful) have not been identified in other tests of everyday working memory and coupled with high reliability and validity, make the RBMT a valuable clinical measure. The concerns regarding existing normative data for the RBMT have been addressed by the current study and as a result the RBMT is now well suited for the assessment of an elderly New Zealand population.

From the concerns regarding the Oxford normative data emerge a number of areas for further research: With stratified normative data the utility of existing

measures can be greatly enhanced and the measurement of rate of change may improve, as well as well as decision making in clinical neuropsychological rehabilitation (van Balen, Westzaan & Mulder, 1996). These stratified norms must take the effects of cultural differences on normative data into account and question the suitability of existing normative data for the population being assessed. In addition the changes observed with age present areas for further investigation and emphasize the potential need for further research into stratified normative data for all neuropsychological measures.

The present study has also revealed the lack of appropriate assessment tools for everyday memory in the elderly. Further, as everyday memory is of significant concern to the elderly and is vulnerable to the effects of aging, and as the numbers of elderly in the population are increasing every year, there is an ongoing need for improvement in testing everyday memory. Although the utility of the RBMT has now been improved by the present study, there is still a need for more tests of everyday memory to allow cross-test comparisons which improve the accuracy of decision making. New tests for working memory in the elderly is another area that needs to be addressed in further research.

REFERENCES:

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

Baddeley, A. (1984). Attention and retrieval from long-term memory. *Journal of Experimental Psychology: General, 113* (4), 518-540.

Balen, H.G., Westzaan, P.S.H. & Mulder, T. (1996). Stratified Norms for the Rivermead Behavioural Memory Test. *Neuropsychological Rehabilitation, 6* (3), 203-217.

Beech, J.R., & Harding, L. (Eds.). (1990). *Assessment of the Elderly.* London: NFER-Nelson.

Bendiksen, M. & Bendiksen, I. (1992). Abstract: A multi-dimensional intervention for a toxic solvent injured population. *Journal of Cognitive Rehabilitation, 10* (3) 20-27.

Bleecker, M.L., Bolla Wilson, K., Kowas, C. & Agnew. J. (1988). Age Specific Norms of the Mini Mental State Exam. *Neurology, 38,* 1565-1568.

Botwinick, J. (1978). *Aging and Behavior (2nd Ed.).* New York: Wiley.

Botwinick, J. & Storandt, M. (1980). Recall and Recognition of Old Information in Relation to Age and Sex. *Journal of Gerontology, 35,* 70-76.

Braekhus, A., Laake, K. & Engelkdal, K. (1992). The Mini Mental State Examination: Identifying the Most Efficient Variables for detecting Cognitive Impairment in the Elderly. *Journal of the American Geriatrics Society, 40,* 1139-1145.

Brazzelli, M., Della-Sala, S. & Laiacona, M. (1993). Abstract: Calibration of the Italian version of the Rivermead Behavioural Memory Test: A test for the ecological evaluation of memory. *Bollettino di Psicologia Applicata, 206,* 33-42.

Britton, P.G. & Savage, R.D. (1969). The Factorial Structure of the Minnesota Multiphasic Personality Inventory from a aged Sample. *The Journal of Genetic Psychology, 114,* 13-17.

Burke, D.M. & Light, L.L. (1981). Memory and Aging: The role of retrieval processes. *Psychology Bulletin, 90,* 74-88.

Chronholm, B. & Schalling, D. (1987). Cognitive Decline with Aging, and Working Capacity. In: *Society Stress and Disease, Old Age, 5,* 227-235. Oxford Medical Publication.

Clarke, G.P.Y. (1987). *Basic Statistics.* Pietermatizburg: Shutter & Shooter.

Cockburn, J. & Collin, C. (1988). Measuring Everyday Memory in Elderly People: A Preliminary Study. *Age and Aging, 17,* 265-269.

Cockburn, J. & Smith, P. (1989). *The Rivermead Behavioural Memory Test: Supplement 3: Elderly People.* Titchfield, Fareham Hants: Thames Valley Test Company.

Cockburn, J. & Smith, P. (1993). Correlates of everyday memory among residents of Part III homes. *British Journal of Clinical Psychology, 32*(1) 75-77.

