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Bilingualism and dementia : the relationship between linguistic variables and cognitive performance in early dementia.

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BILINGUALISM AND DEMENTIA:

THE RELATIONSHIP BETWEEN LINGUISTIC VARIABLES AND COGNITIVE PERFORMANCE IN EARLY DEMENTIA

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BILINGUALISM AND DEMENTIA:
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ABSTRACT

A longitudinal methodology was adopted with the aim of investigating some of the bilingual linguistic factors which might operate in older adults in the early stages of dementia. 120 referrals from General Practitioners in North Wales were obtained. Of the 41 which met the criteria at follow up, 25 completed data collection. The Kendrick Cognitive Tests for the Elderly (KCT) and the Wechsler Memory Scale (WMS) were used to diagnose dementia in the study. 16 subjects were diagnosed as suffering from dementia by the end of the study period. Subscales of the Boston Diagnostic Aphasia Examination Battery (BDAE) and the Token Test were used to assess language skills. All tests were randomly administered in Welsh and English over a period of four days at six monthly intervals for between eighteen months and two years. A Language Use and Contact Questionnaire (LUCQ) was designed for the study as a semi structured interview schedule.
A significant performance deterioration in the dementia subjects was found.

As no method of measuring bilinguality could be identified from the literature it was hypothesised that performance change in dementia could distinguish between a predominantly "Welsh" or "bilingual" subject. It was then hypothesised that past language use and contact over six developmental life stages (as measured by the questionnaire developed for this study) would be related to present performance

deterioration (measured in %change scores).

Findings do not support this hypothesis. Qualitative analyses of cases identified on the basis of their past linguistic contact and dementia severity identified Translation and Asides as strategies to facilitate response.

The study identified Subscales which were both sensitive and resistant to dementia and an order of decline in language skills was identified.

The main findings of the study were discussed in relation to methodological issues, clinical implications and future research directions.

BILINGUALISM AND DEMENTIA:
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CHAPTER ONE

INTRODUCTION

I. THE PROBLEM OF DEMENTIA

A consequence of medical advances in the twentieth century has been a marked increase in life expectancy and the resulting growth of older adults in the population. An analysis of demographic trends (Compendium of health statistics, O.H.E., 1984) indicates that, in absolute terms, the United Kingdom elderly population has increased by approximately three million people over the last thirty years. In fact the population aged 65 to 74 has increased by 39% whilst those over 75 has increased by 94% over the same thirty year period. The elderly population now accounts for 15% of the total United Kingdom population.

In North Wales at the start of the study to be described over 18% of the population were over 65. Projected figures indicate little change in the 65 to 74 age group but a steady increase in those over 75 years of age by the year 2001.

Along with this growth has come an increase in the problems associated with old age. A serious challenge to the caring professions comes from the large increase of those diagnosed as having `dementia'. The prevalence of dementia in the population aged 65 years and over has been estimated at between 5% to 15%, rising steeply with age to between 20% and 40% at 80 years of age (Levy and Post, 1982). Given the nature of the problem (to which we will return shortly) research concerned with the processes of cognitive change in "dementia" is urgently required. This study

will address a particularly important area: the nature of dementia in a bilingual (speaking both Welsh and English) population. The researcher was well placed for such a study being herself bilingual in Welsh and English with access to a bilingual population.

For an individual who develops dementia a gradual deterioration of physical and cognitive abilities (which comprise memory, perception, intelligence and language) occurs. The consequences of this includes management problems both for service providers and for families. As the dementia progresses communication difficulties often lead to distress for the individual unable to understand what is happening both within and around themselves.

II. THE APPROACH AND SCOPE OF THIS STUDY

The Extent of Bilingualism

Most nations of Europe are multiethnic and as a result multilingual (MacNamara, 1967). More than half the world in fact speak more than one language (Romaine, 1989). Theories of language development and Memory systems have demonstrated that the left hemisphere is dominant for language in most humans, that is, language in some way has a special dependence on the anatomical structures and physiological activity of the left hemisphere. This evidence however, has been collected almost exclusively from monolinguals. There is no special reason to assume that the second language is located in the brain in the same manner as for monolinguals. It has been proposed that the learning of a second language in some way may influence the subtle interactions between left and right hemispheres and between cortical and subcortical structures. Hence cerebral function may be different

if there are two languages (Albert and Obler, 1978).

When 'The Bilingual Brain' was published in 1978 the authors (Albert and Obler) proposed this notion to explain their findings when working in Israel as Neurologists. In their work they regularly encountered people who spoke more than one language, for example two (bilingual) or three (trilingual or polyglot). This suggestion called for a reappraisal of language theory.

Bilingualism in Wales

In the study to be described the bilingual nature of North Wales is viewed as a potentially important factor and an added complication to cognitive changes in older adults with dementia. For every 1,000 people over 3 years of age, 612 are Welsh speaking. The county of Gwynedd has a total of 135,000 people who speak Welsh (the highest ratio of Welsh speakers in Wales) whilst in the county of Clwyd this is estimated at 70,000. It is possible to calculate the occurrence of dementia in a bilingual population taking prevalence estimates, to arrive at an approximate figure for the area. Table 1.1 shows the summary of incidence.

TABLE 1.1 THE NUMBER OF BILINGUAL CASES OF DEMENTIA

	GWYNEDD	CLWYD	TOTAL (North Wales)
Population in thousands	232 (37%)	395 (63%)	627 (100%)
Welsh speakers	135 (21%)	70 (11%)	205 (33%)
Welsh speaker Over 65	24 (3.8%)	12 (1.9%)	36 (5.7%)
Welsh speaking over 65, dementing	2.4 (0.38)	1.2 (0.19%)	3.6 (0.57%)

Table 1.1 shows the population at the start of the study in North Wales. From this the number of bilingual cases of dementia are calculated (based on the 10% estimated by Kay, 1964).

It can be seen from Table 1.1 that in North Wales at the start of the study there are potentially 3,600 people who are Welsh speaking, over 65 years of age and likely to be suffering from dementia (based on the 10% estimated by Kay, 1964).

In the area where this study was conducted, nursing staff and doctors who do not speak Welsh have frequently reported instances of bilingual older adults suffering from dementia being unable to communicate. They appear only to be able to speak and understand Welsh. It seems that the ability to speak and understand English has been lost (Hughes, 1981 documents some examples).

Why are these examples common and what has occurred? It is the aim of this research to explore these questions and to describe how the dementing process may influence the bilingual person.

The following chapters, give an overview of current research and understanding of both dementia and bilingualism. Particular focus will be given to the reports of language changes in dementia, before proceeding to explore the issue of bilingualism.

The implications of dementia research on the contribution made by psychologists in the assessment and diagnosis of dementia will be discussed. The issue of bilingualism in this context will be addressed and reasons given as to why current procedures have to be reviewed when conducting an assessment of a bilingual person who is suspected of suffering from dementia. The role of bilingualism requires modification of the prevailing models put forward to account for the cognitive changes observed in dementia.

CHAPTER TWO

PART ONE: AN INTRODUCTION TO DEMENTIA

1. The Use of the Term `Dementia'

The term `dementia', has been used for three different purposes:

i) a label
ii) a diagnosis
iii) a syndrome

The result of having three meanings for the word `dementia' can result in lack of clarity. When used as a label it has described a general picture of confusion without regard for cause or outcome. As a diagnosis it has a specific clinical meaning which carries a set of assumptions about cause and prognosis. When used to describe a syndrome it encompasses a variety of conditions and illnesses some of which may be reversible, others not (Lishman, 1978; Miller, 1977).

The label `dementia' is often used for both reversible and irreversible conditions. Using the label may mean little more than a confusion state in older adults. The objection to its use is that people frequently confuse a descriptive label with a diagnosis with implication for prognosis, often the prognosis being pessimistic i.e. it is irreversible, (Newbern, 1991 gives examples of misdiagnosis). Once a label is given it is difficult to withdraw. The word itself carries sinister connotations that among the general public give rise to fears and concern. This is especially so among older adults themselves (Hanley and Hodge, 1984). Care should be taken to clearly define meaning

of terms and reserve use to a specific condition.

Making a diagnosis should inform therapeutic decisions and intervention and meet individual needs. The difficulty with a diagnosis of dementia is that there are significant differences between people who are diagnosed as having dementia. This difference exists both in course and length of the disease. This means that no one therapeutic intervention can be recommended. In many ways a diagnosis of dementia, (which is a highly inclusive term and a `catch all label') does not help to inform those engaged in working with people diagnosed as having dementia. It does not distinguish between types, does not indicate specific problems and does not inform those concerned with biological dysfunction.A diagnosis of irreversible dementia (a degenerative disease) is made on the basis of eliminating all other possible reversible causes. Even then the diagnosis has no clearly defined core symptoms, not seen in any other condition.

Dementia is viewed by many as a syndrome. This means that it is seen as a state with core symptoms (detailed below) which are understood to result from a specific cause, in this case organic deterioration (although of an unspecified nature). Until the early 1970's dementia was sometimes regarded as a speeded normal ageing process. Since Miller's 1977 seminal book this is no longer tenable. It is clear that the various forms of dementia represent pathological variants and not normal processes. As such dementia is not a function of a normal ageing process (Miller, 1977; Bayles,1987). This has some significance for education since previously many believed that dementia was a probable consequence of growing old causing some fear and anxiety.

In this study `dementia' is used to describe a degenerative disease which is irreversible.

2. Definition of Irreversible Dementia

Most definitions of irreversible dementia highlight it's global impact, gradual onset and pathological causation (e.g. Jeffrey, 1983; Bayles, 1987).

In her definition Bales (1982), was one of the first to include the specific impact of linguistic function to the pattern of general cognitive deterioration. She defines dementia as:

> *"the chronic deterioration of intellectual and linguistic functions due to degenerative changes in the central nervous system "*

3. Clinical Presentation of Irreversible Dementia

Wells (1977), has offered the following example of irreversible dementia which captures its essential aspects thus:

> *`Over the period that we worked together I became gradually aware that the fine edge of his intellect was becoming depleted. He was less clear in discussion and less quick to jump from a new piece of evidence to its possible significance. He spent more time over his work and achieved less; and he found it increasingly difficult to get his results ready for publication. He tended also to become portentous and solemn about his subject, as though one small corner of knowledge nearly filled his world, and the wider horizons were narrowing in. The change*

was so slow as to be barely perceptible, and the signs vanished when I tried to pin them down: they were like those stars which are seen more easily when they are not in the direct line of vision. I was left with a feeling of uneasiness which I could not justify.....After a period of absence, I looked forward with special pleasure to my homecoming, but when we met I knew with certainty that I had lost the companion of my early years. The change was, as yet, mainly a loss of intellectual clarity and he remained himself, but a self that was subtly devitalised. To me it was as though a light has gone out, but no-one else seemed to notice anything amiss....By this time he was worried about his general health and attended a doctor from time to time with rather vague symptoms. For several years he had been said to have low blood pressure, but nothing was found wrong apart from this, and he was reassured.'

Anonymous Author: Death of a mind - A study in disintegration cited by Wells (1977).

Dementia is difficult to identify in its early stages. It is more often a crisis rather than noticeable change in an individual which precipitates the call for professional help (Wells, 1977). This point will be raised at a later stage.

The earliest noticeable disturbance in dementia is usually memory problems. Intellectual ability begins to decline. Problems develop in understanding concepts or ideas and thinking ability gradually becomes more rigid and slow. Routine activities may

continue to be carried out reasonably well in the early stages, but anything which requires an understanding of new or slightly revised ideas is extremely difficult. An individual can fluctuate between a state of elation or feeling depressed and low in mood. It is common for an individual to remain oblivious of the changes that are taking place and lack insight into their real abilities. Personality changes occur and disturbances in language and speech have been noted as the illness develops (Miller, 1977).

In addition, experienced workers in the field of psychogeriatrics emphasise that it is a progressive condition and, that from onset to death takes an average of seven years (Miller, 1977; Kay, 1970).

Table 2.1 shows the main types of dementia which are irreversible (adapted from Miller, 1977; and Bayles et al., 1987):

TABLE 2.1 : THE MAIN DISEASES ASSOCIATED WITH DEMENTIA

Pick's disease	Alzheimer's disease
Huntington's chorea	Multi Infarct dementia
Jacob Creutzfeldt's disease	(Arteriosclerotic
Normal pressure hydrocephalus	Dementia, Vascular
Neurosyphilis	dementia)

The irreversible conditions of dementia listed in Table 2.1 can be further subdivided. Huntington's chorea, Jacob Creutzfeldt's disease, normal pressure hydrocephalus and neurosyphilis are all rare forms of dementia and can be identified on the basis of special investigations, family history and characteristic motor signs (for further discussion of specific

conditions see Miller, 1977; Bayles et al., 1987).

The forms of dementia of relevance to this study are those of Alzheimer's disease and Multi Infarct dementia. Subjects recruited to this study are most likely to be:

a) Early cases of Alzheimer's disease
b) Early cases of Multi Infarct Dementia
c) A co-occurrence of these two conditions.

Criteria selection is most likely to obtain (a) and least likely to obtain (b) or (c).

An exhaustive description of dementia and theories of causation will not be discussed here. The reader is directed to other major sources concerned with these issues (for example, Jorm, 1990; Bayles, 1987). Suffice to say that a brief introduction will serve as a basis for the wider consideration of the cognitive impairments which occur as a consequence of dementia, in particular the impact on language functioning.

a) ALZHEIMER'S DISEASE

In recent years, to avoid the continuing confusion of terms researchers have referred to 'dementia' which is irreversible and mainly associated with Alzheimer's disease, as `dementia of the Alzheimer type' (DAT) or `senile dementia of the Alzheimer type' (SDAT).

Like the term `dementia' the term `Alzheimer's disease' has been applied to more than one population. Until recently Alzheimer's disease was a diagnostic label used to refer to those patients younger than 65 years of age, whilst the term `senile dementia' was used for those over 65. As a result of several studies

in which no difference was found in the pathology of the younger and older group (Blessed, Tomlinson and Roth, 1968; Terry and Wisniewski, 1972) the two conditions were reconceptualized as the same disease entity.

Alzheimer's disease is the most common form of dementia. The data from post mortem studies reveal that between 50% and 60% of all dementia patients have Alzheimer's disease (Jellinger, 1976; Sourander and Sjogren, 1970; Tomlinson et al., 1970).

A diagnosis of Alzheimer's disease is a presumptive one until autopsy confirmation (or a brain biopsy) is made (Bayles, 1987).

The disease was first identified by Alois Alzheimer in 1906. Alzheimer's organic concept of his patient's dementia contradicted the Freudian concept of mental disease as a conflict between the conscious and unconscious minds. Other cases were subsequently reported (Alexander and Selesnick, 1966).

The illness is insidious in onset, usually manifested by an unusual degree of forgetfulness, minor errors of judgement and disorientation. The sufferer becomes muddled, with repetitive speech and verbal perseveration. There is an impairment of memory for recent events and the individual becomes withdrawn, often depressed, and the symptoms are often compounded by co-existent deafness and visual impairment. Episodes of disorientation in space and time occur, and these are accompanied by attacks of panic and purposeless wandering. A change of surroundings or the advent of minor infections or injury may precipitate episodes of delirium, especially at night. Focal signs of dysphasia (impairment of language function),

apraxia (loss of the ability to accurately perform voluntary movements, not due to paralysis) and agnosia (loss of the ability to recognize sensory stimuli) are sometimes present, although seldom severe. Often the individual gets lost within his own home. A difficulty in recognizing faces can also be observed.
Once established the illness may progress rapidly, decreasing life expectancy. Sensory deprivation due to visual or hearing loss increase the difficulties experienced, and dehydration and nutritional disturbances commonly accompany a general self-neglect.

There may be a denial of memory difficulty and confabulation (filling gaps by making things up) and projection (reasoning disabilities by finding fault with others) which can delay identifying the onset of the disease. Wandering can be a problem as a consequence of the difficulty in recognizing familiar surroundings.

b) MULTI-INFARCT DEMENTIA (MID)

Multi infarct dementia,is also known as Arteriosclerotic dementia or Vascular dementia. Well-controlled pathological studies have shown the disease to occur as a result of repeated strokes. MID accounts for approximately 17% of dementia cases (Tomlinson et al., 1976). In MID there is a cumulative worsening of cognitive functioning.

The course is typically a series of `little strokes' resulting in episodes of confusion sometimes associated with minor neurological signs (slurring of speech, weakness down one side of the body, or in a single limb). This is due to circulation problems in the brain, either because a vessel has become

completely blocked, or because the blood pressure has dropped below the level necessary to force the blood through narrowed arteries. The network of arteries to the brain is abundant so that circulation is restored within days or weeks. There is then clinical improvement, or even full recovery. Further episodes follow within weeks, months or sometimes longer. Eventually, after a succession of episodes there is less recovery, until by a process of `step-ladder' deterioration, dementia as profound as Alzheimer's disease develops.

Signs of brain damage other than confusion can serve as indicators. For example, complaints of dizziness are common in the early stages; later there may even be fits. Slurring of speech, Parkinsonism (stiffness and shakiness of the voluntary muscles) weakness of one side of the face and/or body, defects of the visual field (inability to see things to one or other side) and spasticity of the limbs are common neurological signs. Typically, there is a shuffling gait, with little steps. There are frequently, signs of heart disease and of atherosclerosis in other blood vessels in the body than those supplying the brain.

Confusion comes and goes. A person may be muddled in the morning, lucid and alert in the afternoon, rambling and disorientated again in the evening. The individual may become very emotional, crying easily although the distress is not shallow. The personality is relatively well preserved until a late stage in the dementia and the consequent insight into the failing memory can cause profound depression and even suicide.

Paranoid phases are as common as in Alzheimer's disease.
Impairment of judgement and self-criticism sometimes

precede memory failure.

The final picture of multi-infarct dementia is that of any advanced dementia, with severe loss of memory and dysphasia, dyspraxia to the point of helplessness and incontinence. Physically infirmity is more marked than at the comparable stage of Alzheimer's dementia. Death, quite often from a serious stroke, is not long delayed (Bayles, 1987).

c) CO-OCCURRENCE

Multi-infarct dementia can co-occur with Alzheimer's disease in another 15% of cases (Tomlinson et al., 1970).
It has been suggested that a distinction between the two is worth making clinically, if possible, because the short-term future and thus the plan of management for each are different. Alzheimer's disease is a continuous steady deterioration, whilst in MID there may be a measure of recovery , if only temporary, from the effects of a recent infarct (Pitt, 1982; Kontiola, 1990).

4. Neuropathology and Neurochemistry in dementia

Computerized axial tomography (CAT) and positron emission tomography (PET) scanning have aided visualization of brain pathology and are noninvasive techniques (McGreer, 1986). These techniques confirm the presence of cerebral atrophy in dementia and suggest that temporal lobe atrophy may be a characteristic feature (Wilcock and Esiri, 1983).

Descriptions of neurofibrillary tangles (NFT) and senile plaques have been confirmed in many investigations (Kosik, 1989). Similarly, many

investigations have demonstrated a severe decline in cholinergic activity in the cortex of dementia cases (Kokmen, 1984). There is some suggestion that this causes the slowing of the Electroencephalogram recording (E.E.G.) seen in dementia compared to an aged matched control group with preserved mental abilities (Coben et al., 1985; Helkala, 1991). There are also more senile plaque formations and more cerebral atrophy at postmortem examinations. The number of senile plaques found in the brain at postmortem examination generally increases with normal ageing. Blessed and colleagues, (1968), demonstrated the presence of brain alterations usually seen in senile dementia (senile plaques, Alzheimer's neurofibrillary changes, granulovacular degeneration) in the brains of nondemented old people. The presence of these changes does not imply the presence of dementia; further studies by the same authors, however, in which the factor of age was controlled, demonstrated significant association between the average number of plaques in cerebral grey matter and measures of intellectual and personality functioning (Blessed et al., 1980; 1984; 1985).

Kolbeinsson et al, 1991, further suggests that certain psychophysiological measurements may become valuable in the differential diagnosis of dementia and depression.

5. The Cause of Dementia

The cause of dementia is unclear. Genetic influences (Breitner and Folstein, 1984; Heyman et al., 1983), the presence of viral agents (Cornellis, 1986) and of heavy metal deposits (Perry, 1986), have all been suggested, although not proven. In a review of the literature, Britton (1988) concluded that a

multifactorial aetiology may eventually be established with apparent subtypes related to the inter-relationships between 'causal' and `contributory' agents.

6. Treatment of Dementia

Chemical treatments have so far failed to demonstrate any clinical benefits (Cooper, 1991).

Perry (1991), suggests that the human brain has the most remarkable capacity for self maintenance and neuron repair. This suggests hope for future research although, as yet, no reported improvement. This continues to be an area of controversy (Mann, 1991).

Intervention in dementia continues to be one of management and of dealing with the consequences of dementia. Secondary problems can confound the impact of dementia. For example depression and physical problems, which are particularly common in old age, may make it appear as if there is more neurological deterioration than is actually the case; in others that the illness is further progressed than it actually is (Hanley and Hodge, 1984). Treatments based on psychological intervention have shown a significant improvement in people with SDAT (e.g. Teri et al., 1991).

PART TWO: COGNITIVE CHANGES IN DEMENTIA

The first section of Chapter One stated that a gradual deterioration of physical and cognitive abilities occurs in dementing illnesses. Part One of Chapter Two gave an overview of the impact of dementia, at a psychological and neurological level. This section will firstly present a few points on normal ageing and language to offer a context for subsequent discussion; and secondly, give a working definition for some of the components of language of relevance to this study along with a working definition for language, speech and communication.

1. NORMAL AGEING

It is beyond the scope of this thesis to consider in detail the wealth of accumulating research on normal ageing. A number of publications have raised important issues. Contrary to popular belief old age does not imply a loss of cognitive abilities (e.g. Woods and Britton, 1985; Evered and Whelan, 1988; Birren and Schaie, 1990). There is no evidence to suggest that intellect declines. Neither does memory deteriorate. In fact vocabulary has been shown to continue to develop (LaBarge et al., 1986).

For example, results from a longitudinal study comparing normal older adult language ability to younger adults indicate that word finding ability is to a large degree retained in later life. The researchers (LaBarge et al., 1986) used the Boston Naming Test (Goodglass et al., 1976) which is an elaboration of the Boston Diagnostic Examination Test (Goodglass et al., 1976) commonly used to assess language deficits in Aphasia. The BNT is thought to be particularly useful for detecting mild word retrieval problems. When the performance of older adults is

compared to that of younger subjects the range of scores is similar. There is a drop in naming ability of about 10 words from the fourth to the ninth decade with larger standard deviations at the upper age ranges. In addition, there is evidence of good word finding ability well into the ninth decade on a recognition and retrieval task (LaBarge, 1986). These findings have been confirmed by subsequent research (Williams, 1989).

The authors also compared the older adult controls to a group with SDAT to show that in SDAT words are significantly deteriorated. Hence, findings suggests that healthy older adults perform consistently and at a similar level to younger adults. The assumption that word finding drops markedly at higher age ranges because of age alone, is erroneous. A problem with word finding maybe an indication of neuropathology and thus may signal to the clinician that a future diagnostic evaluation is indicated. Thus the loss of word finding ability is not a normal accompaniment of older age.

The concern of this study is with the small percent of the older adult population who develop dementia. It must be stressed that a far greater number of older adults will never go on to develop a dementing illness.

2. `LANGUAGE' AND `COMMUNICATION' SKILLS: DEFINING TERMINOLOGY

When we talk about `language ' and `communication' skills in the following section, the phrases carry a specific meaning. The study of language skills involves assessing what is seen as the structure of a language and identifying an individual's knowledge of

their language. Knowledge of a language involves specific components. These include :
phonology, morphology, syntax, semantic and pragmatics.

Phonology: Phonologic knowledge consists of knowing the sounds of a language and the rules for how to use them in order to produce words. Knowing the sounds means a speaker produces words with the "correct accent", and where to place stress on words.

Morphology: This aspect is concerned with the knowledge of actual words in a language and the way to put words together in a meaningful way.

Syntax: This means knowing the way words are put together. This is done via specific rules of a language which have to be learnt. Knowing English language syntax, is to know the adjective must precede the noun (`big boy', not `boy big' etc.) and words can begin with g + l and K + l, but not d + l.

Semantics: Semantic knowledge is an individual's knowledge of both meaning and reference of linguistic forms and syntactical patterns in relation to objects, events, processes, attributes and relationships in human experience. To have an intact semantic knowledge is to be able to make sense not only of the words but of its deeper meaning of the words or sentences.

Pragmatics: Contemporary psycholinguistic models emphasize the difference between explicit and implicit meaning in language.

The comprehension of prose requires an understanding of both "explicit" meaning (which is the syntactic and semantic structure of the sentence)

and the "implicit" meaning (which is contributed by the listener or reader on the basis their knowledge about the world).

Meaningful communication requires the production and comprehension of ideas. Producing speech is not to communicate, because speech may be structurally and semantically meaningless. Knowing the grammar of a language does not necessarily ensure the ability to communicate. It is possible to know the rules for combining sounds into words with each other, without being able to communicate. It is only when sounds and words have been structured in such a way that the idea of the speaker is derivable by the listener that communication occurs (Bayles, 1987).

The distinction between the terms `communication', `speech', and `language' is made. For the purpose of this study, `speech' is used to refer to the motor production of sounds rather than an acoustic representation of language, and `language' is a symbol system by which sound is paired with meaning. `Communication' is the cognitive process of sharing ideas through language rather than another symbol system.

In the following section the impact of dementia on language and communication skills will be reviewed.

All the studies reported in this section make an assumption which has particular relevance to the study to be reported. In no publication is mention made of the fact that findings are reported on the basis of assessing abilities in one language.