Cockburn, J., Wilson, B., Baddeley, A. & Hiorns, R. (1990). Assessing Everyday Memory in Patients with Perceptual Deficits. *Clinical Rehabilitation,* 4(2) 129-135.

Cockburn, J., Wilson, B., Baddeley, A. & Hiorns, R. (1990). Assessing Everyday Memory in Patients with Dysphasia. *British Journal of Clinical Psychology, 29*(4) 353-360.

Coni, N., Davidson, W. & Webster, S. (1992). *Aging: The Facts (2nd Ed.).* London: Oxford University Press.

Cook, T.D., & Campbell, D.T., (1979). *Quasi Experimentation: Design and Analysis Issues for Field Settings.* Boston: Houghton Mifflin.

Craik, F. I. M. (1977). Age Difference in Human Memory. In Birren, J & Schaie (Eds.). *Handbook of the Psychology of Aging.* New York: McGraw-Hill.

Craik, F.I.M. (1979). Human Memory. *Annual Review of Psychology, 30,* 63-102.

Craik, F.I.M. & Byrd, M. (1981). Aging and Cognitive Deficits: The Role of Attentional Resources. In F.I.M. Craik & Trehub (Eds.), *Aging and Cognitive Processes.* London: Plenum Press.

Craik, F.I.M. (1991). Peace pipes round the TODAM pole: A puff for short-term memory. In W.E. Hockley & S. Lewandowsky (Eds.), *Relating theory*

and data: Essays on human memory in honor of Bennet B. (pp. 195-203). Hillsdale: Erlbaum.

Cummings, J.L. (1989). Dementia of the Alzheimer's Type: Challenges of Definition and Clinical Diagnosis. In: F. Boller & J. Grafman (Eds), *Handbook of Neuropsychology.* New York: Wiley.

Denney, N. W. (1974). Evidence for Developmental Changes in Categorization Criteria for children and Adults. *Human Development, 17,* 41-53.

Drebing, C. E., Van Gorp, W. G., Stuck, A. E., Mitrushina, M. & Beck, J. (1994). Early Detection of Cognitive Decline in Higher Cognitive Functioning Older Adults: Sensitivity and Specificity of a Neuropsychological Screening Battery. *Neuropsychology, 8*(1), 31-37.

Duffy, L. & O'Carroll, R (1994). Memory impairment in Schizophrenia: A comparison with that observed in the Alcoholic Korsakoff Syndrome. *Psychological Medicine, 24*(1) 155-165.

Evans, J., & Wilson, B. (1992). A memory group for individuals with brain injury. *Clinical Rehabilitation, 6*(1) 75-81.

Evans, D.A., Funkenstein, H.H.,Albert, M.S., Scherr, P.A., Cook, N.R., Chown, M.J., Hebert, L.E., Hennekens, C.H., & Taylor, J.O. (1989). Prevalence of Alzheimer's Disease in a Community Population of Older Persons: higher than previously reported. *J.A.M.A., 262*, 2551-2556.

Folstein, M.F., Folstein, S.E. & McHugh, P.R. (1975). Mini Mental State: A Practical Method for Grading the Cognitive State of Patients for the Clinician. *Journal of Psychiatric Research, 12*, 189-198.

Glass, J. (1996, August). *Approaches to Detecting Early Dementia in the Elderly.* Paper presented at the meeting of the Australasian Winter Conference on Brain Research, Queenstown, New Zealand.

Heilman, M.K. & Valenstein, E. (Eds.) (1993). *Clinical Neuropsychology (3rd ed.)*. London: Oxford University Press.

Hochandal, G. & Caplan, E. (1984). Neuropsychology of Normal Aging. In M.L. Albert (Ed.), *Clinical Neurology of Aging*. New York: Oxford University Press.

Jutigar, R. (1994). Psychological Aspects of Aging: When does memory loss signal dementia?, *Geriatrics, 49*, 45-53.

Kaszniak, A.W., (1986). The Neuropsychology of Dementia. In: G.I. Adams, (Eds.), *Neuropsychological Assessment of Neuropsychiatric Disorders*. Oxford University Press.

Katzman, R. (1986). Alzheimer's Disease. *National English Journal of Medicine, 314*, 964-973.

Kemper, S. (1992). Adults' sentence fragments: Who, what, when, where, and why. Special Issue: Communication and aging: Cognition, language, and relationships. *Communication Research, 19*(4), 444-458.

Kendrick, D.C. (1972). The Kendrick Battery of Tests: Theoretical Assumptions and Clinical Uses. *British Journal of Clinical and Social Psychology, 11*, 373-386.

Kendrick, D.C. (1982). Why assess the aged? A clinical psychologist's view. *British Journal of Clinical Psychology, 21*(1), 47-54.

Keppel, G. (1973). *Design and Analysis: A researches handbook.* New York: Prentice Hall.

Kirk, R. (1990). In Holt, Rinehart & Winston (Eds.). *Statistics: An Introduction.* New York: Wiley.

Koenders, M., Passchier, J., Teuns, G. & van-Harskamp, F., (1993). Trait-anxiety and Achievement Motivation are Positively correlated with Memory Performance in Patients who visit a Geriatric Outpatient Clinic with Amnestic Symptoms. *Psychological Reports, 73*(3, Pt 2), 1227-1231.

La-Rue, A., O'Hara, R., Matsuyama, S. & Jarvik, L.F. (1995). Cognitive changes in young-old adults: Effect of family history of dementia. *Journal of Clinical and Experimental Neuropsychology, 17*(1), 65-70.

Lewin, B. (1995). *Genes 5.* New York: Oxford University Press.

Lezak, M.D. (1983). *Neuropsychological Assessment (2rd ed.).*

New York: Oxford University press.

Lezak, M.D. (1995). *Neuropsychological Assessment (3rd ed.).* New York: Oxford University press.

Linnemann, G. (1991). On the Rivermead Behavioural Memory Test. *Nordisk Psykologi, 43*(2), 81-96.

Loewstein, D. A., Argüelles, T., Argüelles, S. & Linn-Feuntes, P. (1994). Potential Cultural Bias in the Neuropsychological Assessment of the Older Adult. *Journal of Clinical and Experimental Neuropsychology. 16*(4), 623-629.

Mayes, A., & Warburg, R. (1992). Memory Assessment in Clinical Practice and Research. In J.R. Crawford, D.M. Parker, & McKinlay (Eds.), *A Handbook of Neuropsychological Assessment,* pp. 73-101. Hillsdale, NJ: Erlbaum.

McKenna, P., Tamlyn, D., Lund, C., & Mortimer, A. (1990). Amnesiac syndrome in schizophrenia. *Psychological Medicine, 20*(4) 967-972.

Morris, J. C., Heyman, A., Mohs, R. C., (1989). The Consortium to establish a Registry for Alzheimer's Disease (CERAD). Part 1: Clinical and

Neuropsychological Assessment of Alzheimerís Disease. *Neurology, 39,* 1159-1165.

New Ethicals Catalogue (Vol 33 (2)). (1996). New Zealand: Graeme S. Avery.

Oken, B.S. & Kaye, J.A. (1992). Electrophysiologic function in the healthy, extremely old. *Neurology, 42*(3, Pt 1), 519-526.

Park, D.C. (1994). Aging, cognition, and work. Special Issue: State-dependent cognitive functioning (2). *Human Performance, 7*(3), 181-205.

Pearson, C. (1996). The RBMT in an Occupational Therapy Setting. In Press.

Perlmutter, R.A. (1982). The borderline patient in the emergency department: An approach to evaluation and management. *Psychiatric Quarterly 54*(3), 190-191.

Plum, F. (1979). Dementia: an approaching epidemic. *Nature, 279.* 372-373.

Rabbit, P. (1982). How to Assess the Aged? An Experimental Psychologists View. Some Comments on Dr. Kendrickís Paper. *British Journal of Clinical and Social Psychology, 21,* 55-59.

Reid, W. J., (1994). Neuropsychological Assessment of Dementia. In: S. Touyz (Eds.), *Neuropsychology in Clinical Practice,* pp. 248-267. New York: Wiley.

Roelands, M., Wostyn, P., Dom, H. & Baro, F. (1994). The prevalence of dementia in Belgium: A population-based door-to-door survey in a rural community. *Neuroepidemiology, 13*(4), 155-161.

Sagar, H. (1990). Aging and age-related neurological disease: Remote memory. In R.D. Nebes & S Corkin (Eds.), *Handbook of neuropsychology, 4,* pp. 311-324. London: Elsevier.