Only one study raises the point in their investigation of English language impairments, stating,

> "it is necessary to eliminate from the sample individuals whose language and speech abilities might have been influenced by such factors as having learned English as a second language" (Bayles, 1982).

No mention however is made in this or any other study as to whether the samples used are monolingual (speak one language) or whether individuals might speak two or more languages.

It is not known if an assessment of impairments in the English language will prove to be a legitimate comparison on which to propose a theoretical explanation of relevance to all language impairment in dementia. No study has either made comparison or explored whether knowledge of more than one language might produce differences in deterioration.

Thus interpretation of results might be contaminated by:

a) Variation of decline in monolingual persons versus bilingual persons
b) The language of testing (i.e. first or second language, see later chapter on bilingualism)
c) Possible differential rates (or processes) of decline in different languages.

When studies are discussed it will be seen that these questions are raised and may only be addressed when we take into account more clearly an individual's linguistic background (information about an individuals language development and use).

When an individual's languages have been taken into consideration in other conditions, such as Aphasia (language and communication impairment following damage to the brain) (Albert and Obler, 1978),

therapeutic treatment of depression (Zulueta, 1984) and family therapy (Zulueta, 1990) interesting results have been reported which have contributed to theoretical understanding of the role of language in such conditions.
It will be shown that theoretical explanations offered to understand the impact of dementia on an individual's linguistic ability has to be able to account also for those who speak more than one language. This point will be discussed later when the issue of bilingualism is explored.

Findings from monolingual studies of dementia, however, forms the basis for addressing the bilingual study of dementia. Consequently, findings from these studies will be reviewed.

SUMMARY

Part One of this chapter gave an introduction to dementia. The need for clear definition and application was argued. The main diseases associated with dementia were presented and two irreversible forms, Alzheimer's disease and Multi Infarct Dementia were selected for further consideration. Deterioration of cognitive abilities is seen in both forms, although there are some differences in the course of both conditions. The cause of dementia is unclear. Chemical treatments fail to reverse the condition. Psychological therapies ameliorate and manage the conditions.

Part two of this chapter described the cognitive changes in dementia in more detail, drawing comparisons to normal ageing. `Language' and `communication' skills were defined for the purpose of this study.

CHAPTER THREE

STUDIES OF LANGUAGE IN DEMENTIA: A REVIEW

The Design of Studies

The early 1980's promoted a surge of publications on language impairments in dementia (Schwartz et al., 1979; Appell et al., 1982; Bayles, 1982; Martin et al., 1983; Gewirth et al., 1984). A typical investigation involves a small sample who have been diagnosed as having SDAT and an age matched control group so that performance can be compared on language tests. Measures used tend to be derived from those used to investigate language impairments in Aphasia. As a result they assess very subtle language performance skills or components of language. These include:

1. Tasks concerned with auditory comprehension: e.g. word discrimination, body part identification, carrying out commands or instructions, `yes/no' responses to questions,
2. Tasks concerned with oral expression: e.g. reciting familiar things such as days of the week, or familiar passages,
3. Tasks concerned with word finding: e.g. naming words from different semantic categories, for example, body part naming and animal naming.
4. Tasks concerned with reading: reading words, repeating phrases and words and word picture matching.
5. Tasks concerned with writing: words or sentences, names and addresses.
6. Tasks concerned with conversational speech: e.g. sample of speech, talking about ideas, describing pictures.

Most experimental designs then conduct a cross sectional study, where comparison is made between a group of subjects with SDAT and a normal control group at one point in time. Findings reported from this type of study are that in the early stage of SDAT, the phonological and syntactic aspects of language are often well preserved (early reviews by Miller, 1977; Bayles, 1982). Consistently reported are semantic and cognitive impairments (Schwartz et al., 1979; Appell et al., 1982; Bayles, 1982; Martin et al., 1983; Gewirth et al., 1984).

This means that in the early stages of dementia, subjects are able to do such things as add plural endings, modify other word endings, and negate sentences (all syntactic operations). They show problems in naming items and in comprehension (Kirshner et al., 1984; Appell et al., 1982). There is evidence of atypical word associations (Gewirth et al., 1984) and semantic rather than phonemic errors are made (Appell et al., 1982; Martin and Fedio, 1983). A failure to utilize semantic context in interpreting homophones such as week/weak, nun/none (Schwartz, 1979) have also been reported. Verbal fluency may be more affected as the disease progresses (Miller, 1977; Bayles,1982).

Britton (1988), in reviewing the evidence from later studies identifies a similar picture. Impairments in conversational speech (Binks and Davies, 1984; Hutchinson and Jensen, 1980) and specific aspects of language process, such as dysphasia (Skelton-Robinson and Jones, 1984) were also observed. Britton advocated caution in interpreting results from studies of language in dementia, as variables such as poor memory may confound the picture.

Longitudinal designed studies are less frequently reported in the literature. This is the result of difficulties which the design brings. These difficulties will be considered at a later point. The attractions of this design include, firstly, that changes can be observed as they occur over time, and secondly, that the order in which language skills deteriorate in dementia can be observed.

Findings reported from longitudinal studies are that semantic knowledge is affected before syntactical knowledge, generative naming before confrontation naming and propositional use of language before automatic use. It also seems that semantic and pragmatic difficulties occur before phonologic and syntactic ones. Vocabulary gradually diminishes with many morphological errors being made as dementia becomes more severe. Communication gradually becomes more impaired and difficult (Kaszniak et al., 1985; Bayles, 1985).

It has been suggested that the pattern of reading deterioration may aid in the clinical identification of dementia and that the disturbance of reading comprehension is a linguistic deficit rather than a product of visual-perceptual disturbance (Henderson, 1990). Reading letters and words aloud, reading partially obscured letters and words, reading irregular words and reading commands aloud, although failed by persons in the most advanced stages of dementia seem to be relatively preserved. There seems to be little association with the measure used to assess dementia severity and reading ability.

Reading comprehension, on the other hand, demonstrates no such selective sparing. On all tests involving understanding of written material (distinguishing

words from nonsense letter arrangements, performance of written commands and sentence comprehension) a systematic deterioration with advancing dementia and a significant correlation with dementia severity has been observed (Schwartz et al., 1979; Appell et al., 1982 and Cummings et al., 1985; Henderson et al., 1990).

Two aspects of language impairment have received much attention in the literature, (1) Confrontation Naming Deficits and (2) Conversational Speech Deficits. These two language aspects will therefore be considered further. The studies to be reviewed under these headings are cross sectional. A description of longitudinal studies will then follow and a general summary of findings of language in dementia will be given at the end.

1. Confrontation Naming deficits

Of all the language impairments which have been described in the literature errors in the naming of items on a visual confrontation naming tasks have received most attention (Bayles et al., 1983; Martin et al., 1983; Kirshner et al., 1984; Skelton-Robinson et al., 1984; Flicker et al., 1987; Kirshner et al., 1984; Williams et al., 1989). In this task, the subject is given an object, a picture, or a drawing of an object, and asked to provide the name. In addition to recording the frequency with which the correct name is provided, the time needed to respond correctly can also be recorded.

The degree to which confrontation naming is impaired early in dementia however remains unclear (Bayles, 1987). Some authors claim it is the most prominent early clinical feature (Kirshner et al., 1984;

Williams, 1989). Others (Appell, Kertesz and Fisman, 1982; Bayles, 1982; Benson, 1979; Obler, 1983) consider that confrontation naming impairment to be less characteristic of early communicative impairment than other deficits. It has been suggested that both conceptualizations may be correct, and that a sub-population of those with dementia may have prominent early confrontation naming difficulties, as a result of greater damage to the neural substrates for naming in the language dominant hemisphere (Bayles, 1987). The extent of chemical changes in the brain may produce those variations seen in early stages of dementia (Haxby et al., 1985; Koss et al., 1985).

An early concern was whether misnamings in dementia are caused by misperception. Early studies (Baker and Lawson, 1968; Rochford, 1971), concluded that perceptual impairment caused the misnamings they encountered. It was established that both normal controls and individuals with dementia, took longer to name less common items. Giving a description of the function of the item to be named, however, resulted in a naming improvement.

More recently, Kirshner et al., (1984) argued that although most naming errors of subjects with dementia are perceptual, linguistic factors also contribute. In a study of 12 subjects with dementia, four types of stimuli each more abstract than its actual predecessor, were presented for naming: the actual object, a black and white photograph, a line drawing and a masked line drawing. Half of the stimuli were associated with high-frequency words and half with low frequency words, half short, and half long. The authors were interested in three issues,

1. the effect of the perceptual strength of the

stimulus items on naming accuracy,

2. the relation of naming accuracy to word frequency and length
3. the relation of naming dysfunction to degree of language and cognitive deficit in dementia.

Overall those with dementia made significantly more errors than normal controls. The level of perceptual difficulty was claimed to influence the rate of misnaming. It was further suggested that word frequency, but not length, significantly influenced naming accuracy.

In a study by Bales and Tomoeda (1983), misnaming performance of 61 subjects with dementia were analyzed. Only 8.6% of all errors were found to be visually similar and otherwise unrelated to the target word. They concluded that misperceptions may have a relation to misnaming although not a prominent one.

The main source of evidence for the apparent breakdown of word meanings comes from tests of naming and identification. The misnamings in SDAT are commonly names of other items from the same semantic category, for example, `cow' for `horse' or `skirt' for `dress' (Bayles and Tomoeda, 1983; Martin and Fedio, 1983; Schwartz, 1979). The misidentifications have been interpreted as indicating the loss of attributes which serve to distinguish related concepts from one another (i.e.knowledge of the word). Various models of confrontation naming have been proposed (e.g. Caramazza and Berndt, 1978; Goodglass, 1980). Most distinguish at least three sequential stages in the naming process (although each stage might involve more than one component and stages need not be completely independent). An object to be named must be perceived and not perceptually analyzed, its lexical semantic

representation must be aroused, and its phonological representation and motor articulatory sequence must be activated. The naming difficulty has been attributed to deficits within a lexical semantic domain, the second stage of this putative sequence (Bayles et al., 1983; Martin et al., 1983, Flicker et al., 1987; Huff et al., 1987; Smith et al., 1989; Troster et al.,1989).

Huff and colleagues (Huff et al., 1987) for example, proposed that intermittent errors represent conceptual, rather than processing deficits. They asked whether the errors in a confrontation naming test were random or the same items consistently missed in different types of tests. They compared patterns of errors on a confrontation naming test and a name recognition test using the same objects in 23 patients with mild to moderate dementia. Items on which a subject with dementia made a semantic error in a name recognition test were less likely to be named in a confrontation naming test. The authors concluded that because errors were consistently made on the same items in the two tests, semantic information is lost in those with dementia.

2. Conversational Speech Deficits

It has been reported by many authors that the size of the active vocabulary diminishes, manifested by increasing difficulties in word finding. The ability to produce a narrative is reduced, sometimes to the point where speech becomes unintelligible.

Dementia has been repeatedly shown to cause a gradual loss in the ability to communicate meaningfully. Over the last fifteen years this has been consistently documented (de Ajuriaguerra and Tissot, 1975; Appell,

Kertesz and Disman, 1982; Bayles, 1982, 1983, 1984, 1985; Bayles and Tomoeda, 1983; Cummings, Benson, Hill and Read, 1985; Ferm, 1974; Iringaray, 1973; Obler, 1983; Obler and Albert, 1981; Wechsler, 1977).

It has been suggested that it is the capacity to form ideas which deteriorates and that speech and language remain relatively intact in the early stages. The ability to communicate (Bayles et al., 1987) is consequently impaired. Bayles and colleagues suggest this is due to a particular impairment of semantic and episodic memory.

A study by Hier and colleagues sought to investigate the extent to which lexicon and syntax are disrupted in dementia (Hier et al., 1985). They also sought to identify any differences between SDAT and MID language characteristics. Measures included alternate items from the WAIS vocabulary subtest (a test to provide concise definitions). Alternate items were administered from the Ammons and Ammons Quick test (Ammons and Ammons,1977). This receptive vocabulary test required the subjects to point to one of four pictures that correspond to each spoken item. Twenty items were selected from the Logico-grammatical sentence comprehension test (Wiig and Semel, 1974). This test required the subject to give a " yes/ no" answer to e.g. 'Does Thursday come after Tuesday?' A twenty item visual confrontation naming test was administered that required the naming of line figure drawings (Shindler et al., 1984). The animal naming subtest from the BDAE was also included as was the Cookie Theft picture from the test to obtain a speech sample.
Findings confirmed language impairments in all measures used.

The authors further identify that the Cookie theft picture is a particularly useful tool in eliciting speech from dementia subjects. Compared to the speech of normal subjects the speech of dementia subjects showed a reduction in both lexical diversity and grammatical complexity. In agreement with prior studies there is some evidence that lexical access is more impaired than is grammatical complexity. Increased dementia severity has differential effects on language depending upon dementia etiology. In SDAT grammatical complexity and length of utterance was seen to be well maintained. However, increasing difficulties in lexical access were manifested and an increase in empty words, pronouns, and indefinite anaphora (repetition of word or phrase at the beginning of successive clauses). With an increase in severity the amount of information conveyed fell and the speech became progressively verbose and less concise. In MID severity was associated with the use of fewer total words so that the mean length of utterance fell. An increase in the use of incomplete sentence fragments and a decrease in the use of subordinate clauses so that the speech loses syntactic complexity was also reported (Hier et al., 1985).

Language changes between SDAT and MID

In a recent study language impairment was assessed in 33 patients with SDAT, 52 with MID, and 86 controls, all living in the community. The changes in language functions in normal subjects could be clearly differentiated from those seen in subjects with mild dementia. Those with different degrees of dementia were seen to differ significantly from each other with regard to language impairment. In addition SDAT and MID appeared to produce different patterns of language impairment. This was despite equal severity of

dementia, levels of orientation and conceptual functions. SDAT was associated especially with a defect in the understanding of grammatical structures and MID with disorders in recognition of words, naming and repetition. The differential diagnostic capacity of 23 selected language items proved to be 97% between SDAT, MID and control subjects. The authors say that these results indicate that the examination of language functions is valuable in the differential diagnosis of dementia (Kontiola et al., 1990).

Summary of findings so far

Table 3.1 gives a summary of findings so far. Preserved and impaired language abilities in dementia are listed.

Table 3.1: SUMMARY OF LANGUAGE ABILITIES IN DEMENTIA

Preserved language ability	***Impaired language ability***
phonology	semantics
syntax	naming
reading aloud	comprehension
	word association
	interpreting homophones
	verbal fluency
	conversational speech
	vocabulary
	grammatical complexity
	reading comprehension

It can be seen from table 3.1 that a number of impairments have been observed. It has been suggested

that it is the ability to know the attributes of a language and to formulate ideas which are impaired in dementia. Preserved abilities have been consistently reported as understanding sound, structure rules and reading aloud.

Methodological issue

The majority of studies of communication or cognition and ageing have employed a cross sectional research design. Within this design individuals of different ages are compared at the same point in time. Although the benefits of such studies is the ability to collect data rapidly a number of difficulties are also involved.

1. Individual variations - Cohort effects (Schaie, 1965) confound the picture. These include, e.g. the differences between age groups, education, health and medical care, social factors.
2. Sampling difficulties - Samples of subjects are frequently not equally representative within each group (Salthouse, 1982). There are difficulties in obtaining an older adult control group to the extent that it has been thought such a sample is unique (Bayles et al., 1987).
3. Problems in the definition of stage or severity of dementia. This means that comparison of a dementia and a control group at any one point will have a large variation in the dementia group on measures and hence makes interpretation of any statistical procedure difficult due to the need to assume homogeneity (similar variance between groups being contrasted) (Bayles et al., 1987).

Longitudinal Studies.

Researchers became interested in longitudinal studies firstly, as a reaction to the methodological difficulties involved in cross sectional studies. Secondly since cognitive changes in dementia occur more rapidly than in normal ageing, longitudinal research can be conducted within a shorter time scale (Kaszniak et al., 1986). This in turn can reduce cohort effects as age matched controls are more likely to be drawn from the same population. Using a longitudinal design also means that the effects of a dementing illness on language ability can be examined by mapping the changes as they take place in individuals and thus identify patterns of language deficits, with a view to specifying which language changes might prove to be early signals of dementia.

Typical recent longitudinal studies have followed up subjects with dementia and normal controls over three years of repeated evaluation and documented significant deterioration (e.g. Kaszniak et al., 1986; Storandt et al., 1986; Berg, 1984). Two longitudinal studies which have been conducted with the purpose of documenting change in communicative function, the Chicago study (Kaszniak and Wilson, 1985) and the Tucson study (Bayles, 1985) will be examined in detail.

The Chicago Study

A major purpose of the Chicago longitudinal study was to document changes in communicative functions in SDAT. Sixty two SDAT subjects and sixty normal controls were recruited. All subjects received physical and neurological examinations which included, computed tomographic (CT) scan, electroencephalogram

(EEG), psychiatric interview, and extensive neuropsychologic evaluation. None of the subjects with dementia were in an institution when the study began. Study participants were examined annually for the 5 year duration of the study. During the first 4 years, new subjects were added. Eight subjects with dementia and 14 controls entered in year 4 and therefore received only two examinations. The longest period over which subjects were followed up was 3 years, 31 subjects with dementia and 39 normal controls. Generally, the dementia subjects were mildly impaired at the time of their inclusion in the study. All were living in the community, none required assistance with basic self care and all were capable of participation in two days of testing. Significant group main effects ($p < .05$) were obtained for all dependent measures, confirming pervasive impairment of memory and language functions in dementia compared with normal elderly subjects.

Four measures were used to evaluate communicative function: the Boston Diagnostic Aphasia Examination (BDAE) the Northwestern Word Latency Naming Test (NWLT) the Peabody picture Vocabulary test (PPVT) and the Auditory Comprehension Test for sentences (ACTS). The BDAE is a comprehensive language examination battery, which surveys fluency, auditory comprehension, naming, oral reading, repetition, automatic speech, reading comprehension, writing and music (this battery is discussed further in the Methodology section). The NWLT is a visual confrontation naming task that involves the sequential presentation of 63 pictures of common objects with three temporally separated, recorded repetitions. The subject is required to name each object. The PPVT is a receptive vocabulary test and the ACTS is a 42 item auditory comprehension test in which length, word

frequency and syntactic complexity are systematically varied. In addition, the Wechsler Memory Scale (WMS) (Wechsler, 1945) and 24 item Mental status examination were administered.

Deficits were apparent in the dementia group across a broad range of communicative functions: naming, repetition, comprehension, reading, and writing. At initial examination, early in the course of dementia, the form of conversational speech (e.g. articulatory agility, phrase length, grammar) was seen to be relatively normal, but the researchers suggest it became more impaired as dementia became more severe. They suggest that content defects, were noticeable early on and markedly increased with severity of dementia. Naming problems particularly generative, were prominent early becoming steadily worse over three years. Repetition was good in the early stages when words or simple phrases were being repeated but impaired when unusual phrases were given. Writing was moderately impaired early and deteriorated steadily over the three years. Significant group main effects were obtained on all dependent variables between the dementia and normal group.

The impact on language abilities over time were described under the following headings, characteristics of conversational speech, auditory comprehension, naming- generative and confrontational, repetition and reading and writing.

Characteristics of Conversational Speech

The flow of speech in SDAT subjects was not found to be abnormal at any time during the course of the study. In relation to speech melody, phrase length, articulatory agility, grammatical form, word finding and frequency of paraphasic errors in running speech,

the dementia group demonstrated only mild to moderate impairment.

Auditory Comprehension

At the initial testing, moderate to severe impairment was observed on the BDAE subtests examining auditory comprehension. Moderate deficit was apparent in the dementia group when they were asked to point to pictured objects or body parts in response to a spoken word, and for two and three step verbal commands. Severe deficit was apparent when the dementia group attempted to answer logical questions (e.g. will a board sink in water?) and demonstrate comprehension of brief stories read to them.

A similar picture of impairment emerged on the PPVT and ACTS. Auditory comprehension of single words was moderately impaired at the time of initial evaluation and deteriorated significantly over time. Comprehension of sentence-length spoken phrases was, however, more severely impaired at the first examination, as determined by performance on the ACTS and continued to significantly deteriorate over time.

Naming: Generative and Confrontational

Severe impairment was observed at the time of initial evaluation in the ability to generate examples of a semantic category (in this case animals). Mild to moderate impairment was observed in the Visual Confrontation Naming and Responsive Naming subtests of the BDAE and NWNT at the initial evaluation, and performance on all four tests deteriorated during the course of the study. Most confrontation naming errors were due to repeating the same answer (perseveration) of previously correct naming responses or names semantically related to the target name (e.g. `lock' for `key'). Phonemic substitutions and neologisms were

reported to be rare.

Repetition

Difficulty with repetition appeared to be a function of task difficulty. The dementia group had mild difficulty repeating words, slightly more difficulty repeating simple common phrases, and marked problems with unusual phrases, (e.g. `The Chinese fan had a rare emerald'). Failures on the latter task are not necessarily attributable to short-term memory defects, because the dementia group were relatively successful repeating high probability phrases of equivalent length.

Reading and Writing

The dementia group could perceive written material and read aloud but comprehension of written material was seen to be poor. The ability to spell and write words correctly (orthography) was seen initially to be only mildly impaired but writing to dictation and narrative writing were moderately impaired. The researchers noted that all aspects of reading and writing deteriorated significantly during the study.

In summary: Differences were apparent in the dementia group when compared to the normal group across a broad range of communicative functions namely: naming; repetition; comprehension; reading and writing. At initial examination of the dementia group, in the early stage of the illness the form of conversational speech was relatively normal. As the severity of dementia was more pronounced conversational speech became more impaired. Content deficits, however, were noticeable with the progress of dementia. Naming problems, particularly generative, were prominent early and became worse over three years. Repetition was good in the early stages when

words or simple phrases were being repeated. This ability was impaired when unusual phrases were given. With the exception of the orthographic aspects, writing was moderately impaired early and deteriorated steadily over the 3 years.

The Tuscon Study

One of the aims of the 3 year Tuscon study was to document the nature of linguistic dissolution in SDAT over time. Thirty one subjects with SDAT and thirty three normal controls were recruited. New subjects were added until the end of the second year. The analysis was based on subjects who were tested every 6 months for 18 months. Of the original sample, data from 13 SDAT and 20 normal control subjects were analyzed. Potential differences between the subjects who participated in the longitudinal portion and those who did not were considered, but no significant differences in age, years of education, or estimated premorbid intelligence were found. The most common reasons for subject attrition were death, development of another serious illness and intellectual deterioration sufficient to make them untestable. Recruitment was similar to the Chicago study.
Study participants received neurological and physical examinations, CT scan, and laboratory tests appropriate for identifying reversible dementia associated conditions. All SDAT subjects were ambulatory and living in the community at the start of the study.

Severity of dementia was determined using results of neurological examination, neurolinguistic and psychometric testing and scores on a behaviourial daily living inventory. Seven of the SDAT subjects were mildly impaired and six were moderately impaired.

Measures to assess language abilities included the Block Design and Forward Digit Span Subtests, Similarities and Vocabulary Subtest of the WAIS and the Nonsense Syllable Learning Task (NSLT) and a variety of communication tasks: Confrontation Naming Task, FAS Word Fluency Measure (a test of ability to name as many words as possible beginning with each of three letters (F,A,S,) in one minute.) The Peabody Picture Vocabulary Test (PPVT) (receptive vocabulary test in which subjects select from among four line drawings, the correct visual representation of increasingly difficult words spoken by the examiner) Sentence Correction Task, Sentence Disambiguation Task, Story-Retelling Tasks and a Pragmatics Task (four part test of ability to use context in utterance interpretation).

The rationale for test selection was based on a desire to evaluate receptive and expressive functions in each linguistic domain (phonology, syntactic, semantic and pragmatic).

Using analysis of variance a significant difference was observed between the mild dementia group and normal controls on Block Design, Nonsense Syllable Learning Task, Generative Naming, PPVT, Similarities, Disambiguation, Verbal Description and Story Retelling. No significant differences were found for sentence correction, confrontation naming and forward digit span. The measure that best discriminated mild SDAT from normal subjects was the Verbal Description Task, a self-generated, discourse production task. When performance at time of entry of the moderately SDAT group was compared with the normal group significant differences were found on all measures.

The researchers also produced a composite variable to

represent linguistic performance by combining performance on a number of the tasks used. They found that this new variable better discriminated the dementia group than individual tasks. The authors suggest that language measures are more effective for discriminating mild dementia and more effective than a small set of psychometric measures (i.e. Block Design, Forward Digit Span, Nonsense Syllable Learning Task and Mental Status Questionnaire).

In Summary: Analysis revealed that language content is affected before form, generative naming before confrontation naming, and propositional use of language before automatic use. Further, phonologic and syntactic judgements are more easily made than semantic and pragmatic. Knowledge of vocabulary was significantly impaired early and gradually diminishes as dementia becomes more severe. Finally the data suggests that measures of communicative function are as able as Block Design and Nonsense Syllable Learning for discriminating mildly and moderately dementing subjects.

Other Longitudinal Reports

Horner et al., (1983) investigated changes in spoken discourse over a one year period in 12 SDAT subjects who were `moderately advanced' at the time of first testing. Subjects were asked to give a verbal description of the much used `cookie theft' picture from the BDAE (Goodglass and Kaplan, 1972). Impairments in conversational speech were observed and descriptions became more concrete and lacking in content.

Faber-Langendoen and colleagues (1988), recruited 58 age matched controls, 44 subjects with mild SDAT and

16 subjects with questionable SDAT. The second part of the study involved an additional 25 healthy age matched controls, 22 mildly dementing and 26 questionable dementia. Thus there was a total of 150 subjects with SDAT and 83 control subjects.

Among the measures used were selected scales from the BDAE and the Token Test.

They found that in the mildly dementing group reading comprehension and written expression were disproportionately impaired compared with the other subtests, whereas performance on oral naming, auditory comprehension and expressive language roughly paralleled the overall decrement on the dementia score.

Performance on word discrimination and body part identification was preserved at 85% of normal for the most dementing group and were thus the last language tasks to be impaired. A great deal of variability was reported between individuals.

Summary of Findings From Longitudinal Studies

Findings from longitudinal studies confirm those found in cross sectional studies as summarized in Table 3.1. Longitudinal studies suggest the following order of impairments over time:

1. semantic
2. syntax
3. generative naming
4. confrontation naming
5. propositional use of language
6. automatic use.

THEORETICAL EXPLANATION OF THE LANGUAGE IMPAIRMENT IN

DEMENTIA

1. Aphasia in Dementia

Individuals with dementia have been shown to have language impairments on the types of test used to evaluate aphasia in people with focal brain lesions. Language impairments in dementia have consequently been compared to deficits found in aphasia (e.g. Faber-Langendoen et al., 1988; Cummings et al., 1986). Techniques and ideas developed in the exploration of aphasia may contribute to further understanding of language impairment in dementia.

The commonly accepted theory of aphasia is that individuals suffer impairment in the comprehension and/or production of language, in one or more modalities, as a result of focal brain damage in the language dominant hemisphere. Further the degree of language and communication impairment is greater than that of cognitive impairment. Reasons have been put forward suggesting that this theory is inappropriate for dementia.

i) impairments in both language comprehension and production are seen but (in the early and moderate stages) the ability to speak, read, and write are maintained.
ii) people with dementia have brain damage in both cerebral hemispheres, while in aphasia damage occurs in one hemisphere.
iii) in dementia the degree of communicative impairment is generally proportional to the degree of cognitive impairment whilst this is not the case in Aphasia (Bayles et al., 1987).
iv) in dementia there is a greater difficulty with the concepts underlying intentional communication

and their manipulation than is observed in aphasia.

v) grammatical and phonological rules and the mechanics of linguistic expression, are not as vulnerable in dementia as in aphasia (Bayles and Kaszniak, 1987).

Assessing dementia in the same way as aphasia with focal lesions carries the implicit assumption that the language impairment in dementia is best conceived of as a form of aphasia. It has been suggested that this may result in a tendency to force the language changes in dementia into one of the standard aphasic syndromes and to overlook aspects which may differentiate dementia from aphasia (Miller, 1989). The use of other language-based tests can sometimes reveal important differences between people with dementia and those with aphasia due to focal lesions (Code and Lodge, 1987; Rochford, 1971).

2. Perceptual impairment

It has been suggested that the picture of impairment and errors observed in dementia are caused by fatigue and inattention (what Chomsky, 1965 called "performance factors").

Linguistic competence has been defined as the speaker's knowledge of the rules of language (Chomsky, 1965). When a normal speaker makes a linguistic error, the error does not necessarily reflect a lack of knowledge of language but may indicate that production has been affected by an extra-linguistic variable such as fatigue, memory limitation, or stress. It has been suggested that dementia is a variable affecting a speaker's linguistic performance and not his knowledge of language. Bayles suggests that this explanation

however does not seem consistent with the lack of self-correction observed in dementia. In normal speakers performance errors are often recognized and corrected. While speakers do not always correct errors, if called to their attention, they usually recognize and correct them. Subjects with dementia in the study never gave evidence of recognizing their errors. This finding is supported by Iringaray (1973) and Whitaker (1976). Their subjects never corrected semantically ill-formed sentences when repeating anomalous sentences presented by the examiner but frequently corrected errors of syntax and phonology. It has been proposed that such performance strongly suggests that certain aspects of syntax and phonology can be processed without an individuals awareness or deliberated intent. The authors add that this raises a question as to which areas of the brain are spared to permit this processing.

3. Episodic Memory Impairment

In their book Communication and Cognition in Normal Aging and Dementia, Bayles and Kaszniak, (1987) argue convincingly the need to view language impairment in dementia from a separate viewpoint to that of aphasia. A separate and distinct theory to address language changes in dementia is required. This they proceed to do in the remaining chapters of their book. Their model is based on the accumulated body of published research which suggests that the semantic knowledge of language is impaired in dementia. They build up their model by reviewing the evidence on the current model of memory and describe in detail Fodor's (1983) model of modality which has wide acceptance. They present a theoretical position with which to view language impairments in models.

Fodor's theory is that people have two types of cognitive systems; modular perceptual systems, of which there are at least six, and one non-modular central system. In the modular, perceptual input systems of hearing, sight, touch, taste, smell and language sensory information is encoded into mental representations understood by the central system. The function of the non-modular central system is to `fix beliefs' and `plan intelligent action'. Fodor's central system corresponds to the construct Semantic Memory. Bayles et al., (1987) suggest that data from subjects with dementia may demonstrate the particular impairment of the central system (or SM). This contradicts Fodor's claim that non-modular central systems lacks a characteristic and specific breakdown pattern. The reader is directed to Bayles et al., (1987) for detailed consideration of this argument.

Of particular interest to this study is that in dementia they suggest there is a particular impairment of semantic memory and a subsystem of semantic memory known as episodic memory. This distinction between semantic and episodic memory was first introduced by Tulving (1972).

Semantic Memory

Semantic memory (SM) refers to the central processing system in which conceptual knowledge is represented and thinking occurs.

`Semantic' indicates that the representation system is for concepts. In SM conceptual knowledge is stored, things like the elements of the periodic table, principles of English composition and the causes of the second world war (e.g. a cat is an animal).

Perceptual input is interrelated in SM to form hypotheses about the world and planning intelligent action. Thinking can be said to occur in a conscious person when the structural elements of SM are serially activated by an individual's needs.

Linguistic comprehension is the result of deriving the right concepts and propositions, and the interconceptual and interpropositional relations (Bayles et al., 1987). The input of linguistic stimuli undergoes lexical, structural, and logical analyses.

Episodic Memory

Episodic memory is a system that receives and stores information about temporally dated episodes or events and their temporal-spatial relation (Tulving, 1984). `Episodic' means that the representation system is for personal events, (e.g. my cat ate my neighbour's goldfish).

It is in EM that the chronology of an individual's life events is stored, such as information about educational, social and work history.

EM and SM are interdependent. Information is transferred between them and both types of knowledge are used in thinking. To illustrate, Bayles, (1987), gives the following example. "Knowing your responsibilities as best man at a wedding involves SM, remembering what you did and who you met at the wedding involves EM."

Bayles at al., suggest that word memory or lexical representation, seems intact in dementia, whereas conceptual memory is impaired. They theorise that in dementia there is a marked impairment in EM which in

part is due to the abnormally rapid forgetting of events stored in EM, similar to that seen in amnesia where there is medial temporal lobe damage.

3. EARLY DETECTION OF DEMENTIA : Implications of Early Language Impairment

It has been suggested that formal language assessment can contribute to the early detection of dementia. It has also been suggested that detecting specific language impairments can discriminate between the two main forms of dementia, SDAT and MID thereby enabling an improvement in meeting individual needs (Kontiola, 1990). It has long been considered that psychometrics have an essential role to play in the assessment of older adults.

In a review of the assessment of dementia, Britton (1988) states that early dementia in its mildest form, especially in the community may be difficult to detect. The studies of Bergmann et al., (1971) and Ron et al., (1979) found that one third of those initially diagnosed as dementing were not found to have the disorder at follow up.

The main problems are:

1) Masking

Symptoms of depression often mask early dementia, or may be confounded with it such that dementia is over-diagnosed (Marsden and Harrison, 1979; Post, 1975; Wells, 1979). Depression has in fact been widely recognized as a reversible cause of dementia (Kiloh, 1961; Freemon, 1976; Folstein and McHugh, 1978; Rabins, 1985). One study found depression accounting for 9% of the admissions for dementia (Marsden and Harrison, 1979).

Although some authors still assert that clinical examination is the best way of differentiating depression and dementia (see for example Rabins, 1985 and Copeland, 1985), others suggest that even with careful assessment and diagnosis it is still a process of eliminating other masking causes (Newbern, 1991).

2) Psychometric Assessment

Although psychometric measures can significantly distinguish between unequivocally normal and dementing subjects, early or borderline cases provide ambiguous results on tests. The need to recognize symptoms early make accurate psychological assessment essential (Kendrick, 1985).

Language based assessments have been proposed for the early detection in a community study (Binks and Davies, 1984) and show promise of improving the early detection of dementia. People with dementia can do very well on simple reading aloud tasks (Schwartz et al., 1979; Appell et al., 1982; Cummings et al., 1985; Henderson et al., 1990). This retained skill can then form the basis of a method for the estimation of premorbid intelligence (Nelson, 1982). These advances show promising signs of contributing to the early detection of dementia, enabling intervention to occur at an earlier point before crisis occurs thus alleviating unnecessary suffering both for the individual with dementia and for carers.

Caution has, however, been advocated in the interpretation of language impairments as other aspects of cognition may be confounding the results (Miller, 1989; Britton, 1988). A further cautionary note is called in relation to generalizing the findings to populations where more than one language is the norm. Taking into account the results of

assessing one language may well be inappropriate. Given that it is more common to encounter communities where more than one language is operating it would appear to be presumptive to advocate assessment of dementia on the basis of one language alone. To this researcher's knowledge no comparative study, however, has been conducted employing cross sectional or longitudinal design in a bilingual population. In the following section it will be shown why it is important to account for multiple language use.

SUMMARY

Language impairments in dementia have been identified, summarized in table 3.1. Methodological issues confound the interpretation of results. Other variables such as poor memory may further influence interpretation of language specific changes. Longitudinal studies have suggested an order of impairment over time in addition to identifying similar findings from cross sectional studies. Semantic and pragmatic difficulties are identified early in the illness whereas phonology and syntax are maintained until much later in the illness.
Theoretical models have been presented to account for language impairment in dementia. The role of language testing in the early detection of dementia shows positive results. Attention has been drawn to the need to address early detection of dementia via language based assessments in communities where more than one language is spoken.

CHAPTER FOUR

BILINGUALISM

Bilingualism is present in practically every country of the world, in all classes of society, and in all age groups (Grosjean, 1982). In fact it is difficult to find a society that is genuinely monolingual, so that bilingualism is nearer the norm in countries than is generally believed (Lewis, 1976). No precise statistics exist concerning the number and distribution of speakers of two languages in the world. Although there are lists of languages spoken worldwide, and the number of people who speak them, there are no comparable figures on the use of two or more languages (Grosjean, 1982).

In the border areas between two language groups, economic and commercial factors lead many people to use both languages on a regular basis, for example Spanish-speaking Mexico and English-speaking America. Bilingualism is also present in specific areas of some countries where linguistic minorities are concentrated. Thus in Brittany most speakers of Breton (a Celtic language) also speak French, and in Wales, most users of Welsh (also a Celtic language) speak English. Bilingualism in some countries is spread throughout a population, as in Paraguay, where Guarani-Spanish bilingualism is found in all areas. In some parts of the world bilingualism exists mainly in urban areas. In the town of Madina, Ghana, for example, over eighty different languages are in contact, and most inhabitants speak at least three languages (Berry, 1971). On the border of Brazil and Columbia there are approximately 10,000 people and about twenty five languages, and most individuals

speak two or three languages (Sorense, 1967).

Although bilingual people are those who use two or more languages in their everyday lives (Grosjean, 1989), the extent to which people will speak both languages will vary, both in contact (or use) and in fluency or ability (competence). A definition of `bilingual' and `bilingualism' must therefore be able to account for this variation.

The conventional model of language is challenged by speakers of more than one language. The prevailing view of language, at a neurological level, is that language is located in the left hemisphere of the brain. In bilinguals more than one language has to be stored in the brain. The location is unclear in bilinguals (Paradis, 1989; Albert and Obler, 1978).

Bilingual persons have to access their multiple languages and be able to select one language in a particular setting above the other. The manner by which they are able to do this has been the source of much discussion (Green, 1987; Hamers and Blanc, 1989). This has resulted in postulating:

i) The existence of two independent psychological mechanisms, one for each language (Independence hypothesis);

ii) the existence of a single mechanism common to both linguistic codes (Interdependence hypothesis).

At a language processing level physically different but functionally equivalent stimuli are interpreted, recognized and remembered. The bilingual person has to organize, store and retrieve this knowledge.

There is general agreement that the bilingual must have a representation common to both languages, although at what level processing occurs is unclear (Hamers and Blanc, 1989).

Hence research interest in bilingualism is concerned with:

a) The definition and measurement of bilingualism

b) The cerebral location of multiple languages in the brain.

c) The separation and selection of languages - without mixing and interference.

d) The coding or storage of multiple languages in the brain - one or two coding systems.

The following chapter will give an overview of current research interest under the above headings. A detailed presentation of the many definitions of bilingualism will not be given here. The reader is directed to other sources for such an account and for further considerations of the many controversies which are present within current research in the area (see for example, Baetens Beardsmore, 1982; Dulay et al., 1982; Grosjean, 1982; Romaine, 1989; Hamers and Blanc, 1989). It is intended, however, to look at issues which are of particular interest to language loss. A definition of bilingualism for this study will be given along with a discussion of methods used to assess bilingual language ability.

A) Definition and Measurement of Bilingualism

i) Definition of Bilingualism

Due to the variation seen between speakers of more than one language different definitions have been proposed. In order to account for the many variations and approaches to defining bilingualism a definition containing dimensions of bilingualism has been suggested. Table 4.1 (adapted from Hamers and Blanc, 1989) identifies the key dimensions which have been described to define bilingualism. Viewed in this manner `bilingualism' is defined by each individual's relation to each dimension. Thus individual variation across each of these dimensions highlight the variation found between bilingual people.

Table 4.1: Dimensions of Bilingualism

	Dimension	Terminology	Definition
1.	COMPETENCE	balanced	Equal competence in both languages
		dominant	More competence in one language than the other.
		true ambilingualism	
2.	ORGANIZATION	compound	Unit one language=unit of the other. Both=one conceptual
		coordinate	unit, both languages have their own conceptual unit.
3.	AGE OF ACQUISITION	childhood	Both languages acquired before 10/11.
		a) simultaneous	Both languages being acquired at the same time.
		b) consecutive	One language acquired before the other. Both acquired before 10/11.
		adolescent	Second language acquired between 11 and 17.
		adult	Second language acquired after 17.
4.	LANGUAGE ENVIRONMENT	endogenous	Both languages present in daily life.
		exogenous	Second language absent from the community.
5.	STATUS	additive	State of bilingualism viewed as an advantage (socially valorized)
		subtractive	Bilingualism viewed as disadvantageous.
6.	IDENTITY	bicultural	Double membership and bicultural identity.
		monocultural	Retaining group membership and cultural identity to first language.
		acculturated	Group membership and cultural identity to second language.
		deculturated	Ambiguous membership and anomic dientity.

1. Competence

Bilinguals have usually been described and evaluated in terms of their fluency in two languages and it is at this point definition and description are complicated. The `real' bilingual is seen as the person who is equally and fully fluent in two languages. This has also been called `ideal', `true', `balanced' (Batens-Beardsmore, 1982) and `perfect' bilingual (Bloomfield, 1935; Thiery, 1976). All the others, who in fact represent the vast majority of people who use two languages in their everyday lives are regarded as falling into specific types of bilinguals. Hence the numerous wording such as `semilingual', `alingual', `dominant', `ambilingual' (Halliday et al., 1970) and `unbalanced' (for detailed discussion see Batens-Beardsmore, 1982).

Weinreich, (1953) and MacKey, (1962) define bilingualism as the alternate use of two or more languages by one or more dimensions of bilinguality. This, however, is not a dimension but the expression of one or more dimensions of bilinguality. The notion of use means that a bilingual individual has the capacity to call on either language, and this implies a minimal competence in both languages. Use will show whether a bilingual person is more or less dominant in one or the other language for a specific domain or topic. The term `preferred language' has been proposed to account for choice of language in a particular situation (Dodson, 1981).

This dimension of bilingualism is of particular relevance to this present study. The notion of competency becomes particularly relevant when accounting for loss of linguistic and communication competency as a result of dementia.

2. Cognitive Organisation

From Weinreich's, (1953) original idea, Ervin and Osgood, (1954) developed the distinction `compound' and `coordinate' language systems. In a compound system two sets of linguistic signs come to be associated with the same set of meanings. In a coordinate system translation equivalents in the two languages correspond to two different sets of representations. The distinction refers to a difference of cognitive organization and not to a difference in competence or age or context of acquisition.

There is a high correlation between the type of cognitive organization, age and context of acquisition (Lambert, 1958), but no one-to-one correspondence between the form of cognitive representation and the age of acquisition. An individual who learned both languages as a child in the same context is more likely to have a single cognitive representation for two translation equivalents. A person who learned a second language in a context different from the first will probably have a coordinate organization (for a more detailed explanation see Hamers and Blanc, 1989; Romaine, 1989). The difference can be viewed as two poles of a continuum on which bilinguals will vary (MacNamara, 1967; Hamers and Blanc, 1989).

This distinction implies that bilingual persons do not all organize verbal material in the same way. Coordinate bilinguals are expected to have a more independent organization than compound bilinguals. This has been supported by a number of studies (e.g. Lambert et al., 1958; 1969). It has been suggested, however, that compound bilinguals have a common semantic store for both linguistic codes whereas

coordinates would have a more independent store (Jakobovits et al., 1969). Studies have also been interpreted as demonstrating that compound bilinguals have a higher degree of interdependence in the organization of their two codes than coordinate (Lambert et al., 1969). Compound-coordinate distinctions, however, have not always been evident (Diller et al., 1970; Arkwright et al., 1974).

The apparent contradictory findings have been interpreted as showing that a bilingual speaker will have a more compound organization for concrete words and a more coordinate one for abstract words. Hence it is possible for an individual to be coordinate at the level of syntax and semantics, but to have a compound phonology, that is a broadened system that serves for both languages. This means that for example, where /i/ is neither the French /i/ nor the English /i/ but something in between that serves for both, in the case of a French-English bilingual (Paradis, 1977).

It has been suggested that should this difference between compound and coordinate bilinguals exist then these differences will vary not only according to the subjects but also according to the task and to the linguistic material involved. Thus caution has been proposed if results are to be accurately interpreted from such studies and detailed language acquisition histories must be obtained (Hamers et al., 1979; Grosjean, 1989).

It has been further proposed that bilinguals who learnt their two languages in childhood display different association networks from equally fluent bilinguals who learnt their second language in later life (Ruke-Dravina, 1971). It seems compound bilinguals do not dissociate a semantic task from

code-switching, whereas coordinate bilinguals proceed in two steps. Thus, compound bilinguals could be defined as those brought up in a thoroughly bilingual home environment from infancy, while coordinates were those who had learned the second language at some time after infancy usually after ten years of age, and usually in a setting other than the family (Lambert, 1972).

This cognitive organisation is likely to be an important factor in language loss and could contribute to language decline patterns.

3. Age of Acquisition

The age of acquisition contributes not only to cognitive representation but also in other aspects of bilingual development, namely, linguistic, neuropsychological, cognitive and sociocultural development (Lambert, 1972; Hamers and Blanc, 1989).

Early bilingualism is defined as the acquisition of more than one language in the pre-adolescent phase of life, called `infant bilingualism' (Haugen, 1956); `bilingualism as a first language' (Swain, 1972), `ascribed bilingualism' (Adler, 1977) and childhood bilinguality (Hamers and Blanc, 1989).

`Consecutive bilingualism' describes when the acquisition of the second language early in childhood but after the basic linguistic acquisition of the first is achieved. `Simultaneous bilinguality' or `Successive bilingualism' describes when the child develops two languages from the onset.

Late bilingualism or adolescent bilingualism refers to learning the second language after the age of 10/11

but before 17, whilst adult bilinguales occurs when the second language is learnt in adulthood.

Patterns of language decline may vary according to age of acquisition. This has not however been addressed in the literature.

4. Language Environment

According to whether the speech communities of both languages are present in the child's social environment, the dimension of endogenous and exogenous bilinguality have been proposed.

An endogenous language is one that is used as the first language in a community and may or may not be used for institutional purposes, whereas an exogenous language is one used as an official, institutionalized language but is not spoken in the community (Hamers and Blanc, 1989).

5. Status

According to whether the two languages are socially valued in the environment the child will develop different forms of bilinguality (Lambert, 1974, 1977). It has been shown that if the two languages are sufficiently valued this results in maximum benefit from the bilingual experience. This can act as an enriching stimulation leading to greater cognitive flexibility compared to monolingual counterparts. If the sociocultural context devalues the first language then cognitive development may be delayed in comparison to monolingual counterparts. These concepts have been termed `additive' and `subtractive bilinguality' (Lambert, 1974).

6. Identity

It has been suggested that the integration of two cultures at a socio-affective level, is the analogue of additive bilinguality at the cognitive level (Hamers and Blanc, 1989). Being `monocultural' means that although bilingually competent in both languages there is not a dual cultural identity. Bilingual identity can lead to renouncing the first language cultural identity and adopting `acculturated bilingualism'. Giving up both cultures leads to becoming anomic or deculturated (Berry, 1980).

In Summary: A definition of bilingualism is made on the basis of recognizing all 6 dimensions occurring for a bilingual person. Identifying the relationship an individual speaker of more than one language will have on these dimensions aid the understanding of bilingualism. This dimension of bilingualism is important in considering the measurement of language use and assessing ability of the resulting language loss.

ii) Measurement of Bilingualism

The majority of measures of bilingualism have been constructed on the basis of an assumption. This is that measuring two separate monolingual states can obtain an adequate measure of bilinguality (the use of two languages). This, however, has been disputed (Hamers and Blanc, 1989; Grosjean, 1989). It has been proposed that the bilingual is more than the sum of two monolinguals and that this behaviour displays some unique characteristics.

It has been shown that comparing language skills in different languages is unreliable at a methodological level (Hamers and Blanc, 1989; Grosjean, 1989). Comparison of performance on language tasks cannot be

done by assuming that the test itself is measuring two languages equally. It has been shown for example that a test of digit recall in Welsh and English is weighted in favour of English (Ellis et al., 1980).

To provide an accurate measure of multi language ability information on use of languages in various settings must be collected. This has been described as "language behaviour". This entails focusing on what bilingual people do with their two languages rather than on how well they know them (MacKey, 1966). This involves relating information on all language contexts and use from language spoken at home to language spoken at work. Samples of language are then taken and transcribed in order to look for patterns of language use and language abilities.

B) Cerebral Lateralization in Bilinguals

With the publication of 'The Bilingual Brain' (Albert and Obler, 1978) there followed an upsurge of research activity addressing cerebral lateralization in bilinguals.

The central focus was whether cerebral lateralization in bilinguals differs from that of monolinguals. If lateralization is the same then both languages of the bilingual person would be processed in the same way (Obler et al., 1982). It is generally accepted that language is processed in the left hemisphere (Lenneberg, 1967; Albert and Obler, 1978; Romaine, 1989).

A general principal has been suggested with which to approach the area with regards to bilingualism (Paradis, 1987). Bilinguals are more likely to show a comparable pattern of hemispheric involvement across

their two languages the more similar the language acquisition conditions. Conversely, the less similar the language acquisition condition the greater the likelihood that the pattern of hemispheric involvement will differ across the two languages of bilinguals. The exact nature of this difference will depend on the outcome of interaction effects of a variety of factors (Paradis, 1990).

The current findings continue to be inconclusive and controversial regarding lateralization in bilingual people (Whitaker, 1989; Scheiderman, 1986; Ojemann and Whitaker, 1978 and Rapport et al., 1983). In a recent review (Paradis, 1990) the whole area of research on lateralization in bilinguals was seriously challenged, concluding that given the contradictions, nothing of value or usefulness has been demonstrated.

C) The Separation of Languages in Communication

The manner by which bilingual people succeed in keeping their two languages separate has been a major focus in the bilingual literature. Most attention has been drawn to how children acquire and develop their two languages, as interference is frequently observed at this time (for a review see Hamers and Blanc, 1989).

It has been proposed that speakers of more than one language have developed a "bilingual switch mechanism" (Albert and Obler, 1978). This switch would then be responsible for allowing bilingual people to speak appropriately in one language without interference from the other.

Interference is defined as the use of elements from language B in an utterance in Language A (code mixing)

as well as the alteration between Language A and Language B in the same utterance (code switching). These elements may be lexical, syntactic or semantic.

The notion of mixing is close to that of inference. According to Grosjean, (1985) bilinguals use a bilingual speech mode with other bilinguals who share their language speech mode and with whom they normally mix languages (code-switching, code mixing and borrowing).

It has been suggested that mixing is an integral part of bilingual development (Romaine, 1989). The majority of mixings are lexical in nature, with nouns as the most frequently substituted words (Swain and Wesche, 1973; Cornejo, 1975; Lindholm and Padila, 1978; Redlinger and Park, 1980). Many mixings are `lexical reduplications' or `spontaneous translations' as when a translation equivalent is supplied as a synonym (for example, `another one', `un arall'); spontaneous translations would suggest that the child is aware of the mixing and is deliberately using it as a communication strategy, and when the situation requires acts as an interpreter (Swain and Wesche, 1973). A phenomenon related to mixing is loan blending, that is borrowing a word from the lexicon of the other language and grammatically adapting it to the language used in the utterance , as e.g. the verb `stopio' used in a Welsh utterance. In this example the Welsh suffix `-io' is added to the English word `stop' in order to conform with Welsh verb formation rules. Mixing is not exclusively lexical but may also occur at other levels, as in the example `est-ce que you give it to her?' (Swain, 1972), where a French question morpheme precedes an English sentence.