Schaie, K.W. (1973). Methodological Problems in Descriptive Developmental Research on Adulthood and Aging. In: J.R. Nesselroade, & H.W. Reese (Eds.), *Life-span Development Psychology.* New York: Academic Press.

Schapiro, M., Kumar, A., White, B. & Fox, D. (1990). Dementia without mental retardation in mosaic translocation Down's syndrome. *Brain Dysfunction, 3*(3-4) 165-174.

Shearer, D.E., Emmerson, R.Y. & Dustman, R.E. (1989). EEG relationships to neural aging in the elderly: Overview and bibliography. *American Journal of EEG Technology, 29*(1), *43-63.*

Stern, R.G., Mohs, R.C., Davidson, M. & Schmeidler, J. (1994). A longitudinal study of Alzheimer's disease: Measurement, rate, and predictors of cognitive deterioration. *American Journal of Psychiatry, 151* (3) 390-396.

Strickberger, M. W., 1985. *Genetics, Third Edition.* London: Macmillan.

Sunderland, A., Harris, J.E. & Baddeley, A.D. (1983). Do laboratory tests predict everyday memory? A neuropsychological study. *Journal of Verbal Learning and Verbal Behavior, 22,* 341-357.

Thal, L.J. (1989). Pharmacological Treatment of Memory Disorders. In: F. Boller & J. Grafman (Eds), *Handbook of Neuropsychology.* New York: Wiley.

Tombaugh, T.N. & McIntyre, N.J., (1992). The Mini Mental State Examination: A Comprehensive Review. *Journal of the American Geriatric Society, 40,* 922-935.

Whitehouse, P.J., Lerner, A. & Hedera, P. (1993) Dementia. In: K. Heilman & E. Valenstein (Eds.), *Clinical Neuropsychology, Third Edition.* 603-645. Hillsdale, NJ: Erlbaum.

Wilson, B.A., Baddeley, A.D., Cockburn, J. & Hiorns, R. (1985). *Rivermead Behavioural Memory Test:* (Suppl. 2). Titchfield, Fareham Hants: Thames Valley Test Company.

Wilson, B.A., Cockburn, J., Baddeley, A.D., & Hiorns, R.W. (1989). The Development and Validation of a Test Battery for detecting and monitoring Everyday Memory Problems. *Journal of Clinical and Experimental Neuropsychology, 11,* 855-870.

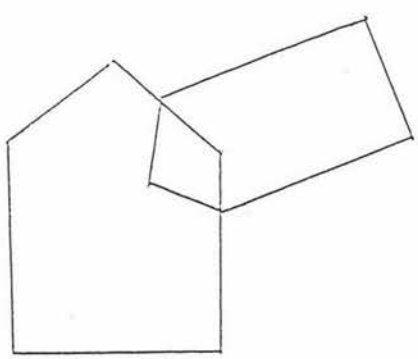
Wilson, B.A. (1991). Long-term prognosis of patients with severe memory disorders. *Neuropsychological Rehabilitation, 1*(2) 117-134.

Wilson, B.A. (1993). Ecological validity of neuropsychological assessment: Do neuropsychological indexes predict performance in everyday activities? *Applied and Preventive Psychology, 2*(4) 209-215.

Appendix I

12 ITEM VERSION OF THE MMSE

		(Score 1 or 0) Max Score	Score
1.	What is the year?	1	0
2.	What is the month?	1	0
3.	What is the date?	1	0
4.	What is the day of the week?	1	0
5.	In which province are we?	1	0
6.	What ward number is this? or What is your street number?	1	0
	Name three objects, then ask the patient to repeat them after you until they have been learned. Don't give any score at this point Objects 1._____2._____3._____		
7.	Spell "WORLD" backwards; (give one point if three or more letters are correct)	1	0
8.	Ask for the three objects learned earlier in this session; give one point if one or more words are reproduced correctly. 1._____2._____3._____	1	
9.	Repeat the following - 'no ifs, ands, or buts'	1	0
10.	Perform a three-stage command: Take this paper in your right hand, fold it in half, and pass it back to me'. Give one point if all stages are completed. (Note: Take care not to hold your hand out for the paper until it is returned!)	1	0
11.	Write a sentence _____ _____ _____	1	0
12.	Copy the design below (all 10 angles represented)	1	0



	Total 12	0

Appendix II

Wanted: Volunteers for memory test study

Taranaki Healthcare is looking for volunteers to take part in a study to gather data on aspects of memory in mature age people.