It has been suggested that all bilingual children mix

codes although this mixing occurs with a low frequency (Swain and Wesche, 1973; Lindholm and Padilla, 1978; Redlinger and Park, 1980). Very little is known as to the role mixing plays in the development of two languages (Hamers and Blanc, 1989). Swain, (1971) suggests that role mixing is a manifestation of a creative process used in the acquisition of language. The child may use mixing either because the equivalent is lacked in the appropriate language or because the mixed utterance expresses the intended meaning more adequately.

Goodz, (1984) observed that language mixing in the child is related to the mixing produced by the parents: at the onset of the child's speech production parents will use every possible communication strategy, including mixing,; at a later stage, however, they might revert to a separation between the languages, especially if they notice a lag in the production of one of the child's languages. Mixing raises the whole issue of differentiation between the two languages. To this researchers knowledge no systematic study of the role of language mixing in the breakdown of language in dementia has been reported.

D) Coding and Storage of Multiple Languages

When a bilingual person is presented with verbal material the first task is to identify the language in which this material is presented (Hamers and Lambert, 1977). The way a bilingual person does this has been the focus of attention in the literature (Marshall et al., 1984; McCormack, 1974, 1977; MacNamara and Kushnir, 1971; Treisman, 1969; Penfield and Roberts, 1959; Preston and Lambert, 1969).

In order to explain how a bilingual person has to

maintain two languages it has been hypothesised that a bilingual will have developed two separate or one single language system. According to the former hypothesis, there are two distinct and independent psychological mechanisms, one for each language (known as the Independent hypothesis). That is, there are two distinct representations for words (Magiste, 1980; Kolers et al., 1980; MacNamara et al., 1971; Ehri et al., 1980). The hypothesis assumes that as bilingual people have separate memory stores for the two languages they are able to control whether a particular language is functioning at a given time. The shared coding hypothesis assumes that bilinguals have a single conceptual or semantic representation, common to both linguistic codes and hence a single language system (Interdependence hypothesis).

Hamers and Blanc, (1989) review the evidence supporting both hypotheses and conclude that the controversy between the proponents of the common-store and the separate-store memory is still unresolved. It seems that there is empirical evidence in favour of either model (e.g. Cutler et al., 1989; Ardal, et al., 1991). It may be that given the degree of evidence supporting both shared and separate coding hypotheses both types of processing are possible and that what determines the ultimate nature of the bilingual's processing of information is as has been suggested, the nature of the task used to measure it (Marshall et al, 1984).

A recent attempt to model bilingual speech production and perception has been advanced by Green (1987). He distinguishes three states of a language system: `selected', `active' and `dormant'. In its selected state a language would control speech output, while in its active state it would still play some role in

on-going processing. In its dormant state it would reside in long-term memory, but exert no on-going processing. These three states have been independently identified by Norman and Shallice, (1980) in the context of non-verbal motor skills.

Green views selection of one language as the consequence of successfully suppressing the activation of the other. As Romaine, (1989) points out, the performance of bilingual individuals is viewed in the same framework as monolingual speakers. Both experience temporary disruptions of varying degrees of severity. Normal speech is the successful avoidance of error, which is always a possibility as, for example, when monolingual speakers produce blends such as `strying' [<trying + striving], or bilingual speakers produce across language ones such as `springling' [< English spring + German Fruhling]. These examples do not indicate that any part of the system has been damaged or destroyed. The error simply results from a temporary failure to exercise full control over an intact system.

In the kinds of naming tasks given to bilingual speakers, words from both languages will compete for selection. Similarly, a monolingual person performing the same task must also activate a word for an object which may evoke associations shared with other words. A picture of a car, for example, may lead to the internal representation for the names `car', `taxi', `van', being activated because they all share some of the perceptual and functional properties that define a car. Occasionally two competing items are activated, resulting in a blend. Examples as those above have been cited as evidence of a probable two-stage process in selection (Garrett, 1982). Firstly, the speaker activates words of a certain meaning, and secondly he

retrieves the actual phonological form, which is later converted into phonetic shape.

Green (1987) suggests how this might account not only for normal speech errors, but also aphasia in bilingual and monolingual speakers. Green's model suggests that when a person wishes to speak one language only, this language must be selected and the other inhibited. In agreement with other authors (e.g. Albert and Obler, 1978; De Camp, 1971) Green suggests that this is done by tagging feature labels onto individual items. Suppression of the non-selected but active language is achieved externally in spontaneous use. Fluency difficulties will occur whenever there is an expression in the non-selected language which is more readily available than in the selected one. In order to produce the correct phrase, the alternative one must be suppressed. In the case of code-switching there may be no external expression. The output may vary according to which words reach the threshold first.

Green goes on to cite examples from bilingual studies and from studies of people with aphasia to demonstrate how this model can help explain the data obtained. For further demonstration of the usefulness of this model and a visual representation the reader is directed to Green's discussion (Green, 1987).

Romaine, (1989) reviews the literature focusing on bilingual production and processing and although concedes that Green's model offers a conceptual advancement on previous models, she points out that it does not specify how sentence level processing will be incorporated, and what relationships may exist between the lexicon, morphology and syntax. Two languages may be unified at more levels than the conceptual, and it

is possible that in some cases of bilingualism, grammars are more closely linked at the syntactic than the lexical level. There is evidence to support the view that certain aspects of language processing at the level of the sentence operate differently and that monolingual speakers of different languages process the same information in different ways (MacWhinney et al., 1984); that there is interaction between a bilingual's two languages in sentence processing (Bates and MacWhinney, 1981; McDonald, 1984). There is also evidence that phonological production and perception may operate in monolingual and bilingual persons differently. Voice Onset timing distribution and colour vocabulary for example differ between monolingual and bilingual speakers (Caramazza et al., 1973 and Caskey-Sirmons and Hickerson, 1977 respectively).

Romaine, (1989) in a review of the evidence concludes that an interactionist rather than independent view of bilingual processing should be advocated. The exact nature and extent of interaction between the bilingual person's two languages will depend on the speaker's proficiency in each and on the relationship between the language-specific features which are available as cues for sentence processing. The issue of individual differences between bilingual persons is again identified as an important variable (Romaine, 1989).

DEMENTIA IN BILINGUAL OLDER ADULTS

Neuropsychiatric aspects of bilingualism and bilingual language use has been identified although no systematic investigation has been conducted to this researcher's knowledge. Hughes, (1981), cites a case from clinical practice and refers to selective loss of language in dementia. The finding is explained in terms of localized neurological lesions, whereby the dominant language of a bilingual subject or the primary language is being preferentially retained. Differential loss in balanced bilingual subjects, he further suggests, is not uncommonly observed in clinical practice (Hughes, 1981; Personal Communication).

Anecdotal evidence from neurologists and other professionals has suggested that in dementia an older adult may experience extreme difficulties in a once previously well known language which was not their native language or revert entirely and in inappropriate circumstances to exclusive use of the first language (e.g. using the language with grandchildren who did not speak or understand it at all, Obler, 1981). It may be that cases in which a healthy or dementing person does not use languages inappropriately, or does not evidence deterioration in the second language do not get reported.
Similarly cases in which it was not the well used second language but rather a little used first language which deteriorated with ageing or dementia are unlikely to be reported. Neurolinguistic factors behind alleged forgetting of a second language in adults should be documented and studied (Obler, 1981).

Bilingual dementia subjects may offer an alternative perspective on which to view theoretical understanding

of various aspects of language changes which occur in dementia. If language changes are found to occur in one language the question of interest is whether the same is seen in the second language. If deterioration is observed and can be seen to follow in the same way for both languages this may be seen as evidence of the two languages operating within a common store and coding system. Should the order of language breakdown differ in the manner of impairment of an individual this may be viewed as evidence of a separated coding and storage system for bilingual persons.

By comparing language impairments it may be possible to find examples where naming is equally impaired in bilingual persons. Findings may indicate whether naming errors can be said to result from perceptual or semantic impairment and hence address current models for understanding language impairments in dementia.

SUMMARY

A brief introduction to the area of bilingualism was given to serve as a context for looking at multiple languages in dementia. Bilingualism was defined along six inter related dimensions: competence, cognitive organisation, age of acquisition, language environment, status and identity of a bilingual person. The difficulty measuring bilingualism was described. Other key issues in bilingual research were identified, namely: cerebral lateralization, the separation of languages during speech and the coding and storage of multiple languages. The question of dementia in bilingual older adults was raised and interesting questions for investigation identified.

CHAPTER FIVE

THE STUDY: AIM, DESIGN AND METHOD

The review of the literature in the preceding chapters has shown that language in the dementing process has become the source of increased research attention. The area is becoming an ever growing field of enquiry and thus emerging in its own right as one with a contribution to make not only in furthering understanding of the dementing process, but also in strengthening understanding of the language system. Some of the difficulties in investigating language in dementia have been highlighted. The added aspect of bilingual language decline has been raised. It has been shown how research on bilingual behaviour addresses issues distinct from monolingual language behaviour. Reasons for investigating bilinguality in connection with dementia have been identified. Important questions however remain to be answered.

1. AIM

The aim of this study is to investigate some of the bilingual linguistic factors which might operate in older adults in the early stages of dementia. Of the bilingual linguistic factors special attention is focused on:

(a) Adopting a developmental perspective of language use and contact to obtain a measure of degree of bilingualism (proficiency in two languages).

(b) Specific language processes, namely,
    i) auditory comprehension
    ii) word finding

iii) oral expression
iv) repetition
v) reading comprehension
v) conversational speech

Language use and contact over developmental life stages was adopted as a method of measuring language proficiency. Six developmental stages were identified for exploration: the influence of childhood factors; adolescent language factors; early adulthood; middle adulthood; later adulthood; and older adulthood.

The specific language processes as listed above were considered to be most relevant, as identified from previous studies of language in dementia.

The study was intended to examine the above linguistic aspects in relation to dementia with subjects acting as their own controls.

The study sought to address the following questions:

1) Has dementia affected language ability in bilingual older adults. If so is there a difference of decline in the two languages of the same individual (Welsh and English).
   - *by assessing performance on language measures over a period of time in Welsh and English.*

2) Can bilingual linguistic variables be identified which operate in older adults in the early stages of dementia.
   - *by investigating a developmental perspective testing six hypotheses based on language history and looking for a relationship between language deterioration patterns and language history.*

3) Can specific differences in the way two languages decline be identified when subjects are selected on the basis of dementia severity and language use and contact history.
- by looking at a random selection of individual subjects with different language background histories and dementia severity and looking for similarities and differences in responding to language tasks.

4) Can specific language abilities be identified which are sensitive to dementia in bilingual older adults.
- by investigating specific language processes, namely,
i) Auditory comprehension
ii) Word finding
iii) Oral expression
iv) Repetition
v) Reading comprehension
vi) conversational speech

5) Can language skills, which are resistant to dementia, be identified for bilingual persons.
- by looking for maintained language abilities over time in the specific language processes listed in question 4.

6) Can an order of decline in language ability be identified for bilingual persons with dementia.
- by conducting a longitudinal study, assessing performance on specific language measures over time and identifying any performance changes in subjects with dementia.

For Specific Hypotheses see Section E in this chapter.

II. DESIGN

A longitudinal study employing a within subject, repeated measurement, experimental design was used. This methodology has been shown to have several advantages over cross section research designs (e.g. Schaie, 1983; Salthouse, 1982). These include allowing individual ageing trends to be investigated and greater statistical power to allow assessment of small age influences. In addition, because cognitive changes in dementia occur more rapidly than in normal ageing, the length of time needed to conduct longitudinal research can be reduced (Kaszniak et al., 1986; Storandt et al., 1986). Thus there is likely to be less confounding between cohort effects and duration of dementia than between cohort effects and age in normal ageing studies (Bayles, 1987). In this study subjects were tested at six monthly intervals over a period of two years. It was hoped to obtain a sample of 25 subjects in the early stages of dementia.

As it is not clear how dementia influences language ability in bilingual people, a qualitative methodology was incorporated into the study. A qualitative paradigm focuses on specifically what people say. Of particular interest was how subjects with dementia respond to the testing sessions, and whether language mixing or interference occurs with dementia and whether this increases as dementia advances. The methodology allows comparison of recurring themes from selected cases with the aim of generating a theory based on the data. This form of qualitative methodology is based on grounded theory (Glaser and Strauss, 1967; Wiseman, 1979).

III METHOD

A. OBTAINING SUBJECTS FOR THE STUDY

1) Selection Process

In a major study in this field Bayles, (1982) used the following criteria to select subjects:

60 years of age or older, with no history of stroke, having spoken English since childhood, being able to read English and having adequate vision for reading.

This study uses similar criteria, will exclude stroke, and accept the necessity for adequate vision and auditory discrimination.

Although neuropathological confirmation was not available for this study, to determine whether a diagnosis of SDAT could be confirmed, other investigators have indicated that a clinical diagnosis of SDAT can be made with 82% accuracy if care is taken to exclude subjects with stroke or other obvious causes of dementia (e.g., Sulkava et al., 1983).

The selection of subjects for the study was conducted in two stages, Phase One and Phase Two.

i) Phase One

The first selection stage (Phase One) was undertaken by the General Practitioners who were participating in the study. The criteria given by the researcher for the selection of subjects at this stage was:

a) subjects who within the last six months have presented with early signs of dementia.
b) signs of memory impairment, forgetfulness and

disorientation.

c) needing day care facilities or an increase in home support.
d) bilingual Welsh and English.
e) either sex.
f) aged over 65.
g) no serious physical impairments; eyesight and hearing adequate.
h) living in their own homes, or with their families.

ii) Phase Two

Stage two (Phase Two) of the selection procedure included the following criteria:

i) the subject conforms to the above profile.
j) subject is willing to participate in the study.
k) the subject has regular contact with a relative or with one of the community agencies (for help in completing the Language Questionnaire and to complete the Behaviour Rating Scale).
l) broadly equal numbers of subjects from areas which have remained predominantly Welsh-speaking rural areas and areas which have become more Anglicised English-speaking parts of the catchment area.

2) The Sampling Procedure

120 cases were referred meeting the criteria at Phase One. Of these, 79 subjects were lost with only 41 (34%) meeting the criteria for Phase Two of the selection process. This low rate was due the following reasons:

1) Language - 5 people could not speak Welsh
2) Bereavement - 2 people were grieving following

recent bereavement

3) Death - 2 had died since referral.

4) Hospitalisation - 3 were in hospital and prescribed antidepressants.

5) Dementia severity - 10 subjects could not give a history as a result of their confused state.

6) Physical health - 7 subjects had poor physical health. 1 had a broken leg and 1 an amputee. The others had poor eyesight and hearing.

7) Noncompliance - 50 referrals were unwilling to continue with the study. Of those, 32 would not open the door to the researcher (abandoned after two visits); 18 were unwilling to proceed following language and background history taking; Families of 6 subjects were unwilling for them to continue with the study following history taking.

3) The Final Sample

The reader is directed to Figure 5.1, (Page 112) in the Testing Procedure for an overview plan of the experimental design.

Of the 41 subjects who entered Phase Three (Data Collection), 33 (80%) completed the assessment at Time 1. Of those, 16 (39%) had dementia by the end of the study (from scores on the K.C.T.).

The further drop out between the 41 who entered Phase Three and the 25 for whom follow up assessment was completed is accounted for in the following way.

1) Time 1 : 8 subjects withdrew consent. 2 withdrew consent on the second day of testing and had received a diagnosis of dementia. 1 withdrew consent and was not diagnosed as suffering from dementia. The other 5 completed testing at Time 1 and received a diagnosis of dementia but were unwilling to be reassessed in six

months.

2) Time 2 : 1 subject, not diagnosed as suffering from dementia, died unexpectedly prior to testing. 2 subjects withdrew consent during testing. 1 had received a diagnosis of dementia, the other had not received this diagnosis.

3) Time 3 : 1 subject, diagnosed as suffering from dementia, died prior to testing. 2 subjects withdrew consent. 1 was diagnosed as suffering from dementia, the other had not received this diagnosis.

4) Time 4 : 2 subjects, both diagnosed as suffering from dementia, withdrew their consent.

In all a total of 16 subjects were lost during Phase three. Table 5.1 presents the demographic information of these 16 subjects who failed to complete the assessment procedure.

TABLE 5.1 SUMMARY OF DEMOGRAPHIC INFORMATION (n=16)

	No	Age	Widowed	Unmarried	Welsh area	Anglicised area
M	3	mean 72.67 s.d. 2.90	2	1	0	3
F	13	mean 72.46 s.d. 2.52	13	0	5	8
T	16	mean 72.5 s.d. 2.67	15	1	5	11

These difficulties and drop out rates are consistent with those described in other studies (e.g. Searle, 1984), and might be anticipated given the nature of the dementing process (e.g. Miller, 1977).

Of the 41 subjects entering Phase Three, 27 subjects (66%) were diagnosed as suffering from dementia and hence were accurately selected for the study. Based on the original 120 referrals this represents 22.5%

Twenty five subjects of the original referrals (120) were subjected to data analysis. Sixteen (13% of original referrals) were dementing by the end of the study. Table 5.2 presents the demographic information of this sample of twenty five. Included in brackets is the separated information for the 16 subjects diagnosed as having dementia by the end of the study.

TABLE 5.2 SUMMARY OF DEMOGRAPHIC INFORMATION (n=25)

	No	Age	Widowed	Unmarried	Welsh area	Anglicised area
M	5(4)	mean 77.75(80)	1(1)	4(3)	5(4)	0(0)
		s.d. 7.56(7.48)				
F	20(12)	mean 78.65(80)	9(3)	11(9)	12(5)	8(7)
		s.d. 4.65(4.48)				
T	25(16)	mean 78.56(80)	10(4)	15(12)	17(9)	8(7)
		s.d. 5.09(5.09)				

The number of male and female subjects can be seen in Table 5.2 to be 5 males (M) and 20 females (F). This ratio is representative of other investigations and of the ratio of male to female at this age group (Miller, 1977). Subjects' age at the beginning of the study and information about where subjects were located are given. All of the males in the sample live in a Welsh speaking area of North Wales.

B. MEASURES

Measures used in the study were:

1) Kendrick Cognitive Test for the Elderly (KCT)
2) Wechsler Memory Scale (WMS)
3) Boston Diagnostic Aphasia Examination (BDAE)
4) Token Test (TT)
5) A Behaviour Rating Scale (BRS)
6) A Language Use and Contact Questionnaire (LUCQ)

Apart from the Behaviour Rating Scale, all measures used in the study were translated. This was undertaken by the researcher and the final version was agreed following consultation with colleagues in the Welsh Department at U.C.N.W. Bangor. All the measures used in this study, and their Welsh translation appear in full in the appendix.

1) Kendrick Cognitive Tests for the Elderly

This measure was selected as it is based on everyday familiar items, can be easily translated, is easy to administer, and can be administered by a researcher in addition to a qualified clinical psychologist.

The psychological assessment of the elderly person presents a vast array of problems at the theoretical and technical levels.

Long test batteries are unlikely to be appropriate for use with the elderly because poor attention and fatigue lose the subjects' cooperation (Kendrick, 1982; Faber-Langendoen, 1988). The Kendrick Cognitive Tests for the Elderly are short, simple and easy to administer. The tests come in two parts, the Object

Learning Test (KOLT) and the Digit Copying Test (KDCT). Used together, and in a sequential testing programme, they have been found to differentiate between elderly normal and dementing people to a high level of accuracy (Kendrick, 1985). They can be used for other assessment and differential diagnostic purposes.

i) The Object Learning Test (KOLT)

The test consists of four white cards 40.64cm by 35.56cm divided into 25 equal sections. Within these sections are black and white line drawings of various familiar objects, e.g. Comb, teapot, chair, etc. The first card displays 10 objects, the second 15, the third 20 and the fourth 25. Six items are repeated across the four cards always in the same position. In addition, on each card there are a number of items which form a category across the four cards. The exposure time allowed for inspection of each card is based upon a three second viewing time per object. The times are shown in table 5.2.

TABLE 5.2: INSPECTION TIMES

		No. of items
Card 1	30 seconds	10
Card 2	45 seconds	15
Card 3	60 seconds	20
Card 4	75 seconds	25

The full score is the total number of correct items recalled over the four cards. Maximum score is 70. This is transformed into an age scaled quotient and together with the Kendrick Digit Copying Test can be used as a diagnostic tool.

There are two equivalent forms, A and B.

Presentation

The subject is seated at a table in a well lit area. The examiner then says to the subject:

"Here I have four large cards. On the cards there are some pictures of various common objects you should recognize. I want you to look at the objects and try to remember as many of them as possible, for in a short while the card will be turned over. When the time is up, I want you to tell me as many of the things you saw as possible. You can tell me them in any order. Is that clear?"

When the allowed viewing time has been reached the examiner says:

"The time is up (THE CARD IS TURNED OVER AND REMOVED), now tell me as many things as you can, in any order."

The responses are recorded by striking out the correct responses on the score sheet. If the subject stops after giving several responses, the examiner can say:

"Can you remember any more?"

ii) The Kendrick Digit Copying Test (DCT)

The KDCT is a simple test of speed performance. The author claims that the test can be used in the following ways: to screen for the presence of dementia (but not to distinguish between the various forms of dementia); for the differential diagnosis between dementing, pseudo-dementing, depressive and normal modes of responding; and for research purposes (Kendrick, 1985).

Presentation

The test is placed on a table or desk in front of the subject who is provided with a ballpoint pen. The examiner gives the following instruction:

> *"I want you to copy each number as fast as you can go. If you see a 9 put a 9 here (INDICATED), if a 1 put a 1. Put your numbers on the lines below (POINTED). Don't miss any numbers, work across the lines, continue until you are told to stop. Don't worry too much about being neat, but go as fast as you can. Ready, begin."*

The subject is allowed two minutes to complete the test. If the test is finished before the time elapses, the time is recorded to the nearest second for the completion of 100 digits.

The number of digits written in two minutes is added up scoring 1 for each digit completed. If the test was completed within the two minutes the time taken is the score. The score can be transformed and converted to an age related score.

Validity/Reliability

No sex differences have been reported. The reliabilities of the individual tests in the Kendrick Tests are of sufficient magnitude for them to be used in pattern analysis. The validity of the Battery assessed against psychiatric diagnosis is good. In a sample of subjects with depression which contained a high proportion of individuals characterized by `pseudo-dementia' an attempt to differentiate these from dementia was made. The results showed that 93% could be correctly identified (Kendrick, 1967).

In this study a significant correlation between the Welsh and English versions of the test was obtained (.8 at $p<.001$).

2) Wechsler Memory Scale

The Wechsler Memory Scale (WMS) (Wechsler, 1945) is a series of seven short subtests that provide a rapid, simple and practical examination of memory function. It has become a widely used clinical instrument for assessing memory function and is supported by hundreds of published studies (Prigatano, 1978; Brinkman et al., 1983).

Memory problems have been shown to occur early in dementia (e.g. Miller, 1977), hence the identification of memory impairment has a diagnostic role in the early detection of dementia.

These subtests comprise of personal and current information; orientation to time and place and current events; mental control items such as counting backwards, counting by 4's, and reciting the alphabet; immediate recall of paragraphs presented verbally; forward and backward digit recall; reproduction of geometric designs after ten seconds observation and the learning of ten paired associations presented and tested three times (such as `lock-door').

The test is designed to determine a memory quotient (M.Q.) in the same way as the I.Q. is determined. Although the WMS has received much criticism (e.g. Miller, 1977) some of the difficulties have been overcome, such as obtaining more representative norms (Osborne et al., 1978; Bak et al., 1981). Miller concedes that some of the subtest may have some potential for diagnosing dementia such as paired associate learning (Miller, 1977). Older adults

produce significantly higher scores on all subscales than subjects diagnosed as having dementia (Logue and Wyrick, 1979; Brinkman et al., 1983). The scale has also been shown to correlate with other measures in diagnosing dementia (Whelihan et al., 1984).

The WMS was selected for this study to support the Kendrick Cognitive Tests for the Elderly and so aid in the diagnosis of dementia.

3) The Boston Aphasia Examination Battery .

Over a century of intensive analysis of aphasic symptoms has produced considerable agreement as to the component deficits in aphasia. Some may appear in nearly pure form, or may stand out by their severity on a background of milder impairment in the remaining language skills. Thus extreme, selective disorders of auditory comprehension, object-naming, articulation, reading or repetition may be seen. Not only is there consensus as to the individual components which have been observed, but the common clusters of difficulties (i.e. the major aphasic syndromes) emerge repeatedly in the literature.

The Boston Diagnostic Aphasia Examination (BDAE) was developed with the aim of offering insight into the function of subjects. It was intended that the test results could be related to the common aphasic syndromes. Part of the development of the test was the study of the neuropathological correlates of the varieties of aphasia and the psycholinguistic analysis of aphasic language.
The approach measures articular configurations with their neuropathological correlates.

In the construction of the battery, the authors sought to assess the components of language. For this reason

it was decided to use the measure to study language processes in dementia. Thus the BDAE was developed with the assumption that language consists of many components. The scale consists of a number of subtests designed to assess function in these various components of language.
Their basic view is that if a researcher first talks to someone they may give a general view of language ability but it will not be in detail. Language problems can occur in expression, comprehension etc. and simple speech would not distinguish these aspects. Thus by measuring such components as the BDAE does, one can be more precise in assessment and measurement of various functions, possible areas of impairment and change over time.

The subtests of the aphasia battery have in turn been chosen so as to elicit quantitative evidence of the many possible specific areas of impairment to try and identify where they take place, as they are not necessarily obvious. This is undoubtedly the case with language impairments in dementia. Although there is no reason to expect similarities in impairment between the two syndromes, it may be helpful to approach the study of language in dementia using these measures which have been developed with precise attention to language processes.