The study aims to find how the day to day memory function of local people aged between 60-90 years compares to a British sample of the same age group. Data gathered will be used as standards against which to compare the performance of people with suspected memory impairment. The study has the approval of the Hospital Ethics Committee.

It is part of a wider research project being conducted by psychologist John Glass who works in the Assessment and Rehabilitation Unit at Taranaki Base Hospital. John is being assisted by Sean Fraser, a post graduate student from Massey University.

Part of John's work at A&R involves assessing aspects of memory function in people over the age of 65 years. "Usually the assessment is requested because of suspicion of poorer memory than is normal for the age of the client. Since adequate memory is a core requirement for day-to-day living, it is important to know how memory is performing and what, if any, remedial techniques or aids will be helpful."

"It is quite common to find older people who believe that poor memory is a natural consequence of ageing but while some memories do fade, our day to day or 'working' memory should remain relatively intact."

The CHE study involves volunteers taking a short test of working memory plus a short side test with a total time involvement of 25 to 30 minutes. Volunteers can opt to complete the test in their own homes or they can choose to take them in the outpatients' area in the A&R Unit.

"Most people find it an interesting and stimulating experience and it is absolutely painless! All data remains confidential and no one person will be able to be identified since all scores are pooled in five year age bands."

If you would like to volunteer and are aged between 60 and 90 years or if you would like to find out more about the research, contact John Glass at Base Hospital (753-6139 ext 7462) and leave your name and phone number. Alternatively, just clip out this article, write you name and address/phone number on the edge and post it to John Glass, c/o A&R Unit, Taranaki Base Hospital.

Mature volunteers wanted

Taranaki Healthcare is looking for men and women aged in the late 70's and above to take part in a research study on memory.

Additional volunteers are needed to take part in the study which was publicised in the Midweek earlier this year. The study was set up to look at the day-to-day memory function of mature age people (age 60-90 years). If you are interested in knowing a little bit about how your memory is working and can spare about 30 minutes, please phone John Glass at Taranaki Base Hospital on (06) 753 6139.

Or if you prefer, you can cut this article and write your name and phone number beside it - post it to the hospital and they will contact you. The measure takes only 30 minutes to complete and can be taken in your own home if you prefer.

Appendix III

AGREEMENT TO TAKE PART IN A RESEARCH PROJECT AIMED AT ESTABLISHING NEW ZEALAND NORMATIVE DATA FOR THE RIVERMEAD BEHAVIOURAL MEMORY TEST

Name: .....

Address: .....

.....Phone No: .....

Age: .....Date of birth: .....

Number of years of education: .....

My main paid occupation was/is: .....

I consider my day-to-day memory to be:	Tick one
- About average for my age	☐
- Above average for my age	☐

I have no history of neurological problems.

I have no history of serious cardiac or respiratory problems.

I generally consider myself to be in reasonable physical health for my age.

I agree to completing:

1. A brief cognitive screen
2. A test of working memory

I have read the attached and I am happy to take part as a volunteer.

....

Signature Date

SUBJECT NO: ☐

project3

Appendix IV

Taranaki Healthcare Ltd.
Private Bag 2016
New Plymouth 4620
New Zealand
Tel: 06 - 753 6139
Fax: 06 - 753 7770

TARANAKI
HEALTHCARE

Better with us

Taranaki Base Hospital
Private Bag 2012
New Plymouth 4620, NZ
Tel: 06 - 753 6139
Fax: 06 - 753 7710
Hawera Hospital
P O Box 98
Hawera, NZ
Tel: 06 - 278 7109
Fax: 06 - 278 8018
Stratford Hospital
Romeo Street
Stratford, NZ
Main: 06 - 765 7189
Maternity: 06 - 765 7078
Fax: 06 - 765 6110

To Participants in Memory Assessment Study.

Thank you for your interest in helping with the development of New Zealand Standardisation Data for the Rivermead Behavioural Memory Test (RBMT).

This is a short test of day-to-day memory which is very useful for detecting early memory problems in older populations. The test was developed in Oxford, UK, and standards for 'normal' performance were made available for people aged between 60 and 94. For the test to be maximally useful, it is desirable to extend the UK data and to check how a group of healthy older New Zealanders perform on the test. Ideally, we should obtain a similar pattern of scoring to the UK group. In general, the more reliable the data pool on the test (the norms), the more confident we can be about interpreting an individual's performance on it.

If you would like further information about the process or test development, please don't hesitate to talk with me.

If you are agreeable to taking part, you will be asked to take two short tests - one a short screening test and the other the RBMT. Both tests will be administered by myself or a Psychology student (who will be trained in what to do).

The two tests will take no longer than 20-25 minutes to complete in total.

You can choose to take the tests at home if you prefer, otherwise I will arrange a suitable time and place for you to attend.

No payment or other expenses will be available to you for taking part in the test exercise.

The detail of your test results will not be discussed with you and, once completed, the data will be pooled with that of other participants. There will be no way to identify any individual participant from the pooled data. However, the test file will be stored and kept for seven years in the event that it might be useful for other research at a later date.

You can be assured of complete confidentiality.

Should you have any concerns about your performance following the tests, you are welcome to ask for an appointment with me at which time these concerns will be discussed. If appropriate, you could be offered a full cognitive assessment at no charge at a suitable time.

Having volunteered to take part, could you please answer the questions on the attached form and return this form to me in due course. I will then contact you to arrange a suitable time and location for the tests.

Should you decide that you do not wish to take part after you have returned the consent form, just give me a call and I'll remove you from my list of volunteers.

Yours sincerely

John Glass
Psychologist (Regd)
ASSESSMENT & REHABILITATION UNIT

Phone: 7537747, Ext. 7462

Appendix V

TVTC
Thames Valley Test Company

RBMT

The Rivermead
behavioural memory test

Procedural guide and scoring sheet

- This scoring sheet provides a summary procedure to ensure that the test is consistently carried-out in the correct order.
- Please follow the instructions in the Manual for detailed procedural and scoring guidance.

Subject and test details

Name

Date of birth

Date of test

Assessment 1 ☐ 2 ☐ 3 ☐ 4 ☐

Version A (Red) ☐ B (Blue) ☐ C (Green) ☐ D (Brown) ☐

• 1 and 2 First and Second Name

Action
Present the portrait for 'Remembering a name'.
A Catherine Taylor
B Henry Fisher
C Pauline Roberts
D Philip Goodwin

• 3 Belonging

Action
Hide a belonging for 'Remembering a hidden belonging'.
A Desk drawer
B Cupboard
C Filing cabinet
D Brief case or bag

• 4 Appointment

Action
Set the timer for 'Remembering an appointment'.
A 'When do I have to see you again?'
B 'When does this session end?'
C 'When will I know the results of the test?'
D 'What time do we finish today?'

• 5 Pictures

Action
Present the ten presentation cards for 'Picture recognition'.

• 6a Story (immediate)

Action
Read the prose passage from the separate Story Sheet. Then ask the subject to recall the prose passage.
Response
Adopt your own technique (e.g. underlining and encircling) for recording each of the 21 'ideas' correctly recalled or partially recalled against the appropriate passage on the Story Sheet.
Scoring
Scoring is based on points awarded for the number of 'ideas' correctly recalled. You should therefore count and calculate *after* the test has been completed.

☐ *Raw Score*
Each 'idea' recalled word-perfect or using a close synonym = 1
Each 'idea' partially recalled, or recalled with approximate synonym = ½
(Maximum = 21)

☐ *Standardised Profile Score*

Raw Score	≤3.5	4–5.5	≥6
Standardised Profile Score	0	1	2

Screening Score
Score later

• 5 Pictures

Action
Present the 20 recognition cards for 'Picture recognition'.
Response
Tick each picture identified correctly. (Those pictures which were previously presented are indicated by superior figures on the reverse of the picture cards.)

1	2	3	4	5	6	7	8	9	10

Total ☐

Record the number of false positives ☐

Scoring

☐ *Raw Score*
Subtract the number of false positives from the total number of pictures correctly identified
(Maximum = 10)

☐ *Standardised Profile Score*

Raw Score	≤8	9	10
Standardised Profile Score	0	1	2

◯ *Screening Score*
All ten pictures identified correctly with no false positives = 1
(Otherwise = 0)

• 7 Faces

Action
Present the five presentation cards for 'Face recognition'.