For the purpose of this study subtests have been selected if:

a) impairments of a similar nature have been suggested and hence can be investigated for their presence in a bilingual sample.
b) they have been used in other studies of language in dementia so that a comparison can be made with a bilingual population (e.g. Bayles et al., 1982; Williams et al., 1989; Faber-Langendoen, 1988).

Subscales Selected from the BDAE

A description of the subscales used in this study follows. A copy of the subscales and their Welsh equivalents are included in the Appendix.

Auditory comprehension subscales:

1. Word Discrimination

This is a multiple-choice, auditory word-recognition test. Subjects are asked to locate named items from six semantic categories of words: objects; geometric forms; letters; actions; numbers and colours, giving the opportunity to observe selective impairment of word categories. This test correlates best with the other three auditory comprehension scores in the battery (.71 with Body-Part Identification, .68 with Commands and .62 with Complex Ideational Material.)

Each of the two test cards presents three categories of visual stimuli and the examiner names words in rotation among these three categories, forcing the subject to shift category-set with each test word. Individuals with dementia have difficulty with this task.

2. Body-Part Identification

The first eighteen items of the test sample a range of body-part names, including three fingers (middle, index and thumb). Eight items are included for right-left comprehension. This subtest's highest three intercorrelations are within the auditory comprehension cluster (.71 with Word Discrimination, .68 with Commands and .62 with Complex Ideational Material). The subject is asked to point on his own body to the part named by the examiner.

Monolingual subjects with dementia seem to perform relatively well on this task. This may be due to familiarity with the task. As the dementia becomes more severe it is expected that performance will deteriorate.

3. Commands

In this subtest, the subject has to carry out five commands. They increase in complexity to include:

1. Make a fist

and:

5. Tap each shoulder twice with two fingers keeping your eyes shut.

The highest intercorrelations of this subtest are also within the auditory comprehension cluster (.68 with Word Discrimination, .61 with Complex Ideational Material and .58 with Body-Part Identification). Monolinguals with dementia perform poorly on this test.

4. Complex Ideational Material

This subtest requires a `yes/no' answer to questions. The test begins with simple questions (e.g. *"will a board sink in water?"*). The material then increases in length and demand. Each item consists of a pair of questions, one requiring *"no"* and the other requiring *"yes"*. This order is randomized. Final items are based on the comprehension of a series of four paragraphs. The questions are presented after each paragraph. The following is an example of a more difficult passage:

`Mr. Jones had to go to London. He decided to take a train. His wife drove him to the station but on the way they had a flat tyre. However, they arrived at the station in time for him to catch the train'.

Questions asked are:

5. *Did Mr. Jones miss his train?*
   Did he get to the station on time?

6. *Was Mr. Jones going to London?*
   Was he on his way home from London?

The task can be performed by individuals with average ability. The highest correlations are with the comprehension subtests. It has been shown that performance by individuals with dementia is impaired on this test.

Oral Expression Subtests:

5. Automatized Sequences

In this subtest four well over-learned sequences are tested: days of the week; months of the year; numbers from one to twenty-one; and the alphabet. In dementia performance has been shown to deteriorate on this task.

6. Recitation

Several nursery rhymes are suggested to elicit completion responses. The Lord's Prayer or passages from the Bible were also suggested. It is not clear what occurs in dementia on this task.

7. Singing

The subject is encouraged to sing a favourite song. The ability of dementia subjects on this task is unclear.

8. Rhythm

Four rhythmic patterns are tapped with a pencil by the examiner for the subject to imitate. The ability of dementia subjects on this task is unclear.

Repetition subscales:

9. Repetition of words.

Word repetition is judged an easy task. In this subtest a wide sample of word types are presented, including a grammatical function word, objects, colours, a letter, numbers, an abstract verb of three syllables and a tongue twister. Subjects with dementia show little impairment in the early stages of the disease.

10,11. Repeating Phrases and Sentences

This section is divided into sets of sentences, differing in vocabulary difficulty and predictability of word content, referred to as "high " and "low" probability sentences. The correlation between the two scores is fairly high (.65).

An example of "high" probability sentences would be `You Know How'; and of "low" probability, `The spy fled to Greece'.

Subjects with dementia show little impairment in the early stages.

12. Word Reading

This test depends on basic reading ability. Word reading can be easier than confrontational naming because the written word can be said correctly without the need for comprehension, or the need to know the meaning of the word. Performance of subjects with

dementia is relatively preserved on this task.

Word finding subscales:

13. Responsive Naming

In this word-finding task, subjects are asked ten questions to which they have to supply a single word (for example 'What do we tell time with?'). The response words include nouns (watch, scissors, match, chemist), colours (green, black), verbs (shave, wash, write) and a number (12). Whilst performance depends on degree of auditory comprehension, the closest correlation is with Visual Confrontation Naming (.70). As in the other naming subtests, the score depends on the time taken to respond.
Monolingual subjects with dementia show performance deterioration on this test.

14. Visual Confrontation Naming

This test requires the naming of 35 pictures. The items to be named are the same ones used in the Word-Discrimination Test, and include objects, geometric forms, letters, actions, numbers, colours and body parts. Impairment of visual confrontation naming are the most frequently reported in the literature on language in monolingual subjects with dementia (see Chapter Three).

15. Body-Part Naming

This test is related to the Confrontation-Naming Subtest, expanding the examination of body-part naming. The assessors point to 10 body parts to be named on themselves. This addresses the possibility that naming difficulty is due to misperception.

Monolingual subjects with dementia show impairment on this task.

16. Animal Naming

The procedure suggested in this subtest is an adaptation of the Stanford-Binet Procedure for Animal-Naming, modified by giving a starting word, "dog". The purpose of this is to facilitate the task in two ways, first to provide a preliminary set which may assist the subject in shifting from one category to another and secondly to provide a definite starting point for timing. Average adults name about eighteen animals. This subtest has its highest correlation (.58) with Visual Confrontational Naming, dropping to a .49 correlation with Responsive Naming.

Monolingual subjects show performance impairment in this task.

Understanding written language subtests:

17. Word Picture Matching

This subtest involves the comprehension of the meaning of written words. Ten words corresponding to objects, actions, colours, numbers and geometric forms are presented. These are the same words which are used in the testing of auditory word discrimination, naming and oral word-reading. Corresponding pictures are also presented and the subject is asked to point to the picture which corresponds to the word pointed to by the assessor.

Subjects with dementia show impairment on this task.

Conversational Speech:

The Cookie theft picture is presented and subjects are asked 'Tell everything you see going on in the picture'. The examiner may point to neglected features of the picture and ask for elaboration if the response is skimpier than the apparent potential. A one minute time limit can be allocated.
Subjects with dementia perform relatively well in the early stages of dementia, but as the illness progresses speech response is reduced and lacks content and depth.

4) The Token Test

A shortened version of the Token Test (De Renzi and Faglioni, 1978) was used in the study. This was to help keep testing sessions as brief as possible.

The Token Test as originally conceived by De Renzi and Vignolo (1962) is a subtle test of receptive language functions.

The authors suggest the purpose of the test to be :

1. a means of assessing milder forms of receptive dysfunction which are difficult to identify by observation alone.
2. to make the assessment purely linguistic in nature i.e. uncontaminated by other intellectual functions, particularly attention span and the cognitive processing of a task.

The Token Test is regarded as meeting the criteria for a satisfactory test of language perception. This means that it is based on objectively quantifiable responses, it minimizes paralinguistic redundancies as much as possible, it makes minimal demands on verbal memory and no demands on other types of memory and it

is relatively easy to administer; in addition, it includes levels of increasing linguistic difficulty or complexity (Noll and Randolph, 1978).

In this shortened version of the Token Test the subject is requested to place various tokens in relationship to each other (e.g. "Put the green square next to the red circle"). Maximum score is 15. The shortened version is included in the Appendix along with the Welsh translation used in the study.

Caution in the interpretation of the test results incurred since the beginning of the study (Miller, 1989) suggest that subjects could do badly on the test for reasons other than poor comprehension (e.g. memory, or general intellectual decline).

5) The Modified Stockton Behaviour Rating Scale

The scale is based on the Stockton Geriatric Rating Scale developed for use in the assessment of elderly patients in hospital (Meer and Baker, 1966). It has been shown to be one of the most useful rating scales for use with older adults to assess behavioural competence (Salzman, Shader et al., 1972). For use in a wider variety of settings some of the items in the original scale were not always applicable, especially outside the hospital setting, and some were found to have consistently low inter-rater reliabilities. Consequently this shortened version of the scale was developed. It has been extensively used with older adults in both hospital and social services settings.

The scale consists of 18 items, measuring four main areas of behavioural disability, namely: Physical Disability; Apathy; Communication Difficulties and Social Disturbance which together can offer a measure of competence in older adults.

Six items in the scale are related to physical disability, for example:

When bathing or dressing, he/she requires:

- no assistance 0
- some assistance 1
- maximum assistance 2

Five items are related to apathy, for example:

He/she helps out in the home/on the ward:

- often helps out 0
- sometimes helps out 1
- never helps out 2

Two items are related to communication difficulties, for example:

He/she understands what you communicate to him (you may use speaking, writing, or gesturing):

- understands almost everything you communicate 0
- understands some of what you communicate 1
- understands almost nothing of what you communicate 2

The final five items are related to social disturbance, for example:

He/she hoards apparently meaningless items (e.g. wads of paper, string, scraps of food, etc.):

- never 0
- sometimes 1
- frequently 2

Included at the end of the scale are seven items on language observation. Three items related to the past

three days, for example:

He/she responds to questions put in English:

- in English 0
- in Welsh 1
- in a mixture 2

Language used when he/she is most agitated/excited:

- mostly English 0
- equally 1
- mostly Welsh 2

The items are rated by a relative or carer, who knows the subject, on a three-point scale (0,1,2). The total scores can range from 0 - 36. A grading system is offered with grades A-E which can be subdivided into 11 grades, which may be seen as indicating levels of impairment in functioning.

Validity

This Behavioural Rating Scale combined with a Cognitive Test make up the CAPE (Pattie and Gilleard, 1979). This Test has been shown to classify correctly over 90% of cases with irreversible dementia (Pattie and Gilleard, 1975, 1977). The authors maintain that the CAPE which comprises a cognitive and behavioural rating scale, continues to be a useful test to use with older adults, being both reliable and easy to administer (Pattie, 1988).

Significant correlations have been reported between the Kendrick Object Learning Test (KOLT) and the Behaviour Rating Scale (Kendrick, 1985). A high correlation has also been reported between the Wechsler Memory Scale (WMS) and the CAPE (Cognitive and Behaviour Rating Scale) (Pattie and Gilleard, 1979).

6) The Language Use and Contact Questionnaire

The difficulty in defining and obtaining a measure of bilinguality has been discussed (See Chapter Four: Bilingualism). It was decided to define bilingualism in terms of language contact and use in this study along the dimensions described in Chapter Four. The Language Use and Contact Questionnaire (LUCQ) was designed for this purpose (Higson, P. and Jones, D.A., 1982). It is intended as a practical measure to gather background information in a context of language use by bilingual people. It attempts to provide an extensive and comprehensive assessment of language use and establishes a clear picture of this from the beginning of contact with the subjects. It is also chronological for the subject at all stages of life. A copy of this schedule is enclosed in the Appendix. Examples of

items in the questionnaire are:

"Which language did you learn at home?
Was the primary school Welsh or English?
Where did you work when you left school?
Which language did you speak with your children?"

This questionnaire is intended to be used in data analyses by placing items into six developmental stages. This is a theoretical method adopted in the study to identify bilingualism and will be analyzed with respect to psychometric performance. These six stages have been identified as developmental life stages and give rise to six hypotheses which are to be explored in the data analyses. The following section expands on the rationale used to propose these six hypotheses:

Developmental Stages Hypotheses

A developmental hypothesis to determine "degree of bilingualism" and bilingual competence is proposed in this study based on the summed responses to the Language Use and Contact Questionnaire (see Appendix). Six developmental stages are postulated, which might identify variables critical to the development of a bilingual person's two languages. (See also E. Specific Hypotheses on Test Measures Page 113).

STAGE 1: Childhood Language Variables

Childhood is the critical period for language development (Lenneberg, 1967). This period is influenced by schooling and for a bilingual child will be a period of formal language learning. Thus the influence childhood contact and use of Welsh and English on later language loss in dementia is of particular interest.

Ribot, (1882) proposed a general theory of memory disorders whereby earlier learned items are better preserved in brain damage and that in recovery from memory loss, earlier learned items return before later learned items. His hypothesis with respect to polyglot aphasia was that earlier learned language recovers first. It may be further hypothesized that the first learned language will be better preserved than the second language in dementia (Hughes, 1981; Obler, 1981).

Items summed in this section comprise :
language spoken with parents, language in the home, language spoken with grandparents, siblings and peer group and within the wider context of the extent of Welsh and English use during these developmental and formative years. Table 5.5 shows the percent reports of language use and contact during this stage of development by the sample (n=16).

Table 5.5 CHILDHOOD LANGUAGE USE (n=16).

	% LANGUAGE USE		
Variable	Welsh	Bilingual	English
Mother	94	6	-
Father	88	-	12
Paternal g'pts	88	-	12
maternal g'pts	94	-	6
relatives	88	6	6
siblings	82	12	6
primary teaching	20	50	30
school friends	62	38	-
friends in community	90	10	-
community	90	10	-
religion	94	6	-
activities	60	20	20

It can be seen from table 5.5 that apart from primary school teaching, Welsh was the most frequently used language. In fact, other than at school and related activities there was little contact with English.

It has been shown that age of acquisition influences the organisation of languages in the brain and a compound-coordinate dichotomy has been advanced on the basis of how multiple languages are learned (See Chapter Four: Bilingualism). On the basis of the information obtained from the sample in this study, it appears that Welsh is the first learned language in most cases. It is proposed that childhood language variables will influence later language decline. A differential decline would then be suggested with English showing a greater rate of decline.

STAGE 2: Adolescence Language Variables

It is postulated that language spoken during adolescence will have an influence on language loss in dementia.

Language development during this period has been shown to play an important part in the way languages are organised and stored in the brain (see Chapter Four: Bilingualism). Contact with languages at this time has been identified by Lewis, (1981) as contributing to linguistic diversity. Adolescence has been described as a period when the foundations of beliefs, attitudes and thereby identity set (Erickson, 1968, 1982). Bilingual use and competency has been shown to be related to identity (Lambert, 1974, 1977). Hence it may be predicted that beliefs and attitude to language at this stage may influence language development and later language deterioration.

Items summed in this section consist of:

later schooling, language spoken with friends and at home, language most frequently used in the community. Language contact and use socially and in activities, and religion.

Table 5.6 shows the percent reports of language use at this time.
(n=16)

TABLE 5.6: ADOLESCENT LANGUAGE USE (n=16)

	% Language use		
variable	Welsh	Bilingual	English
later schooling	25	60	15
friends	75	25	-
home	90	10	-
relatives	90	5	5
community	80	20	-
social life	70	20	10
religion	75	25	-

It can be seen from table 5.6 that Welsh continues to be the most frequently used language. There is, however, an infusion into the Welsh language by English. This results in more bilingual contact. It may be that there will be differential decline with English showing greater deterioration but that there may be equivalent decline in some aspects of language.

STAGE 3: Early Adult Life Language Variables

It is proposed that the language spoken in young adulthood will have an influence on later language loss. It has been suggested that language use (or language behaviour) can inform language competency (MacKey, 1968). This means that familiarity or knowledge of a language is related to the frequency with which it is used. Thus it is suggested that

factors related to usage and not only early development will play a crucial role in language loss.

Items in this section include:
language spoken at work, language spoken in the home at that time where the person was living, language used with friends and in the environment and community at this period. Also included are activities and interests.

Table 5.7 gives the percent account of use of languages during early adult life.

TABLE 5.7: YOUNG ADULTHOOD LANGUAGE USE ($n=16$)

	% Language use		
variable	Welsh	Bilingual	English
work after school	70	10	20
home	80	10	10
friends	80	10	10
neighbours	60	20	20
community	70	20	10
social life	80	20	-
religion	80	20	-

It can be seen from Table 5.7. that Welsh continues to be the most frequently used language during early adult life. The English language, however, can be seen to have an increasing impact during this period. There may be some differential decline with English showing greater deterioration. There may also be equivalent decline on some aspects of language.

STAGE 4: Middle Adult Life Language Variables

Stage 4 relates middle adult life language factors to later language performance deterioration in dementia. It is unclear which period of adult life might influence language development. This is a period of transition, and the development of a new family nucleus. Factors related to this period of development have been identified as being critical to the preservation of bilingualism in multilingual cultures (Lewis, 1981; Linz and Miguel, 1975).

Items include:
language spoken with partner, work, environment, friends in the community, friends in contact, activities and interests, children, language of children's schooling, language of children's friends and of children's later schooling.

Table 5.8 gives the percent account of use of language during this period.

TABLE 5.8: MIDDLE ADULT LIFE LANGUAGE USE ($n = 16$)

	% Language use		
variable	Welsh	Bilingual	English
partner	50	40	10
work	30	40	30
environment	40	30	30
friends	60	15	25
neighbours	40	30	30
community	40	40	20
social life	50	30	20
religion	60	30	10
children	40	50	10
children's schooling	10	70	20
children's friends	40	50	10

Table 5.8 shows a greater move towards bilingual

contact and use. There is a greater range of contact than at previous stages. Most subjects have a much greater contact with English at this time and some report most contact with English. It is predicted that an equivalent deterioration in Welsh and English performance will be obtained.

STAGE 5: Later Adult Life Language Variables

It is proposed that later adult life factors will have an influence on language development and will influence later language decline. This period is also one of change to family life, introducing new members. Social change in this period may also influence language use and thus contribute to language behaviour (MacKey, 1968).

Items in this section include:
the language of the community, the language of friends and neighbours, language used with family members and of interests is also included.

Table 5.9. gives the percent report of language contact during this period.

TABLE 5.9 LATER ADULT LIFE LANGUAGE CONTACT ($n = 16$)

	% Language use		
variable	Welsh	Bilingual	English
community	50	40	10
friends	60	40	-
neighbours	60	30	10
family	70	20	10
son/d'ter in law	25	50	25
grandchildren	20	40	40
television	-	10	90
radio	-	-	100
reading	-	100	-

It can be seen from table 5.9. that English is becoming as frequently used as Welsh during this period which is a dramatic change from language contact and use during childhood. Bilingual use is most frequent at this stage. Hence a significant impact of factors from this period would result in equivalent performance deterioration in dementia.

STAGE 6: Older Adult Life Language Variables

It is suggested that the language spoken at onset of dementia will have an impact on the way language declines. This proposal seeks to test Pitres, (1895) observation that the language to recover first would be the one that has been used most in the extended period to the onset of aphasia. The impact of dementia on language has been compared to that of aphasia (see Cummings et al., (1985); Faber-Langendoen et al., 1987).

Items in this section include:
language use with carers and contacts in the community, family, interests-reading and daily papers, religion and doctor or community nurse.

Table 5.10 gives the percent account of use of languages during older adult life.

TABLE 5.10 : OLDER ADULTHOOD LANGUAGE USE (n = 16)

variable	% Language use Welsh	Bilingual	English
family	70	20	10
radio	-	-	100
reading	20	10	70
community	50	40	10
carer/day centre	60	30	10
religion	75	15	10
doctor	60	25	15

It can be seen from Table 5.10 that both Welsh and English are used during this period. The English language can be seen to have an increasing impact during this period. It is thus predicted that there will be equivalent decline as a result on language measures in Welsh and English.

C. TESTING PROCEDURE

The testing procedure consisted of three stages:

1. Phase One - First action taken towards obtaining subjects for the study.
2. Phase Two - Refining subject selection, deciding on the sample.
3. Phase Three - Data Collection.

1. Phase One

Twenty five G.P. practices were approached in the catchment area of North Wales and the aims of study introduced. Visits were arranged at the practices

where the researcher met to discuss the study and request referrals. A criteria list and short information sheet devised for the study, were given to the General Practitioners (see Appendix). This was to remind the G.P. of the study and to be available when considering potential referrals.

All G.P.s agreed to send potential referrals within three weeks of the visit. The General Practitioner agreed to approach potential candidates to ask permission for the researcher to visit and talk about the research. Where possible, families were included at this stage.

2. Phase Two

When referrals were received the researcher visited all (n=120) in turn. The purpose of the first visit was to meet the second stage of the selection criteria. For those referrals who agreed to talk to the researcher, the research was described as a study of language in bilingual elderly. No resistance was encountered at this stage. This is most likely due to the fact that bilingual speakers tend to show a great deal of interest in language preservation, which receives much political and cultural interest in Wales. It may also be that people viewed the researcher as a welcome visitor, especially in the more rural parts of the catchment area, where visitors are infrequent.

At the visit the Language Questionnaire was used to guide the interview. By the end of the visit the researcher concluded if the subject would be a suitable candidate for the study. When subjects were not included, either because they were unsuitable for the study or following consideration did not wish further participation, they were thanked for their

help with the research, and for completing the questionnaire.

3. Phase Three

Testing was conducted in subjects' own home. This was to cause the minimal disruption. Older adults are often uneasy when asked to come to a hospital or laboratory to be `tested ' by a `psychologist'. It has also been suggested that data collected during the first encounter with a subject is highly unrepresentative of an individual's level of competence (Rabbitt, 1982).

Psychometric tests were administered to each subject selected for the study over a period of four days. On the first and second days, the Kendrick Cognitive Tests (KCT) and the Wechsler Memory Scale (WMS) were administered, in Welsh and English. On the third and fourth days the Boston Diagnostic Aphasia Examination (BDAE) and the Token Test (TT) were administered in Welsh and English. The same measure was never administered in Welsh and English on the same day as *this might result in greater practice effects*.

Visits took an average of 1 $^{1}/_{2}$ hours on each occasion. Care was taken to visit at the same time on each day. All testing was administered in Welsh and English. The testing procedure was repeated at intervals of 6 months for a period of 2 years. The order of language administration and of test administration was randomly determined, for each subject independently and for each repeated administration.

The Behaviour Rating Scale was completed at the beginning of the study and at the end by a carer or relative who knew the subject well.

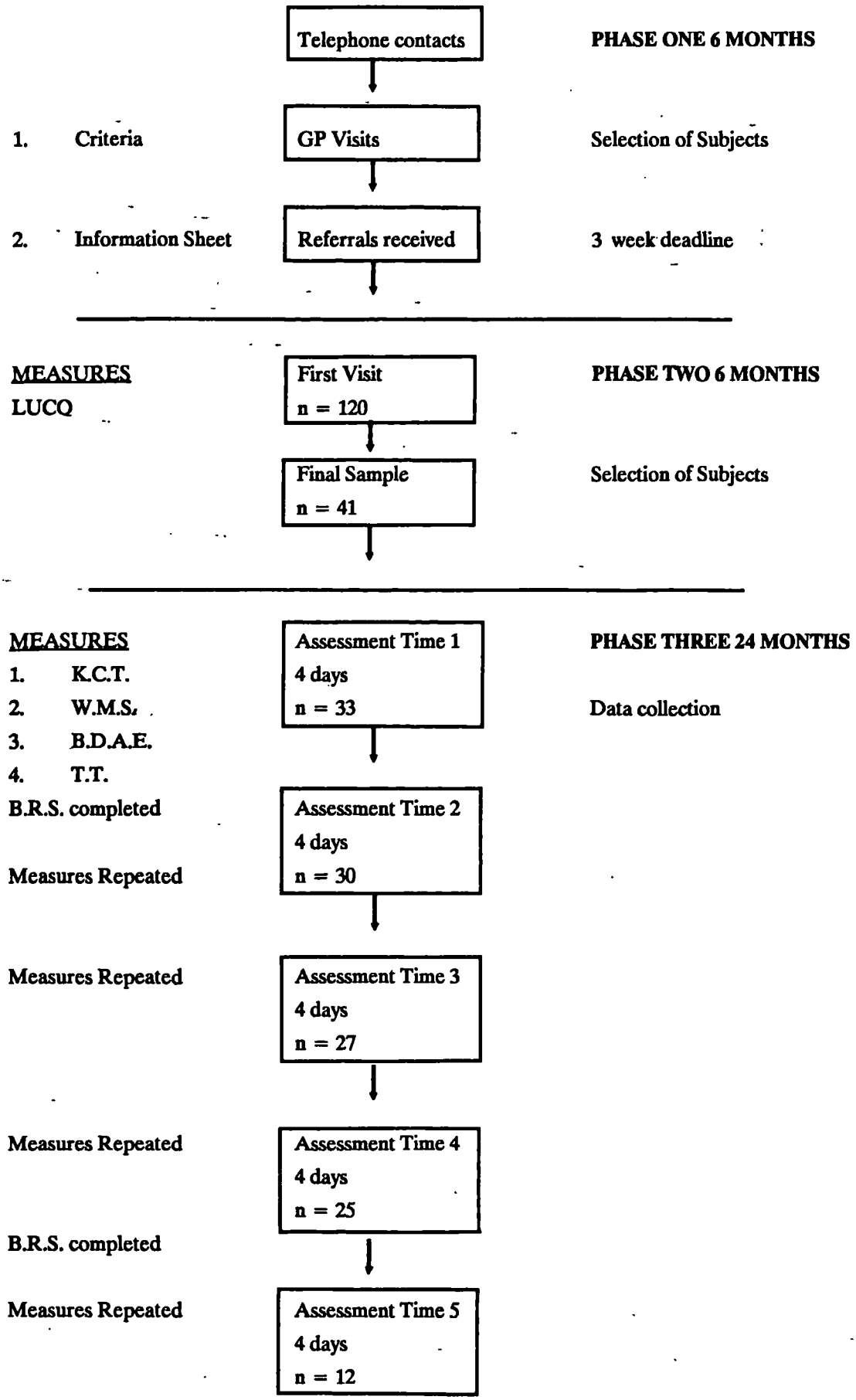


Figure 5.1: An Overview Plan of the Experimental Design

D. METHODS OF STATISTICAL ANALYSES.

The type of statistical analysis conducted on the data generated by this experiment involved mixed design Analysis of Variance, Related and Independent t tests and correlational analyses.