• 8a Route (immediate)

Action
Demonstrate the route for 'Remembering a short route' (immediate). (Leave the 'Message' envelope for 'Remembering to deliver a message' at the location marked by an asterisk below.) Then ask the subject to reproduce the route. Record each of the stages reproduced correctly below. The subject's response to 'Remembering to deliver a message' should be recorded in the next section.
Response
Tick each stage of the route correctly recalled:

A Chair	door	window	table*	chair
B Door	window*	table	chair	door
C Window	table	chair*	door	window
D Table	chair	door*	window	table

Scoring

☐ *Raw Score*
Total number of stages recalled correctly
(Maximum = 5)

☐ *Standardised Profile Score*

Raw Score	≤3	4	5
Standardised Profile Score	0	1	2

◯ *Screening Score*
All five stages of the route recalled in the correct order = 1
(Otherwise = 0)

• 9a Message (immediate)

Action
When demonstrating the route, leave the 'Message' envelope for 'Remembering to deliver a message' (immediate) at the location marked by an asterisk above.
Response
Tick as appropriate:
'Message' envelope picked-up spontaneously ☐
picked-up after prompt ☐
left at correct location ☐

Scoring

☐ *Raw Score*
'Message' picked-up spontaneously = 2
picked-up after prompt = 1
left at correct location = another 1
(Maximum = 3)

Standardised Profile Score
Score later

Screening Score
Score later

• 7 Faces

Action
Present the ten recognition cards for 'Face recognition'.
Response
Tick each face identified correctly. (Those faces which were previously presented are indicated by superior figures on the reverse of the face cards.)

1	2	3	4	5

Total ☐

Record the number of false positives ☐

Scoring

☐ *Raw Score*
Subtract the number of false positives from the total number of faces correctly identified
(Maximum = 5)

☐ *Standardised Profile Score*

Raw Score	≤3	4	5
Standardised Profile Score	0	1	2

◯ Screening Score
All five faces identified correctly with no false positives = 1
(Otherwise = 0)

• 10 and 11 Orientation and Date

Action
Ask the ten questions for 'Orientation' and 'Date' in the order given below:
Response
Record the subject's responses in the spaces provided:

1 Year	2 Month	3 Day of week
4 Date	5 Place	6 City or town
7 Age	8 Year born	9 Prime Minister

10 President

Scoring

☐ *Raw Score*
Score one point for each correct response.
• Total number of correct responses to Orientation questions i.e. excluding Date
(Maximum = 9)
• Correct Date
(Maximum = 1)

☐ *Standardised Profile Score*
• Orientation questions

Raw Score	≤7	8	9
Standardised Profile Score	0	1	2

• Date

Raw Score	≤ Two days out	One day out	Correct
Standardised Profile Score	0	1	2

Screening Score
• Orientation questions
All nine Orientation questions answered correctly = 1
(Otherwise = 0)
• Date
Correct Date given = 1
(Otherwise = 0)

• 4 Appointment

Action
Engage the subject in conversation until the timer sounds for 'Remembering an appointment'. Prompt if necessary.
A 'When do I have to see you again?'
B 'When does this session end?'
C 'When will I know the results of the test?'
D 'What time do we finish today?'
Response
Tick as appropriate:
Subject asked appropriate question spontaneously
after prompt
Subject remembered that something had to be asked but could not remember what it was

Scoring

Raw Score
Subject asked appropriate question spontaneously = 2
after prompt = 1
Subject remembered that something had to be asked but could not remember what it was = 1
(Maximum = 2)

Standardised Profile Score

Raw Score	0	1	2
Standardised Profile Score	0	1	2

Screening Score
Appropriate question asked without prompt when timer sounded = 1
(Otherwise = 0)

• 6b Story (delayed)

Action
Ask the subject to recall the prose passage for 'Delayed prose recall'. Give opening prompt if necessary.
Response
Record each of the 'ideas' correctly recalled or partially recalled against the appropriate passage on the Story Sheet.
Scoring
Score exactly as for 'Immediate prose recall' *but deduct one point if the subject needed an opening prompt.*

Raw Score
Each 'idea' recalled word-perfect or using a close synonym = 1
Each 'idea' partially recalled, or recalled with approximate synonym = ½
(Maximum = 21)

Standardised Profile Score

Raw Score	≤1.5	2–3.5	≥4
Standardised Profile Score	0	1	2

Screening Score
If the subject recalled at least six 'ideas' on 'Story (immediate)' and at least four 'ideas' on 'Story (delayed)' = 1
(Otherwise = 0)

• 8b Route (delayed)

Action
Ask the subject to reproduce the route for 'Remembering a short route' (delayed). Record each of the stages reproduced correctly below. The subject's response to 'Remembering to deliver a message' (delayed) should be recorder in the next section.
Response
Tick each stage of the route correctly recalled:

A Chair	door	window	table*	chair
B Door	window*	table	chair	door
C Window	table	chair*	door	window
D Table	chair	door*	window	table

Scoring

Raw Score
Total number of stages recalled correctly
(Maximum = 5)

Standardised Profile Score

Raw Score	≤3	4	5
Standardised Profile Score	0	1	2

Screening Score
All five stages of the route recalled in the correct order = 1
(Otherwise = 0)

• 9b Message (delayed)

Action
Remind the subject, if necessary, about the 'Message' envelope for 'Remembering to deliver a message' (delayed). The location is marked by an asterisk above.
Response
Tick as appropriate:
'Message' envelope picked-up spontaneously
picked-up after prompt
left at correct location

Scoring

Raw Score
'Message' picked-up spontaneously = 2
picked-up after prompt = 1
left at correct location = another 1
(Maximum = 3)

Standardised Profile Score
The Standardised Profile Score for 'Remembering to deliver a message' is based on the sum of the Raw Scores obtained for the immediate and delayed recalls (therefore maximum Raw Score = 6).

Sum of Raw Scores	≤4	5	6
Standardised Profile Score	0	1	2

Screening Score
If the subject spontaneously picked-up the 'Message' envelope and left it at the correct location in the immediate and delayed recalls = 1
(Otherwise = 0)

• 1 and 2 First and Second Name

Action
Re-present the portrait for 'Remembering a name'.
Give first letter prompt if necessary.
A Catherine Taylor
B Henry Fisher
C Pauline Roberts
D Philip Goodwin
Response
Tick as appropriate

First Name recalled without prompt
recalled with prompt
Second Name recalled without prompt
recalled with prompt

Scoring

Raw Score
• First Name recalled without prompt = 2
recalled with prompt = 1
(Maximum = 2)
• Second Name recalled without prompt = 2
recalled with prompt = 1
(Maximum = 2)

Standardised Profile Score
The Standardised Profile Score for 'Remembering a name' is based on the sum of the Raw Scores obtained for the recall of the First and Second Names (therefore maximum Raw Score = 4).

Raw Score	≤2	3	4
Standardised Profile Score	0	1	2

Screening Score
• If the subject recalled the First Name without prompt = 1
(Otherwise = 0)
• If the subject recalled the Second Name without prompt = 1
(Otherwise = 0)

• 3 Belonging

Action
Inform the subject that 'We have finished this test'.
Wait for recall of 'Remembering a hidden belonging'.
Prompt if necessary.

A Desk drawer
B Cupboard
C Filing cabinet
D Brief case or bag
Response
Tick as appropriate:
Place recalled without prompt
recalled with prompt
Item recalled without prompt
recalled with prompt

Scoring

Raw Score
Place recalled without prompt = 2
recalled with prompt = 1
Item recalled without prompt = 2
recalled with prompt = 1
(Maximum = 4)

Standardised Profile Score

Raw Score	≤2	3	4
Standardised Profile Score	0	1	2

Screening Score
If the subject spontaneously recalled the item and the place where it was hidden = 1
(Otherwise = 0)

Score summary

	Standardised Profile Score (2,1 or 0)	Screening Score (1 or 0)
1 First Name		
2 Second Name		
3 Belonging		
4 Appointment		
5 Pictures		
6a Story immediate		
6b delayed		
7 Faces		
8a Route immediate		
8b delayed		
9 Message (immediate & delayed)		
10 Orientation (not including date)		
11 Date		
Total	maximum = 24	maximum = 12