E. SPECIFIC HYPOTHESES ON TEST MEASURES.

1. It was predicted that those subjects diagnosed as having dementia (by Kendrick and Wechsler measures) will show a significant deterioration over the course of the study as measured by the Boston Welsh, Boston English, Token Welsh and Token English. Those without such a diagnosis will not show a significant deterioration in those measures.

2. In view of the literature where it remains unclear if there will be a difference in the rate of decline of the two languages of the same individual suffering from dementia, it will be hypothesised that there will be no difference.

3. It is uncertain whether the introduction of a second language creates additional storage or whether the second language competes with the first language thus detrimentally inhibiting the development of the first language. For the purpose of this study it will be hypothesised that the introduction of the second language and the degree of contact with the second language (in this instance English) will have a detrimental impact on the first language (in this study Welsh). Thus it is hypothesised that % change from Time 1 to Time 4 in the two languages

as measured by their performance on BW,BE,TW and TE will be related to experience of the English language. It is further predicted that the Language Use and Contact Questionnaire (LUCQ) is related to performance as measured by the Boston and the Token tests so that:

- When subjects % change from T1 to T4 is calculated on the Welsh version of the Boston and Token tests those subjects with the least % change will have least contact with English (and most contact with Welsh) as measured by the LUCQ.
- Subjects with the least % change between T1 and T4 on the English version of the tests will have least performance decline on BE and TE and will have greatest contact with English as measured by the LUCQ.

5. The LUCQ was divided into six stages and responses to items in each stage summed. It was hypothesised that each stage could have an influence on language decline in dementia as measured by Boston Welsh, Boston English, Token Welsh and Token English. (See Developmental Stages hypotheses described previously for detailed discussion of each stage). Thus it was predicted that:

H1: childhood language factors would have an influence on language measures in dementia.
H2: that adolescent language development would have an influence on language measures in dementia.
H3: early adulthood language factors would have an influence on language measures in dementia.
H4: middle adult life factors would have an influence on language measures in dementia.
H5: later adult life factors would have an influence on language measures in dementia.

H6: older adult life factors would have an influence on language measures in dementia.

Thus the concern always is whether we are dealing with factors related to language or factors relating to dementia.

To ensure that the measures of dementia are not related to bilingual language use the states of the LUCQ will be analyzed in the same manner as the performance measures. It is predicted that there will be no relationship between the dementia score and the six stages.

6. The subscales of the Boston (n=17) can be individually analyzed. Hence:

   It was predicted that subscales would show performance decline and that those subjects with least contact with English would show less performance decline in the subscales in Welsh compared to subjects with most contact with English as measured by the LUCQ.It was *hypothesised that those with most contact with* English would show relatively equivalent performance decline on both Welsh and English measures.

   It was predicted that subjects who had least contact with English as measured by LUCQ would show less language mixing and interference. No prediction was made as to interference or language mixing as dementia becomes more severe.

7. Cases are selected from four categories, "moderate" and "severe" dementia rating (based on a diagnosis of dementia at Time 1) and on the basis of their scores on the LUCQ. Specific

hypotheses are identified for each case in relation to performance on subscales of the Boston test. Thus:

	Welsh	Bilingual
Mild/Moderate	1	2
Severe	3	4

1) Moderate dementia and Welsh group:
It is predicted that subjects in this category will show differential rate of change in the two languages. It is predicted that subjects will favour responses in the more familiar Welsh language, (i.e. the less familiar English will have deteriorated first).

2) Moderate dementia and bilingual group:
Subjects in this category are expected to show equivalent impairment in performance (T1-T4). Hence the same difficulty in providing responses in Welsh or English. Subject will show equivalent competence in both languages and have no preferred language of communication.

3) Severe dementia and Welsh group:
In the advanced stages of dementia it is predicted that English performance would be more severely impaired than Welsh performance. It is predicted that there will be little English interference in the Welsh responses. This group is expected to show most similarity to the monolingual language impairment patterns discussed in the review of studies of language decline in dementia.

4) Severe dementia and bilingual group:
It is predicted that English and Welsh performance will show the severe effects of dementia. No prediction is made as to the occurrence of language mixing or interference.

CHAPTER SIX

INTRODUCTION TO THE RESULTS CHAPTERS

Data collection was completed for 25 subjects. 16 subjects (64%) were diagnosed as having dementia according to the Kendrick Tests of Cognitive Abilities (KTCA) by the end of the study and thereby provide the sample sought for this investigation of bilingual older adults in the early stages of dementia. Of the 25 subjects, 9 subjects (36%) received no such diagnosis.

The following four chapters will present the results of data analysis. Chapters follow chronologically, the process of data analysis generating the subsequent analysis. To complement the quantative analysis a qualitative analysis of selected cases (4) from the dementia sample was undertaken enabling closer examination of the process of bilingual performance change over time. Ideas generated from this procedure along with results obtained from quantative analysis will then be further examined and incorporated into subsequent analysis. A summary of findings will be presented at the end of the results chapters leading to the final Discussion Chapter. The organisation and format of the results chapters will be as follows:

i. PRELIMINARY DATA ANALYSES (Chapter Seven)

This chapter will present preliminary data analyses for all 25 subjects. Results will be given in the following way:

A) Results from the dementia measures (Kendrick test of Cognitive abilities and Wechsler Memory

Scale)

B) Results of the Boston Test

C) Results of the Token Test

D) Results of the Behavioural Rating Scale.

A brief summary of these results will be presented at the end of this chapter.

ii) DEVELOPMENTAL STAGES HYPOTHESES: findings from the Performance Measures (Chapter Eight)

Results from the analysis of Development Stages will be presented in this chapter in this following way:

A) Results of a correlation matrix between the six developmental stages.

B) Results of the correlation between the Boston, Token and Kendrick (OLT) measures administered in Welsh with the six Developmental stages identified by the Language Contact and Use Questionnaire.

C) Results of correlation bewtween the Boston, Token and Kendrick (OLT) administered in English with the six Developmental stages identified by the Language Contact and Use Questionnaire.

iii) QUALITATIVE ANALYSES OF FOUR CASES (Chapter Nine)

This chapter will present a qualitative analysis of four cases. By looking in detail at the performance results of individual subjects on the Boston test, the analysis will seek to identify language patterns by looking for similarities and differences in the process of bilingual language decline. Subjects will be chosen on the basis of dementia severity (measured in this study by the Kendrick test of Cognitive abilities and the Wechsler Memory scale), and extent

of contact with Welsh and English (as measured by the Language Use and Contact questionnaire). In this way four categories can be identified:

- mild/moderate dementia and bilingual background

- mild/moderate dementia and Welsh background
- severe dementia and bilingual background
- severe dementia and Welsh background

The findings from this analysis will be presented under the following headings, relating to specific language skills:

1) auditory comprehension
2) word finding
3) oral expression
4) repetition
5) reading comprehension
6) sample speech

A summary of findings will be presented at the end of this chapter.

iv) LINGUISTIC SENSITIVITY AND RESISTANCE TO DEMENTIA (Chapter Ten).

This chapter will develop ideas generated by the previous results chapters. In particular results will be presented which identify language skills sensitive and resistant to the impact of dementia.
At the end of this chapter an overview of the results chapters will be included.

CHAPTER SEVEN

PRELIMINARY DATA ANALYSES

This chapter will give the results of preliminary data analyses of the Boston and Token Tests. Results from the Kendrick and Wechsler dementia measures will first be reported and findings from the Behaviour Rating Scale will be given. Directions for further analyses will be given at the end of the chapter.

A) RESULTS FROM THE DEMENTIA MEASURES

1) KENDRICK TEST OF COGNITIVE ABILITIES

In Chapter 5, (page 81), it was shown in Table 5.2 that of the 25 subjects who completed the study, 16 subjects were diagnosed as having dementia by the end of the study. Of the 16 subjects, 63% on the Welsh version of the measure and 69% on the English measure were diagnosed as having dementia at Time 1.

Table 7.1 gives the assessment results of Kendrick Cognitive Test (KOLT and KDCT) from assessment at Time 1 to Time 5 (6 monthly intervals).

Table 7.1 : PERCENTAGE RATES OF DEMENTIA FROM TIME 1 TO TIME 4 (n= 16).

Diagnosis of Dementia given when test language is:

% (n=16)	Welsh	English
Time 1	62 (10)	69 (11)
Time 2	69 (11)	75 (12)
Time 3	94 (15)	94 (15)
Time 4	94 (15)	94 (15)
*Time 5	86 (6)	100 (7)

* n=7

In Time 1, if the test was given in English, 11 (69%) met the criteria, but if the test was given in Welsh, it was met by 10 (62%). No meaningful inference can be drawn as the Welsh version was not standardized.

Further analyses with the Kendrick measure will be done by allocating subjects into two categories. Subjects diagnosed as having dementia at Time 1 will be the Severe category and subjects diagnosed as having dementia by the end of the study will be the Mild/Moderate dementia category. See Chapter 9 for further analyses.

2) WECHSLER MEMORY SCALE

The Wechsler Memory Scale was included as part of the measures of dementia in the study. The aim was to offer additional support to the Kendrick Tests of cognitive abilities which was the primary diagnostic tool to screen referrals. Table 7.2 gives the

percentage of the sample previously selected by the KCTE to have dementia. The memory impairment from Time 1 to Time 4 as measured by the WMS for those subjects is given. Nondementia subjects fall in the Normal range.

TABLE 7.2: WECHSLER MEMORY SCALE NORMAL AND IMPAIRED CLASSIFICATION FOR N=16 IN WELSH AND ENGLISH AT TIME 1 AND TIME 4.

	Time 1		Time 4	
% (n=16)	Welsh	English	Welsh	English
Normal	81.25 (13)	75.0 (12)	18.75 (3)	31.25 (5)
Impaired	18.75 (3)	25.0 (4)	81.25 (13)	68.75 (11)

It can be seen from Table 7.2 that 81.25% of the sample diagnosed as having dementia according to the KCTE have memory problems when assessed on the WMS in Welsh. 68.75% of the same sample show memory problems on the English version of the test. The test in both languages has therefore shown a change from the start of the study, with the language of testing producing different results. According to the WMS two more subjects show memory problems on the Welsh version of the test than when the test is administered in English. Table 7.2 indicated that equal numbers of the sample were suffering from dementia when the test was given in English and in Welsh at Time 4. These differences between the tests is most likely due to one of two borderline cases. The small sample size limits any conclusions which can be drawn regarding differences in the assessment of performance in the two tests.

B) THE BOSTON TEST RESULTS

The results reported in this section are based on the summed score of the subscales (total subscales = 17).

Table 7.3 which follows gives the average scores in each condition.

TABLE 7.3: MEAN AND STANDARD DEVIATION SCORES FOR DEMENTIA (n=16) AND NONDEMENTIA (n=9) SUBJECTS GIVEN FOR WELSH AND ENGLISH VERSIONS OF THE BOSTON TEST OVER FOUR TESTING TIME POINTS.

		Nondementia group(n=9) Boston		Dementia group(n=16) Boston	
		Welsh	English	Welsh	English
Time 1	mean	336	348	302	314
	s.d	38	23	29	49
Time 2	mean	336	350	296	303
	s.d.	33	31	49	60
Time 3	mean	341	348	282	278
	s.d.	26	19	51	51
Time 4	mean	327	351	269	271
	s.d.	31	41	61	79

A 3 way Analysis of variance with one between subject factor (Nondementia and Dementia) and 2 within subject factors (time, language)was performed. The levels of the Time factor were Time 1, Time 2, Time 3 and Time 4. The levels of the Language factor were Welsh and English.

A significant effect of Dementia was obtained ($F=9.29, df=1,23, p<.01$). A significant interaction between Dementia and Time was observed ($F=3.11, df=3,69, p=.03$).

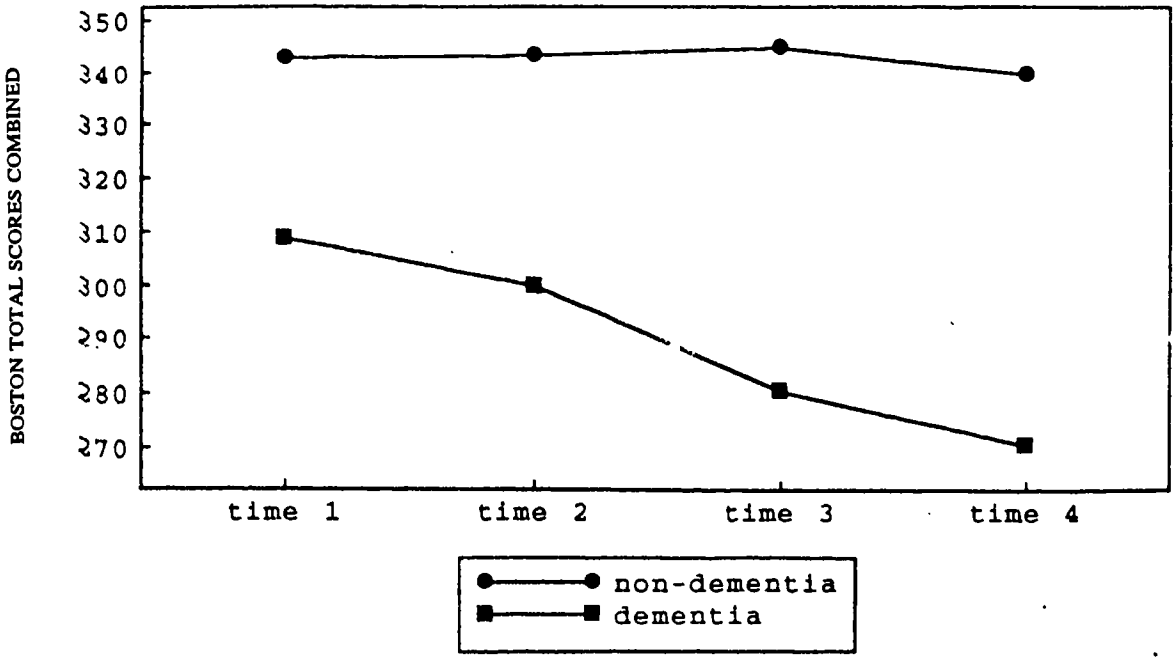
To investigate this interaction, simple main effects

were performed and these showed a significant effect of Time on the dementia subjects ($F=4.72, df=3,69, p<.01$) but not on the nondementia subjects ($F<1, df=3,69$).

A Language effect was observed ($F=4.69, df=1,23, p=.04$), in that the English mean is significantly larger than the Welsh mean performance (English mean =321, Welsh mean =311) indicating better performance scores on the English version of the test.
However Language did not interact with Dementia ($F=1.29, df=1,23, p=.27$) or Time ($F<1$). This would suggest that the performance in the two languages declines at the same rate.

As language effects do not interact with dementia or time, both language results have been combined in Graph 7.1 and the means of the dementia and nondementia group reproduced graphically to illustrate change over Time.

FIGURE 7.1: PLOTTED BOSTON (WELSH AND ENGLISH SCORES COMBINED) MEAN TOTAL SCORES FOR DEMENTIA (N=16) AND NONDEMENTIA (N=9) GROUPS OVER 6 MONTH TIME INTERVALS.



Tukey pairwise comparisons were used to investigate the effects on the dementia subjects. There was no evidence of a change from Time 1 to Time 2 at the .05 level. At Time 3 however, the dementia group showed a marked group mean deterioration. This deterioration continues to occur at Time 4. The Nondementia group showed a mean improvement at Time 3 which is maintained to Time 4 ($p<.05$). Time 3 and Time 4 did not significantly differ.

C) THE TOKEN TEST RESULTS

Table 7.4 which follows gives the avarage scores and standard deviation for the dementia and nondementia subjects over the course of the study.

TABLE 7.5 : MEAN AND STANDARD DEVIATION FOR DEMENTIA (n=16) AND NONDEMENTIA (n=9) SUBJECTS FOR WELSH AND ENGLISH VERSION OF THE TOKEN TEST OVER FOUR TESTING TIME POINTS.

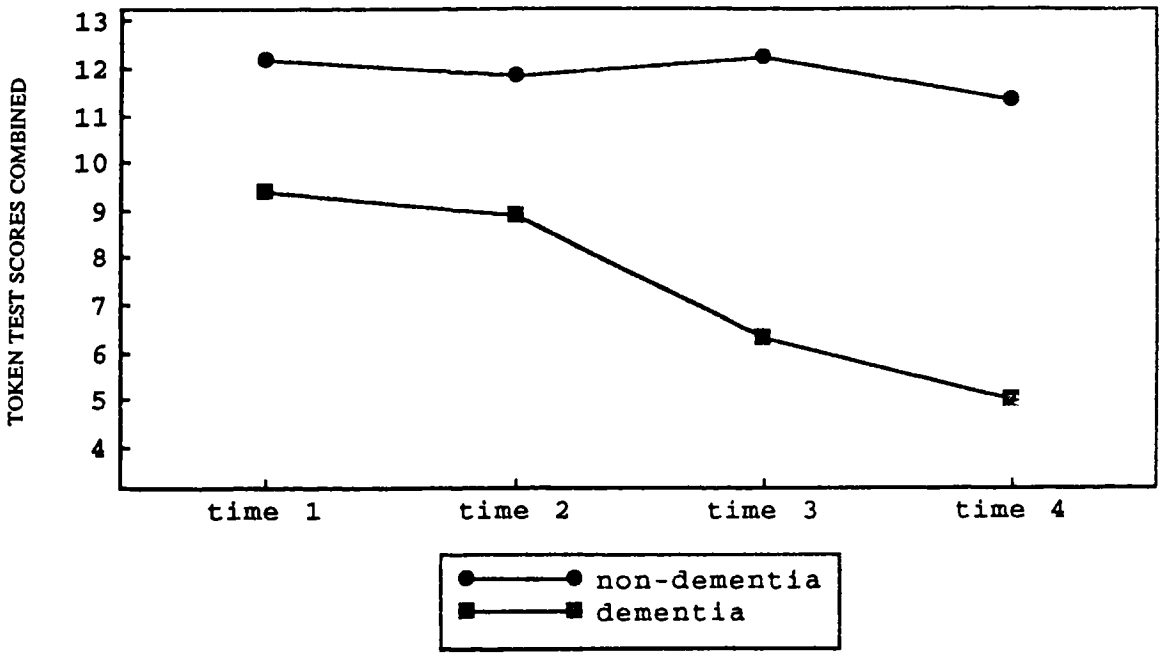
		Nondementia group(n=9) Token		Dementia group(n=16) Token	
		Welsh	English	Welsh	English
Time 1	mean	13.3	11	9.4	9.3
	s.d.	1.5	3.3	4.3	3.9
Time 2	mean	13	10.5	9.3	8.4
	s.d	1.9	3	4.1	3.8
Time 3	mean	12.4	11.9	6.4	6.2
	s.d	2.6	2.6	4.2	3.8
Time 4	mean	11.8	10.8	5.2	4.7
	s.d.	2.9	4.1	4.4	4.8

A three way Analysis of variance was performed to explore whether there had been a deterioration over time in terms of performance change on the Welsh and English versions of the Token Test. As with the Boston Test there was one between subject factor (Nondementia and Dementia) and two within subject factors (Time and Language). The levels of time was again Time 1, Time 2, Time 3 and Time 4, whilst the levels of the language factor were Welsh and English.

A significant effect of Dementia was obtained ($F=11.874, df=1,23, p>.01$). A significant effect of time was observed ($f=9.69, df=3,69, p>.001$). A significant interaction between Dementia and Time was observed ($F=6.29, df=3,69, p.001$). Simple Main effects were performed to investigate the interaction effects. These showed a significant effect of Time on the dementia subjects ($F=10.69, df=3,69, p>.001$) but not on the nondementia subjects ($F<1$). Language did not interact with Dementia ($F=1.29, df=1,23, p=.27$) or Time ($F=.80, df=3,69, p=.50$) suggesting performance in both languages declines at the same rate.
A language effect was observed ($F=7.73, df=1,23, p=.01$) indicating a significantly larger Welsh mean (English mean=9.08, Welsh mean=10.10). No other effects were observed.

As with the Boston results language effects do not interact with dementia or time, so both language results have been combined in Graph 7.2 and the means of the dementia and nondementia group reproduced graphically to illustrate change over Time.

FIGURE 7.2: PLOTTED TOKEN (WELSH AND ENGLISH SCORES COMBINED) MEAN SCORES FOR DEMENTIA (N=16) AND NONDEMENTIA (N=9) GROUPS OVER 6 MONTH TIME INTERVALS.



Post hoc comparisons (Tukey at the .05 level) were performed to investigate the effects on the dementia subjects. There was no evidence of a change from Time 1 to Time 2. At Time 3 the dementia group mean differs significantly from Time 1 and Time 2. Time 4 also differs significantly from Time 1 and Time 2.
The full results are reported in the appendix.

D) BEHAVIOURIAL RATING SCALE RESULTS

Ratings on the Behaviour Rating Scale were taken at the start and end of the study for each subject. A 't' test was used to compare mean scores at the start and end to see if a change has occurred for subjects in the dementia and nondementia groups. Table 7.5 which follows gives the means, standard deviation and t values of the behavioural rating scores at the start and end of the study for the dementia and nondementia groups.

TABLE 7.13 BEHAVIOURIAL RATING SCALE : DEMENTIA (N=16) AND NONDEMENTIA (N=9) MEANS, STANDARD DEVIATION AND t VALUES.

		Start	End	t(2 tailed)	p
Dementia subjects	mean	3.25	19.62	-8.45	.001
	s.d.	(5.77)	(8.06)		
Non Dementia subjects	mean	5.56	6.22	-1.79	NS
	s.d.	(0.73)	(0.67)		

Table 7.5 shows a significant change in scores from Time 1 to Time 4 for the Dementia group. An increase in scores indicates behaviourial deterioration. Thus a significant behavioural change over a period of two years has occurred in subjects diagnosed as having dementia. This has not been observed in those subjects not receiving a diagnosis of dementia from the measures used in this study.

Summary

1. Of 25 subjects completing the full set of follow up assessments, 16 subjects received a diagnosis of dementia according to the Kendrick test of Cognitive abilities.

2. Used as a secondary measure to aid in the diagnosis of dementia, the Wechsler Memory scale indicated that the dementia group had memory problems.

3. There is a significant effect of Dementia on performance scores of the Boston test (total scores) over the time scale of the study.

4. There is a significant deterioration for the dementia subjects over time but not for the nondementia subjects.

5. In the dementia group, performance in the two languages decline at the same rate.

6. There is a significant effect of dementia on performance on the Token test over the time scale of the study.

7. There is a significant change over time for the dementia group on Token test performance of both languages.

8. There is no effect of time on the performance of the nondementia group on the Token test in either language.

9. In the dementia group, performance in both languages of the Token test declines at the same rate.

CHAPTER EIGHT

DEVELOPMENTAL STAGES HYPOTHESES: findings from the performance measures

This section aims to test the theoretical proposal that language contact and use at specific developmental life stages will have an influence on later bilingual deterioration. This will be determined by seeking to demonstrate a relationship between performance measures and linguistic variables, thereby establishing whether performance measures are influenced by linguistic variables.

Stage 1 represents the summed response of items 1-12. Stage 2 represents the summed response of items 13-19. Stage 3, 20-26; Stage 4,27-37; Stage 5,38-43 and Stage 6 represents items 45-51. A full list of items is included in the Appendix. Detailed rationale for each stage is presented in Chapter Five.

The method of the investigation will be to use the % change in scores from Time 1 to Time 4 in the performance measures (Boston Welsh, Boston English, Token Welsh and Token English) and to determine whether they can be related to language behaviour over the six developmental life stages.

The guiding hypothesis is that the introduction of the second language and the degree of contact with the second language (in this case English) will have a detrimental impact on the first language (here Welsh). Thus % change from Time 1 to Time 4 in the two

languages as measured by their performance on the Boston and Token tests will be related to the experience of English as measured by the Language Use and Contact Questionnaire. It is proposed that limited contact with English over developmental life stages will be related to least % change in scores from Time 1 to Time 4 on the Welsh versions of the performance measures.

The results will be presented in the following way.

A) Results of a correlation matrix of the six stages.
B) Results of the test measures administered in Welsh
- Boston , Token and Kendrick (OLT)
C) Results of the test measures administered in English.
- Boston, Token and Kendrick (OLT)

A) CORRELATION MATRIX: DEVELOPMENTAL STAGES

The relationship between the stages was firstly investigated. Table 8.1 gives the correlation matrix.

Table 8.1: Correlation Matrix for Stages 1 to 6 (N=16)

	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Stage 2	.84				
Stage 3	.08	.07			
Stage 4	.01	.01	.25		
Stage 5	.29	.24	.03	.53	
Stage 6	.31	.31	-.04	.10	.31

It can be seen from Table 8.1 that there is a correlation between Stage 1 (Childhood factors) and Stage 2 (Adolescent factors) at the .01 level. Stage 4 (middle adulthood) and Stage 5 (later adulthood) shows a correlation approaching significance at the .01 level.
The table shows the stages are fairly distinct categories appart from stages 1 and 2, with a suggestion that stages 4 and 5 are related. This would suggest that the contact subjects report with the Welsh and English languages during childhood and adolescence remains much the same, thus subjects in this study have experienced little change in social contact or lifestyle over these periods of their lives.

From young adulthood on however, this early linguistic continuity appears to change , for individuals in the sudy overall, suggesting movement and adjustments at this stage in their lives.

The approaching significance for Stage 4 and Stage 5 may suggest continuity and consolidation at middle and later adulthood, possibly related to established social networks and family lives over this period of time. This earlier continuity undergoes change as measured by language contact, as subjects enter older adult life, probably a statement about the change in lifestyle and circumstances typical of older adults in our society.

From Tables 5.5 and 5.6 (pages 102,104) it was seen that Welsh was the most frequently reported language used over the items identified. From Tables 5.8 and 5.9 (pages 106,109) it can be seen that subjects more frequently report equivalent use of languages.

B) Results of the Boston, Token and Kendrick (OLT) measures administered in Welsh.

Table 8.2 which follows gives the correlation results of the Boston, Token and Kendrick (OLT) measures given in Welsh with the Language Use and contact Questionnaire over the six developmental stages identified in the study.

TABLE 8.2: LUCQ STAGES, BOSTON WELSH, TOKEN WELSH AND KENDRICK (OLT) CORRELATION RESULTS.

	BOSTON WELSH	TOKEN WELSH	KENDRICK OLT WELSH
STAGE 1	.15	.25	-.06
STAGE 2	-.17	.08	-.25
STAGE 3	.19	-.26	.10
STAGE 4	-.01	-.22	-.42
STAGE 5	-.13	-.01	-.07
STAGE 6	.06	.22	.09

It can be seen from table 8.2 that there is no evidence to suggest a relationship between developmental stages and later Welsh language performance deterioration as measured by the Boston or Token tests. Stage 4 (middle adulthood) is approaching significance for the Kendrick (OLT), the dementia measure in the study.

C) Results of the Boston, Token and Kendrick (OLT) measures administered in English

Table 8.3 which follows gives the result of the correlation between the Boston, token and Kendrick (OLT) and the six developmental stages of the Language Use and Contact questionnaire.

TABLE 8.3: LUCQ STAGES, BOSTON ENGLISH, TOKEN ENGLISH AND KENDRICK (OLT) CORRELATION RESULTS

	BOSTON ENGLISH	TOKEN ENGLISH	KENDRICK OLT ENGLISH
STAGE 1	.16	.07	.00
STAGE 2	-.02	-.05	-.24
STAGE 3	-.48	-.42	.11
STAGE 4	-.41	-.48	-.07
STAGE 5	-.06	-.36	-.06
STAGE 6	.31	.15	-.01

The guiding hypothesis is that the LUCQ is related to performance as measured by Boston English and Token English and Kendrick OLT and % change from Time 1 to Time 4 on those measures is related to contact with English over developmental life stages. Those with the greatest % change in performance from Time 1 to Time 4 on the English measures will therby have least contact with English over developmental life stages.

A negative correlation means the least contact as measured by LUCQ over developmental stages and the greatest language deterioration.

Looking at table 8.3 there is no evidence to support

the hypothesis as the correlations obtained do not attain significance.

The results reported in this chapter do not support the hypothesis that later detrioration is related to the manner in which languages are learnt and develop over a person's life. It has been hypothesised that the LUCQ would be an appropriate way of measuring language knowledge. It was then proposed that the LUCQ could be related to performance on the language measures. The lack of evidence to support this hypothesis may be due to a variety of factors, which may include:

1) There is indeed no relationship between language development and contact over stages of a person's life and the way languages will later deteriorate and thus no clear pattern could be identified.

2) Methodological problems may lead to incorrect conclusions. Sample variability and the sensitivity and appropriateness of test measures may confound the results.

With the aim of casting further light on these potential explainations and to complement findings reported in chapters 7 and 8 a qualitative consideration of the data was undertaken. The focus of the investigation was not only on measured performance decline but on the manner with which subjects respond to the assessment procedure. Chapter 9 which follows reports the findings of this qualitative investigation.

Summary

1) There is a correlation between Stage 1 (Childhood factors) and Stage 2 (Adolescent factors) when language history is measured by the LUCQ.

2) No correlation was found between any other developmental stages, indicating that the stages are fairly distinct categories.

3) When %change from Time 1 to Time 3 on the Welsh version of the Boston, Token and Kendrick (OLT) tests are calculated, no relationship was found with any of the developmental stages.

4) When %change from Time 1 to Time 3 on the English version of the Boston, Token and Kendrick (OLT) tests are calculated, no relationship was found with any of the developmental stages.

CHAPTER NINE

QUALITATIVE ANALYSIS OF FOUR CASES

In the following section results of the Boston Diagnostic Aphasia Examination subtest analyses will be presented in detail for four subjects who took part in the study. Cases were selected from four categories - Mild/Moderate and Severe dementia rating, (based on a diagnosis of dementia at Time 1) and on the basis of their grouping into 'Welsh' or 'Bilingual'. This presentation will try and identify language patterns and look for similarities and differences in the process of bilingual language decline in individual subjects.

The *guiding hypothesis is that developmental* linguistic factors influence performance decline. Thus specific hypothesis can be advanced for the four grouping categories *identified. (See Chapter Five:* Specific hypotheses, Page 113).

For the purpose of investigating individual cases, findings from the subscales will be presented in four parts. A full description of each Subscale has been given in Chapter Five of this report and a copy of the test is included in the Appendix.

1. Auditory Comprehension

The following subscales are included in this section: Word discrimination, Body part identification, Commands and Complex Ideational Material.

2. Word Finding Subscales

The Subscales in this section are: Responsive Naming,

Visual Confrontation Naming, Body Part Naming and Animal Naming.

3. Oral Expression
The Subscales in this category include Recitation, Singing and Rhythm and Automatized Sequences.

4. Repetition
Subscales in this category comprise Word Reading, Repetition of Words and Repeating Phrases (High and low probability).

5. Reading Comprehension
Within this category of language skills is the Word Picture Matching subtest.

6. Sample Speech
The Cookie theft picture description (see copy in the Appendix).

In the following case descriptions names and some personal details have *been altered to maintain* confidentiality.

1) Mild/Moderate dementia and bilingual group

Subject 15: **Miss Hughes**

Miss Hughes was selected as her performance on individual language tests placed her in the bilingual group consistently. Miss Hughes was not assessed as dementing at the start of study (see Appendix for list of groupings). Miss Hughes was aged 71 at the start of the study, and has lived all her life on Anglesey. She was born in Holyhead, Anglesey. Her parents were Irish, although her mother had learnt to speak Welsh. She has one brother. Her father, a sailor, was lost at sea when she was seven. She remembers there to be

little Welsh taught at school but recalls being taught through the medium of Welsh at chapel, a major focus of her life from childhood. She went to County School but did not study Welsh there. She remembers her mother teaching her to recite Welsh poetry. Her mother remarried when she was an adolescent. He was a Welsh speaker.

Her mother died giving birth to her youngest sister. Miss Hughes was then aged 18. She left school aged 15 without qualifications. She had a job in Boots, and recalled spending long periods of time in the library. She remembered taking some examinations at this time and passing. Her brother went to University and became a teacher. During the second world war relatives who were Welsh speaking lived with them. War work at a local post office was made permanent at the end of the war and she remained there for thirty two years, until her retirement. She never married. Her younger half sister, a Welsh speaker, married an English speaker and they have always lived close by. She described their children as "very Welsh" and felt her own Welsh to be inferior. Following her retirement she took many cruises abroad with her best friend. They spoke Welsh together. She now attends the Day Centre at Holyhead daily, which has a bilingual atmosphere. She sits next to a Welsh speaking friend.

When this interview was conducted Miss Hughes expressed no language preference. She did however have a tendency to switch frequently between languages. At Time 1 and 2 there was no indication of dementia. Time 3 identified dementia and this was supported at Time 4. Miss Hughes was cooperative throughout the period of the study. At the last two testing points, however, she did not remember me and her health had deteriorated.

1. Auditory Comprehension

Miss Hughes had difficulty with some of the Word Discrimination Subtest administered in Welsh. She did not know the meaning of some words e.g. the Welsh word for 'Spiral'. She took time to locate others, in part by guessing. At Time 4 when asked to point out a named item in Welsh she first translated the word to herself and said it aloud before pointing to the correct picture on the card. This was not reflected in her performance score but was a successful method used for most of the test.
She achieved maximum score for the other Subscales or showed little change in performance over the testing period. By Time 4 she could not answer questions on the long passages of the Complex Ideational Material Subtest in Welsh or English.

2. Word Finding Subscales

In the Word Finding Subscales Miss Hughes consistently showed examples of switching language if she failed to obtain the word in the language being tested. For example, she supplied *Welsh words for* 'running' and 'smoking' when asked to name those activities pictured on a card.

Her other method at word finding was to name the English word first then translate into Welsh to obtain the requested word. This seemed to help her activate and access her Welsh language. This was also seen in English. For example, "that pigog what is it dwad...thistle" (that prickly thing what is it now....thistle) preceded supplying the word 'cactus'. During testing in English, to obtain the word to describe the activity on a card Miss Hughes first said the Welsh word and a few seconds later supplied the

correct English word e.g. 'cysgu...sleeping', 'llwyd....grey'. This did not happen for letters, objects or numbers.

At the final testing session 'y bluen...a feather' and 'y faneg...a glove' were given for the Welsh version.
This behaviour was seen at Time 1 and Time 2, when according to the assessment measure Miss Hughes was not diagnosed as suffering from dementia. The main difference between her performance from the first two time points and the final two time points can be described as one of language attrition. She less actively searched for words. The errors and difficulties with word finding at earlier points continued to be the case throughout. Items with which she had no difficulty at initial testing were preserved, whereas those items she found difficult to name at the beginning of testing continued to be difficult *or were failed by Time 4*.
Many items reached maximum score (ceiling) and did not show much evidence of change throughout the testing period. This may suggest that the test is not sensitive enough to pick up subtle word changes, only gross and more obvious ones. This finding will be considered further in the discussion chapter.

3. Oral Expression

A difficulty reciting the alphabet in Welsh was observed from the onset whereas there was little difficulty in English. At Time 4 difficulties persisted in Welsh. In the English alphabet Miss Hughes began to include Welsh letters. At Time 1 the majority of the months in Welsh were successfully recited after giving those months first in English and then translating month by month into Welsh. This

method was seen at Time 4 although Miss Hughes was slower and less able to access all the months by then. This strategy was also used to obtain 'Friday'. Prior to this no difficulty other than slowing down the speed of reciting, from 4 to 8 seconds was observed.

Miss Hughes could recite long passages of prose and rhymes in Welsh at Time 1 and 2. Although she could still recite rhymes at Time 4, she could not remember with ease and provided less variety. This is not reflected in scoring. The loss seemed to be of willingness to try and conjure up passages or to be able to remember the beginning of some poems which she had previously volunteered and enjoyed telling. She gave up when stuck over the Welsh version of the Lord's prayer.

4. Repetition

She also had difficulty repeating phrases. Incorrect words were frequently substituted e.g. 'fair' for 'fan', 'catched' for 'captured', and 'calling' for 'speak' at Time 4 in English.

'Boggy field' was given for 'foggy heath' at Time 4 on the Repeating Phrases Subscale. At Time 1 Welsh mutations were incorrectly made and unfamiliar Welsh words wrongly pronounced. This continued throughout the Welsh testing. Errors were made repeating low frequency sentences at Time 4 in English, although Miss Hughes was able to repeat low frequency sentences in Welsh which equally consisted of unfamiliar words.

5. Reading comprehension

At Time 1 Miss Hughes when was not diagnosed as

suffering from dementia, she pointed to brown instead of purple in the English testing session. Other errors in both Welsh and English version were due to Miss Hughes saying the word out loud before pointing to what in the end was the correct word. At Time 2, purple was incorrectly identified. Appart from that error, Miss Hughes increased her tendency to read the word aloud before pointing. At Time 3 this continued, thus producing a lowered score. At Time 4 Miss Hughes incorrectly identified 'smoking', but was correct with other items in the test. In Welsh three items were incorrectly located. These were the Welsh equivalents for 'hamock', 'smoking; and 'dripping'.

Overall performance in English improved by the end of the study, whilst accuracy on the Welsh version was reduced by half.

6. Sample Speech: Cookie Theft Picture

When shown the 'cookie theft picture' (see Appendix) and asked to describe what she thought was happening in the picture Miss Hughes switched languages during both English and Welsh sessions. The Welsh words and pronunciations are underlined in the following examples and a translation follows where appropriate.

Miss H.: *Woman washing the dishes..the other one going to the cupboard for the jar..ia..jar of something yes..and he's got something in his hand..ha..ydio wedi cael rwbath yn y fan yma..what else have we here..(yes/ ah/has he got something here)*

Examiner: *Who is she?*

Miss H.: *Oh ..chwaer swn i yn feddwl..neu ei fam o...and she is drying up the dishes and a cloth in her hand. (Oh / sister I would*

think or mother)

At Time 3, Welsh comments were included in the English session.

Miss H.: *There's a cupboard, don't know, call it that...and a plat (plate) and a basin siwgwr ia ...reit be arall rwan sy ma...be di rheina bloda? (sugar basin yes...Right what else now is there...What are those, flowers?) Bloda (flowers) they look like to me...I've said powlen (basin). That looks funny to me...Picture 'di hwn dudwch ar y wal? (Is this a picture on the wall?). They'll say this one's bonKers.*

In the equivalent Welsh version there were a few English insertions such as:

"looks like it ia i fi" (looks like it yes to me)

These insertions, however, were not as frequent as Welsh insertions in English. The words used to describe the picture in Welsh were simple, everyday words, reflecting local dialect.

At Time 4 during the English session the following description was offered:

Miss H: *There's a boy and a ym wait a minute now, my what's its name do you want his name too. There a girl there, nice little girl, and she's helping him...and there's a stool what do you call what you climb on? Tisho hwn hefyd? Bedi hwn drawer ia?(Do you want this too? What is it drawer?) some of them are poorly made yes...ym and ymm llestri'n cael*

eu golchi..lot o lestri. (dishes being washed up. Lot of dishes) Washer upper here and all..very pretty one..and there's a boy on a ladder here, sefyll ar stool..neu (standing on the stool, or) (laugh) a nice pair of stools in the corner here they look as if they're ready for the rummage sale...Cookie jar and a very pretty girl helping him putting things on the shelves.

2) Moderate dementia and Welsh group

Subject 16: **Mr Davies**

Mr Davies was selected as, on the basis of his performance of Subscales in Welsh and English, he was consistently allocated into the Welsh group and was not dementing at the start of the study.

Mr Davies was aged 90 at the start of the study. He was born in Llansannan. His parents were Welsh speaking. He left school aged 13. He described his schooling as mainly in the medium of English but he always spoke Welsh with his friends and at home. On leaving school he became a local bus driver and worked there until he retired. He married a Welsh woman and she worked as a district nurse. They had three children who were brought up as Welsh speakers. When seen at Time 1 and 2 Mr Davies was living on his own, still in the same village which he described as very Welsh. His home help was Welsh speaking and his son lived near by. On subsequent occasions he was seen at a residential home where the carers were mostly English speaking. From initial contact Mr Davies delighted in reciting long passages of prose and poetry in Welsh.

At Time 1 Mr Davies was not assessed as suffering from dementia. By Time 2 he was assessed to be dementing.

1. Auditory Comprehension

Mr Davies had been unable to identify the Welsh word for 'spiral', which is not a familiar word, and this continued to be the case during testing. By Time 4 Mr Davies had difficulty discriminating between colours in Welsh. In the equivalent English scale Mr Davies had difficulty discriminating between colours at Time 1, but no difficulty with items from any other semantic category. Other items became problematic in English, across all semantic categories. In addition to colours, Mr Davies for example could not identify 'spiral'. He called this 'spring' at Time 2, indicating that he could semantically distinguish the form from, for example, colours or letters. Letters and numbers remained intact in English and Welsh pronunciation. The ability to identify body parts deteriorated from Time 1 to 2 but did not change from then on. Errors made in English at Time 1 persisted throughout the testing period. In carrying out commands, more deterioration in English than in Welsh, although there were only minimal errors, for example, not closing eyes to complete the task. It was in the area of Complex Ideational Material that Mr Davies showed the greatest impairment. As passages became increasingly difficult and complicated Mr Davies could not remember what had been said. He answered incorrectly all the Welsh questions at Time 4 and did slightly better in English.

2. Word Finding

Mr Davies reached maximum score on the Responsive

Naming subtest and this did not change over the testing period. Mr Davies confused the names of colours at Time 1. This became worse over the course of testing in Welsh an English. The action category of the Visual Confrontation Naming test showed most evidence of deterioration. These words were correctly named at Time 1 but deteriorated both in Welsh and English by Time 4. There were no examples of Welsh or English word mixing. Body part naming showed a gradual deterioration in both Welsh and English. At Time 2 the Welsh word for 'elbow' was provided once the English word had been said aloud. Mr Davies failed to name certain other body parts i.e. the Welsh name for 'shin', 'knuckle' and 'eyebrow'. Interestingly, Mr Davies failed to name these words in English when asked during the English session. At Time 3 Mr Davies gave 'orchid' instead of 'cactus' which suggests that the difficulty was not one of perception.
The ability to name animals gradually deteriorated, in terms of the number given, both in Welsh and English. There were no examples of language mixing on this subscale. Scores dropped from 10 to 2 in Welsh and from 11 to 4 in English.

3. Oral Expression

In the Automatized Sequences Mr Davies had no difficulty recalling days of the week, months of the year, numbers up to 21 or the alphabet in English. The first indication of difficulty came at Time 4 when December was left out during reciting the months of the year. In Welsh Mr Davies similarly showed no difficulty recalling days of the week throughout the testing period. The remaining components of the test however were problematic. At Time 1 he could say the months of the year, the alphabet and count correctly in Welsh. By Time 2 Mr Davies mixed the months of the

year and included English words. He also became confused while reciting the alphabet. At Time 3 Mr Davies could only recall the first two months in Welsh, improving slightly by Time 4. In the Recitation Subtest Mr Davies initially did very well, reciting passages and prayer clearly. This ability became impaired as testing sessions progressed and at Time 4 Mr Davies could only recall about half the Lord's Prayer in Welsh or English. This ability seemed to be maintained longer in Welsh as he had been able to recite the Lord's Prayer perfectly at Time 3 whereas this was not the case in English.

4. Repetition

Mr. Davies reached maximum score on Word Reading and this did not change over the duration of the study.

Difficulty in Repeating Phrases was revealed from the onset in English and in some of the more unusual sentences in Welsh. *Examples from Time 2 are 'mine are* sour' instead of 'limes are sour', and 'the barn swallow punctured a plump worm' instead of 'the barn swallow captured a plump worm'. Welsh errors were mainly added words, morphemes or incorrect mutations.

5. Reading Comprehension

At Time 1 Mr. Davies failed to identify 'purple' on both Welsh and English versions. At Time 2 Mr. Davies began to read words aloud before correctly identifying them, resulting in a much reduced score. This continued at Time 3 where Mr. Davies also failed to correctly identify items. On the English version 'dripping', 'brown' and 'smoking' were incorectly identified. By the end of the testing

period, Mr. Davies' performance in Welsh and English had deteriorated. The main cause of this total incorrect score, was due to reading the word aloud.

6. Sample Speech: Cookie Theft Picture

In describing the cookie theft picture Mr Davies gave no examples of language mixing. At Time 4 in English Mr Davies described the following.

Mr D: *A young lady aye, washing up in the back kitchen...*
Examiner: *Anything else?*
Mr D: *A little girl helping and a boy standing on a stool and a stool turned over. Can't see anything else.*

This passage is a good illustration of both separating languages and of a marked decrease in the description which is offered. Previous descriptions were much fuller and detailed. This passage lacks any thinking or warning about the content of the picture, as noted on previous occasions.

This same hollowness was observed in the Welsh description at Time 4 although thoughts ran into other associations.

Mr D: *Gweld ryw ddynas yn golchi llestri a dau o blant. Os gynno chi deulu? Ryw ddynas yn golchi llestri.*
Examiner: *Rywbeth arall*
Mr D: *na*

(Mr D: *I see some woman washing dishes and two children. Do you have a family? Some woman washing dishes.*

Examiner: *Anything else?*
Mr D: *no*)

3) Severe Dementia and Bilingual Group

Subject 3: **Mrs Williams**

Mrs Williams was selected as she was identified as being in the bilingual group more frequently on the basis of her performance on individual language tests and dementing at Time 1. Mrs Williams was 81 years of age at the start of the study. She was born, and went to school in Cerrigydrudion. The initial interview was by her preference conducted in Welsh. Her schooling was in English and she recalls the headmaster becoming very angry if they spoke Welsh. The language spoken at home and with friends, however, was always Welsh.

Her father was a farmer and part time postman. Before their marriage her mother was in service with a family in Manchester. At periods in her adolescence she would spend up to six weeks with aunts in Yorkshire. They worked as cooks and maids there. When the family was away on holiday they would look after the house and Mrs Williams would go and stay with them. She recalled an occasion when she had to go to school there and having English lessons. She married a Welshman in 1927. He worked for the water board. They had two children and both were brought up as Welsh speakers. The family lived on the family farm and all the family now live locally. Mrs Williams has a number of grandchildren, and all are Welsh speaking. She has been a regular church attender, and during her adult life taught at Sunday school. She was also the church organist for a long time and competed in music competitions at local Eisteddfodau.

1. Auditory Comprehension

In the Word Discrimination Subtest, difficulty was noticeable from Time 1 in identifying objects. Although many were correctly identified Mrs Williams was slow to point to pictures of objects when asked. Words to describe actions were the next to prove difficult to locate in Welsh, whereas colours and forms were incorrectly pointed out in English. By Time 3 colours were also confused in Welsh and Mrs Williams failed to identify '7000' in Welsh. The picture of deterioration continued so that by Time 5 in English Mrs Williams made many Welsh asides. In the Welsh testing the strategy of naming first in English and then translating to obtain the number in Welsh was used, to correctly identify the corresponding picture.

In Body Part Identification the errors made at Time 1 were the only errors to be made on subsequent occasions. These were the Welsh word for 'eyelid' (a word used infrequently in Welsh) and 'index finger' in English. Mrs Williams' performance on the Commands subtest showed little deterioration until Time 5 in Welsh where she failed to complete a task, and did not keep her eyes closed. In the English version although her score evidenced little decline she made many Welsh asides, saying that she didn't understand what was being requested. Errors were most frequent in the English commands than Welsh. Her performance on the Complex Ideational material was seen to be problematic from the beginning in both Welsh and English. Her performance fluctuated during the period of the study but showed evidence of impairment throughout. By Time 5 Mrs Williams could not respond to the more complicated material.

Deterioration in her performance was marked by a

general language impoverishment. Certain aspects of her languages were well maintained, in particular Automatized sequences in English, whereas performance on this test deteriorated in Welsh.

2. Word finding

Mrs Williams' performance reached maximum score in Welsh and English on the Responsive Naming test and this was sustained over the period of the study, suggesting that this ability stayed intact in her dementia. In Verbal Confrontation Naming, however, some items could not be named from the onset, for example 'cactus'. At Time 2 Mrs Williams gave 'asgell' (thistle) which suggests that the difficulty was not one of perception as she offered a word from the same semantic category. She did not offer any alternative for the English equivalent. She showed examples of using a word in one language to help obtain the equivalent word in the other language, for example:

Mrs W.: *Feather...oh ia 'pluen'. (...oh yes feather)*
and,
Mrs W.: *Oh 'elbow'...be ydi hwnna..'ysgwydd'. (what is that ...shoulder) Oh I know 'shoulder'.*

From the onset numbers were first said in English and then quickly translated into Welsh. Mrs Williams confused colours, especially in English. She was slow to name colours from the beginning but this became more impaired over the period of the study. At one point she named 'grey ' in English before repeating the Welsh word, but in the majority of instances she had difficulty in correctly distinguishing between colours, although she did not cross semantic categories and give totally incorrect words.

The errors and failed responses made at Time 1 were the only ones repeated in Welsh. The errors in English contained the same body parts, namely, 'knuckle', and 'shin' which had been failed in Welsh. The Welsh word was provided and then translated before 'shoulder' was correctly named on this Subtest at Time 4.

3. Oral Expression

In the Recitation Subtest Mrs Williams could recall rhymes in both Welsh and English although the lines were muddled. What was most noticeable from Time 1 to Time 5 was the reduction in the number of examples offered. She also began to give up in the middle of a line. The Lord's Prayer in both Welsh and English was her preferred recitation. It remained perfect in Welsh but towards the end of testing the English version contained errors of phrases and passages were left out.

In the Automatized Sequences Mrs Williams showed differential impairment in her ability to name months, the alphabet and count up to 21. Her performance in Welsh deteriorated whereas her ability in English remained relatively intact. She retained her ability to name days of the week well and quickly both in Welsh and English. Her performance gradually deteriorated in Welsh and she increasingly offered English equivalents as substitutes to Welsh words. She said at Time 1 that she found this section easier in English.

4. Repetition

Mrs Williams' word reading ability showed little indication of change in English until Time 4 where she misread 'brown ' as 'browning', which followed the

word 'dripping'. In Welsh 'pwys' (pound) was misread for 'piws' (purple) at Time 1 and 'pumpdeg' (fifty) for 'pymtheg' (fifteen) at Time 2. Welsh words were pronounced in English, e.g. 'triangle' instead of 'triongl' at Time 3, along with the earlier errors. The same errors occurred at Time 4.

A few distortions of words, and morphemes were observed but this did not alter meaning in Welsh on the Repeating sentence subtest. Her ability to repeat correctly, deteriorated from Time 1 to 5. In English, words altered to the extent that sentence meaning was lost, for example 'saved a cloth' for 'soared across'. Other errors included 'the vat leak' for 'the vat leaks', 'lime and flour' for 'limes are sour', 'the fly sped to Greece' for 'the fly fled to Greece' and 'clothing' for 'closing'. By Time 5 she included many Welsh asides to express her difficulty in recalling what had been said.

5. Reading Comprehension

At Time 1 Welsh errors amounted to failing to identiy 'hamock', and '7-21'. In English the overall score was identical to the Welsh. Errors made however, were 'triangle', 'dripping', 'smoking' and so appart from 'triangle' were different on this occasion. At Time 2, Mrs. Williams began to read aloud the words in Welsh, before correctly identifying items, thus obtaining a reduced score. The problematic items included all which were read aloud at Time 1 in Welsh. In English, words were incorrectly identified. Here too, the errors were on items failed at Time 1, although included 'hammock' on this occasion. At Time 3 the itmes continued to be problematic for Mrs. Williams. Increasingly words were read aloud. Items failed in Welsh were among fhose failed in English. On both language versions, 'triangle' was identified by

pointing to 'star'. By the end of the testing period performance had deteriorated in both languages. More deterioration in score was observed on the English version however.

6. Sample Speech:Cookie Theft Picture

The following passage gives Mrs Williams' description of the cookie theft picture in English at Time 1:

Mrs W.: *Dynes glanhau ydi hon ia? (Is she a cleaning woman?)*
Examiner: *A woman?*
Mrs W.: *Cleaning ia? (yes?)*
Examiner: *What is she doing?*
Mrs.W.: *She's looking through the window and washing pots ac mae'r boi bach yna just iawn a syrthio ac yn tynnu hwne i lawr. (and that little boy has nearly fallen and pulling that down)*
Examiner: *What do you think is happening there?*
Mrs W.: *Well there is going to be an accident really.*
Examiner: *What do you think will happen?*
Mrs W.: *Well*
Examiner: *Will the accident happen to the little boy?*
Mrs W.: *Oh yes... the stool is going to drop isn't it?*
Examiner: *The stool?*
Mrs W.: *Yes..and the little girl wants something from him.*
Examiner: *What does she want?*
Mrs W.: *Fedra i ddim dweud be ydio wir yn iawn....(Well I can't say what it is really)*
Examiner: *Something to eat?*
Mrs W.: *Yes..jar o rhywbeth ynde...(of something yes)*

Examiner: *Can you see anything else?*

Mrs W.: *Only this lady here...washing up ynde(isn't it)....trees..grass and the road.*

It can be seen from the above passage that a number of phrases have been underlined. These show the extent of language mixing and interference. When shown the card at Time 1 in Welsh no English words were included in the description. Although the content of the passage lacked substance and the vocabulary was simple and elementary there was no evidence of borrowing or switching to help access a richer vocabulary.

At Time 2 no interference was observed in the Welsh description. A much shorter description was offered in the English session:

Mrs W.: *Well a boy reaching for the girl..and reaching for the jam jar or something...little girl asking for something and this one is washing up is she..this one..in the kitchen...I don't know..I think that's all.*

Although Mrs Williams was encouraged to continue, this was the extent of her description. There were long silences between utterances and sentences were left incomplete.

At Time 5 no interference was observed in Welsh although the description offered was very short. The English description was a little longer on this occasion but there was evidence of language mixing.

Mrs W.: *A lady washing up...and a be arall sy na pantry neu (and what else is there, pantry or) washing place ydi de a ma'r (isn't it*

and the) lady, wedi gweld rwbath(she's seen something) she's seen something and stopped washing up. A hogyn neu hogan ar dop y (and a boy or girl on top of the) chair. A little girl watching him falling and he's nearly falling and he's taking a pot of jam from the cupboard.

4) Severe dementia and Welsh group

Subject 9: **Mrs Price**

Mrs Price was selected as she was identified as being in the Welsh group more frequently than in the bilingual group on the basis of her performance on individual language tests and dementing at the start of the study.

Mrs Price was aged 83 at the start of the study and born in Tonypandy, South Wales. She was the third of seven children. She and two sisters were born in South Wales where her father had moved to find work. They moved very soon after her birth to Holyhead, North Wales. She attended primary school there but after a few years the family moved to Newborough, where she finished her schooling. She says that Welsh was the predominant language of her childhood.

Her father was a native of Newborough and her mother from Caernarfon. He was a seaman until he met and married her mother. Both could speak English although Welsh was the family language. She gained a school scholarship to grammar school but due to financial constraints on the family had to forego that opportunity to help support the family. She left school aged 13 and went into domestic service with a Welsh family nearby. From there she went to Liverpool and worked for a Welsh speaking family. She was there

about a year before returning to be with another family in Bangor. On her return she met her husband and they married when she was 21. He was a blacksmith in Bangor and came from a Welsh family. Although initially living with his parents, they soon moved to Newborough to be with her family as her mother became ill. At some point they returned to Bangor and she worked for a number of years as a telephonist.
They had two children who had a Welsh upbringing. Both sons married and lived locally. One family is Welsh speaking whilst English is the family language of the other.

The richness of her Welsh was particularly evident and she used many less common Welsh words both in conversation and during testing.

1. Auditory Comprehension

Performance on the Word Discrimination subtest did not alter greatly. Overall response time became slower but few errors were made in Welsh or English. Those made occurred both in the Welsh and English versions, namely 'spiral' and 'cactus'.

The only failed item of Body part identification was 'index finger' at Time 4 in English. Performance on the Commands was also well preserved with errors only occurring at Time 4, where eyes were not closed to complete the task.

Complex Ideational Material identified impairment from Time 1. In Welsh the first five short passages were answered correctly but only the first two were correct in English. Mrs Price made a number of asides during the English sessions to indicate that she did not understand.

2. Word Finding

On the Responsive Naming subtest Mrs Price showed no difficulty with the Welsh version. At Time 3 in English she included Welsh asides into her responses. She also gave the Welsh word followed by the English translation, for example 'molchi..wash'. She failed to provide the word 'wash' at Time 4.

In Verbal Confrontation Naming there were examples of errors in naming items from all categories. At Time 3 difficulties were most evident and occurred in both Welsh and English, for example, 'cactus' and 'red' produced no response. By Time 4 Mrs Price was seen to make errors in all categories, although she continued to provide some Welsh words for English items before translating those into English, for example, 'bigwrn' for 'knuckle' and 'aeliau' for 'eyebrow'. She also gave the English '700' and '42' before the Welsh translation.

Body part naming was retained in both Welsh and English. Errors at the onset were repeated at subsequent testing sessions. Mrs Price frequently named in Welsh and then sought the English translation, although she was not always able to name in English. She would make Welsh asides at this time, such as,

'oh ddaw o ddim' *(oh it won't come)*.

Animal naming showed little change in Welsh throughout the testing period. In English there was considerable loss. At Time 4 Mrs Price could not be encouraged to name any animal in English although at Time 1 more animals had been named than in Welsh.

3. Oral Expression

Recitation was retained throughout the testing period. In the Automatized Sequences the ability to recite days of the week reached maximum score throughout. Mrs Price showed no difficulty supplying the English months but from the onset she had difficulty reciting months in Welsh. At Time 1 she completed the task after the following aside:

'be di October dudwch, Medi ydi September de a Rhagfyr ydi December...Hydref..ar ol i mi roi fy thinking cap ar fy mhen'

(What's October now, Medi is September isn't it and Rhagfyr is December...October..after I put my thinking cap on).

At Time 4 Mrs Price could only supply the months in Welsh by giving the English first and then translating into Welsh. Counting posed no difficulty but reciting the alphabet in Welsh gave some difficulty from the beginning, and this deteriorated by the Time 4 where she was unable to provide half the Welsh version.

4. Repetition

Mrs Price had no difficulty with Word Reading in Welsh or English. 'Lime are sour', instead of 'limes are sour' and 'the fly spread to Greece' instead of 'the spy fled to Greece' were given in the Sentence Repetition Subscale. Mrs Price consistently mixed and muddled sentences from the onset in English. Many errors also were produced in the Welsh sentences. Small word alterations resulted in loss of meaning i.e. 'y sbeiliwr i'r Groeg' (the spy to the Greece) instead of 'y sbeiliwr i Groeg' (the spy to Greece). Those Welsh errors persisted on subsequent occasions.

'Sbaeniwr i'r coed' (spaniard to the woods) was the alternative offered. In the English phrases Welsh words were included by Time 3 and 4, for example, 'Chinese fan y be a emerald' (and what an). Mrs Price also said that she could not understand in Welsh and continued to talk in Welsh from then on.

5. Reading Comprehension

At Time 1 Mrs. Price failed to identify 'triangle' and read aloud the Welsh version of 'purple', '15' and '7-21'. In English she failed to identify 'brown' and 'dripping' and read '15' aloud.

At Time 2 errors made at Time 1 were correctly identified, but there was an increase in reading aloud. Many items were incorrectly identified in English, although these errors did not include those made at Time 1. By Time 3, 'triangle' and 'purple' were mistakenly identifed in English, while 'purple' was the only item failed in Welsh.

By Time 4, an increasing amount of items were failed in Welsh. The failed errors included errors made at Time 1, namely 'triangle' and '15'. 'Circle' and 'hammock' were the only correctly identified items in English. These had been incorrectly identified in Welsh. From Time 1 to Time 4 an equivalent deterioration rate in score was observed in both Welsh and English performance, with both languages showing marked deterioration in performance.

6. Sample Speech: Cookie Theft Picture

The description of the Cookie theft in Welsh showed no evidence of language mixing from Time 1 to 4. The descriptions became shorter, and consisted of shorter sentences which merely identified objects on the card. The description at Time 1 in English is interesting in that there was no evidence of language mixing during

the passage but at the end when talking to herself and turning to the examiner Mrs Price switched to Welsh:

Mrs P.: *She's washing up or drying up..drying the dishes or something..washing up and drying up yes..and he is looking for something to eat..cookies..a yes..she forgot the tap didn't she..she was talking to somebody...she is looking straight that way isn't she..* *ia wir fel yna ma'i.* *(yes indeed that's what it's like).*

At Time 3 in English Mrs Price mixed languages more frequently and included many more asides seeking reassurance and encouragement to continue. For example:

Mrs P.: *You want me to speak English with you now..oh well heavens above...arhoswch imi gael llwnc o de...dros 'n ngheg bach, (wait for me to take a sip of tea) oh lovely...elur galon..dad yn galw (ointment for the heart, as my father would say) sweets..elur galon oh dwi wedi dweud wrtha chi ganwaith. (ointment for the heart, oh I've told you a hundred times) ..a young girl wiping dishes...washing them look at the mess she's done ...ma hi 'di gwneud mwy o lanast (she's made more of a mess). Silly girl..She's still washing dishes..a'r hen hogyn bach cofn iddo syrthio oddi ar y stol na. (and the poor little boy's going to fall off the top of that stool).*

At Time 5 in English language mixing continued. About half the description is in Welsh and the English comments are translations of those first given in

Welsh:

Mrs P.: *Sychu llestri yn (drying dishes, in) English ia (yes). Wiping her plate ma' hi yn fan ma a be ma o'n neud dwch (she's doing here and what is he doing I wonder) reaching a plate i hon te (for her yes).*

Examiner: *anything else*

Mrs P.: *Nag os does dim byd arall nag oes? (no there's nothing else is there?)*

Examiner: *Where are they?*

Mrs P.: *Where are they? Yn y ty am wn i te. Yn y pantri ma hon i weld yn gwneud bwyd a ballu a hwnan'n dringo i'r top na.(In the house I suppose. She's in the kitchen as she's making food and he's climbing to that top).*

SUMMARY FINDINGS

Results from case analysis both support and contradict the hypotheses proposed in Chapter 5.

1) Mild/Moderate dementia and bilingual:

It had been hypothesised that as a result of contact with English at developmental life stages, Miss Hughes would be expected to show evidence of equal impairment in performance on both language measures over time. Although there is evidence of equal impairment in performance change scores on subtests, looking at individual subscales there is also evidence of unequal impairment. There are instances where Welsh interferes with the English response and of English mixing when the Welsh responses are requested. There are more examples of English mixing during the Welsh testing periods. This was evident at Time 1 when Miss Hughes was not assessed to be dementing. The pattern of language function and competence remains similar. Translation proved to be a method Miss Hughes had developed in order to provide a correct response. Some subtests showed no change over time and performance scores reached maximum indicating that dementia made no impact of certain language skills, or of a failure on the part of the test to pick up subtle changes.

2) Moderate dementia and Welsh

A differential rate of deterioration favouring responses in Welsh was predicted. The analysis presented here identifies examples where performance scores show least change in Welsh on some subscales and of least change in English on others. On some subtests there is equal deterioration. There is

evidence of giving English responses aloud then translating to access Welsh. There is also evidence of Welsh asides and insertions in English sessions. There are no examples of language mixings in describing the cookie theft picture. As dementia severity increases, a reduced verbal response is observed in both languages.

3) Severe dementia and bilingual

It was predicted that there would be an equivalent performance decline. There is evidence of differential performance deterioration in both languages. On some subtests there is less Welsh impairment while other subtests show English being better maintained. Asides to the examiner and to self during Welsh and English testing were in Welsh.

4) Moderate dementia and Welsh

It was predicted that there would be differential decline with Welsh being preferentially maintained. There is evidence of Welsh being better preserved than English but similarly evidence in favour of English on particular subtests, namely Automatized sequences. Maximum scores were also obtained so that some language abilities were maintained as others deteriorated with increasing dementia severity.

TRANSLATION AND ASIDES

A number of themes recur in the four case analyses. The researcher was especially struck by the role which translation and Asides seemed to play in accessing an unavailable word.

Translation was seen to occur:

1. to give a cue or prompt, e.g. in reciting sequences. A month is given in English then translated into the Welsh equivalent one by one. This procedure served to activate the Welsh words.
2. for confirmation, e.g. a word given in one language by the examiner was translated and said aloud before pointing to the correct picture. It seemed as though subjects could only 'tell themselves' what the word means if they say the word in the other language first.

The use of Asides was evident for all subjects. It seemed that the thinking process had to be said aloud by subjects to aid response. This idea will be developed further in the final overview and discussion chapter.

The following chapter will seek to build on findings from chapters 7, 8 and 9. Language deterioration has been shown in those subjects identified as suffering from dementia. No such deterioration was observed in subjects without such a diagosis. Findings suggested an equivalent rate of deterioration in both languages. In seeking to explore whether language histories could be related to later language deterioration, namely relating degree of contact and use to % deteriorationon performance measures, no evidence for this hypothesis was encountered. Further support for this finding was encountered when the data were investigated employing a qualitative methodology. Indeed it was repeatedly observed how both languages interrelated to aid subjects in obtaining their responses on certain language tasks. When dementia is more severe this process of interrelatedness excelerates, and was seen to offer help on an

increasing number of subscales exploring specific language skills. This contrasts with the way similar phenomenon is observed in childhood bilingual development, where interference and language mixing is viewed in a negative framework.

Thus, in the next chapter the central concern will be to draw together and identify an order in which specific language skills decline as dementia progresses, therby identifying aspects of language both sensitive and resistant to dementia.

CHAPTER TEN

PART ONE: IDENTIFYING LANGUAGE SKILLS SHOWING SENSITIVITY AND RESISTANCE TO ADVANCING DEMENTIA

Previous longitudinal studies investigating the impact of dementia on language skills have sought to identify those components of language which show most sensitivity and resistance over time to dementia (see chapter 3). The aim of this chapter is to in part one, identify language skills which are both sensitive and resistant to dementia in bilingual subjects and thus identify a possible order of decline. This develops further the ideas proposed in chapters 7,8 and 9.

It has been established that the dementia group do not show significant change from Time 1 to Time 2 but at Time 3 there is a significant deterioration in total mean score for the dementia group on both English and Welsh versions of the Boston test (see Chapter 7). In this chapter component parts of the Boston test which appear to be most sensitive and resistant to dementia will be described. This will be done by looking at change scores from Time 1 to Time 3 (Time 1-Time 3) for the following language skills:

1. Auditory comprehension
2. Word Finding
3. Oral Expression
4. Repetition
5. Reading Comprehension

Table 9.1 below gives the frequency performance scores in Welsh showing deterioration, improvement and no change from Time 1 to Time 3 in the Welsh version of the Boston Test. The scores are given in percentages and the number of subjects given in brackets to follow.

Table 9.1: Subject (N=16) percentage frequency distribution over the five identified language skills, showing deterioration, improvement and no change from Time 1 to Time 3 on Boston Welsh performance scores.

	Deterioration	Improvement	No change
Auditory comprehension	56 (9)	44 (7)	0
Word finding	75 (12)	19 (3)	6 (1)
Oral Expression	69 (11)	12 (2)	19 (3)
Repetition	69 (11)	25 (4)	6 (1)
Reading comprehension	63 (10)	19 (3)	19 (3)

It can be seen that 75% of subjects have performance deterioration in Word Finding subscales by Time 3. Although 1 subject shows no change in performance on these subscales and 3 subjects have a performance improvement, these word finding skills do seem to be especially sensitive to the impact of dementia. Equal numbers of subjects (11) have performance deterioration on the Oral Expression and Repetition subscales suggesting that next to the word finding subscales, these skills are sensitive to dementia. Least sensitive to dementia in this sample overall are Auditory comprehension subscales, with 7 subjects (44%) demonstrating performance improvement. Half the sample show performance deterioration by Time 3.

The same procedure was undertaken to identify change scores from Time 1 to Time 3 on the English version of the Boston test. Table 9.2 below gives the frequency performance scores in English showing deterioration, improvement and no change from Time 1 to Time 3 in the English version of the Boston test.

Table 9.2 : Subject (N=16) percentage frequency distribution over the language skills tested, showing deterioration, improvement and no change from Time 1 to Time 3 on Boston English performance scores.

	Deterioration	Improvement	No change
Auditory comprehension	69 (11)	31 (5)	0
Word finding	88 (14)	6 (1)	6 (1)
Oral Expression	81 (13)	0	19 (3)
Repetition	88 (14)	6 (1)	6 (1)
Reading comprehension	75 (12)	19 (3)	6 (1)

It can be see from Table 9.2 that as with the Welsh subscales, the performance of most subjects on Word Finding subscales show deterioration and thus sensitivity to dementia.

In this sample of 16 subjects, overall, Word Finding skills are most sensitive to dementia and most frequently the language skill to show performance

deterioration. This is especially so when Word Finding skills are tested in English. 14 out of the 16 subjects have performance deterioration by Time 3 when tested in English. 12 subjects show performance deterioration when tested in Welsh.

Repetition and Oral Expression skills then appear to be affected most frequently by subjects in this study. Reading Comprehension then follows in frequency.

Although still affected the least sensitive to dementia appears to be Auditory Comprehension skills, with 56% of the sample in Welsh and 69% in English showing performance deterioration from Time 1 to Time 3.

Clearly this suggested order of decline does not address the differences in difficulty in expression between the two languages of a bilingual. It is however interesting to note the similarities and differences in the frequency scores on the language skills.

Within these identified language skills, performance on individual subscales of the Boston test can be further distinguished. In the 4 cases presented in chapter 9 deterioration in Welsh and English scores were observed on the following subscales from the beginning of the study:

B4 - Complex Ideational material (Auditory Comprehension)
B6 - Recitation (Oral expression)
B11 - Repeating phrases, low probability (Repetition)
B14 - Visual confrontation naming (Word Finding)
B16 - Animal naming (Word Finding)

When the scores for the whole group of subjects with dementia is considered Welsh and English scores show performance deterioration, irrespective of dementia severity, or differing level of language ability for all subjects. On the subscales listed above the following is observed:

B4 Complex Ideational Material Of the 16 subjects in the sample 15 show deterioration in scores from Time 1 on this subtest. One subject shows improvement in Welsh scores and a deterioration in English scores.

B6 Recitation There is 100% subject deterioration in scores for Welsh and English from Time 1 to subsequent occasions on this subscale.

B11 Repeating Phrases Low Probability There is 100% deterioration in both Welsh and English from Time 1 and on subsequent occasions on this subscale.

B14 Visual Confrontation Naming Three subjects show improvement in Welsh scores, three subjects show improvement in English scores. The other 10 subjects deteriorate both in Welsh and English.

S16 Animal Naming 15 out of the 16 subjects show deterioration in scores for Welsh and English. One subject shows an improvement in Welsh and English scores.

Although all five tested language skills show deterioration by the end of the study time when tested in both Welsh and English. Looking at individual subscales which assess these language areas reveals subtests which show no change from maximum scores or little change from high scoring, not only for the four individual cases examined in chapter 9, but for the whole sample.

The following 3 subtests show no change from maximum scores or high scores for the 4 cases:

B2 - Body part identification (Auditory comprehension)
B9 - Repeating words (Repetition)
B12 - Word reading (Repetition)

These abilities appear to be preserved when dementia becomes severe. This finding is supported by the other subjects in the sample, so that for the whole sample:

B2 Body Part Identification: 14 subjects show retained ability to maximum scores on both Welsh and English versions of the subtest. The other 2 show differential preservation or little change in scores.

B9 Repeating Words: 14 subjects show preserved abilities, to maximum score on this subtest. As with Body part identification, changes are slight for the other 2 and unequal preserved ability is evident.

B12 Word Reading: 13 subjects show preserved ability, to maximum score on this subscale while the other subjects show little change or deterioration.

The other subtests which make up the Boston test show evidence of unequal decline both for the 4 cases in chapter 9 and for the remaining subjects in the sample. Thus no clear direction nor meaningful pattern of deterioration could be identified.

Figure 10.1 which follows gives a summary presentation of the results from these subscales.

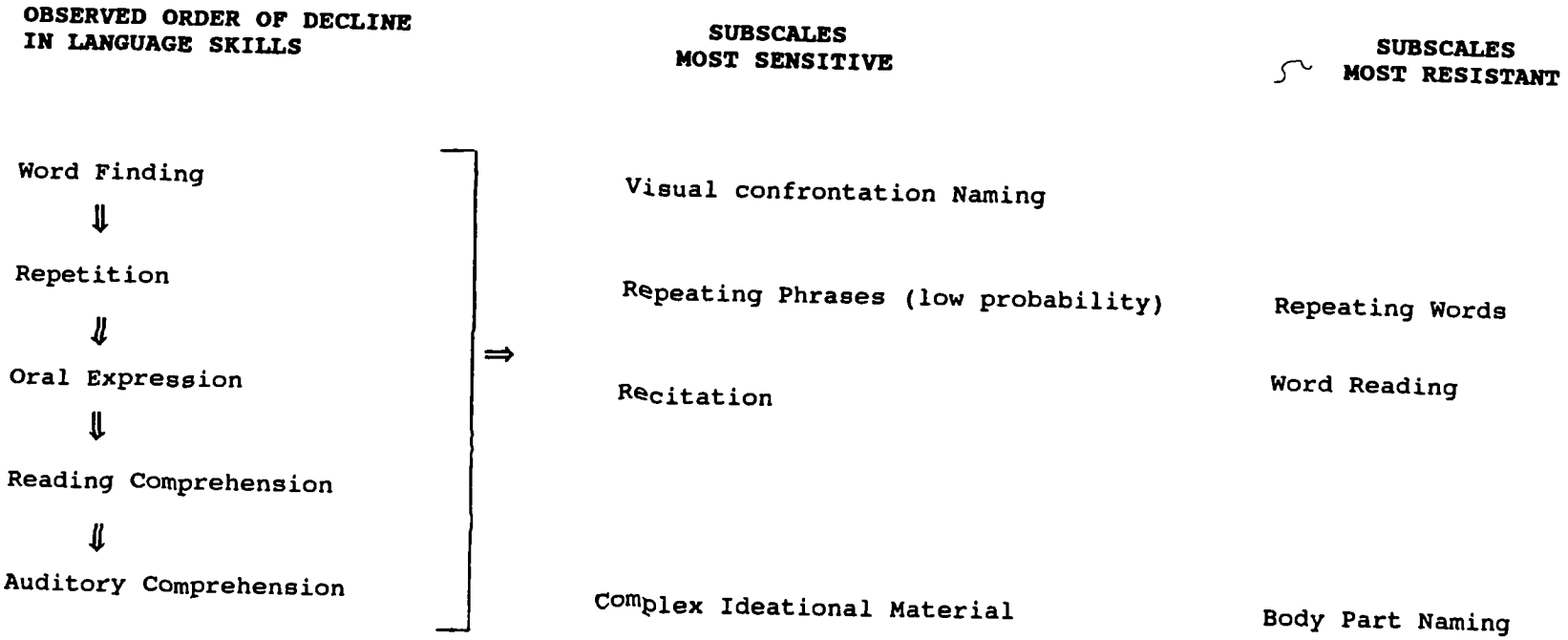


Figure 10.1: An illustration of the findings suggesting order of decline and subscales sensitive and resistant to dementia.

PART TWO: SHORT OVERVIEW OF THE RESULTS CHAPTERS

i) PRELIMINARY DATA ANALYSIS (Chapter Seven)

There is performance deterioration in both Welsh and English as measured by Boston and Token tests. No such performance deterioration is seen for those subjects without dementia. Thus results from Chapter Seven support the hypothesis that those subjects diagnosed as having dementia (by Kendrick and Wechsler Measures) will show a significant deterioration over the course of the study as measured by Boston English, Boston Welsh, Token English and Token Welsh. Those without such a diagnosis will not show a significant deterioration in those measures. No difference in rate of decline of the two languages in the same individual is found.

ii) DEVELOPMENTAL STAGES HYPOTHESES: Findings from the Performance Measures (Chapter Eight)

The LUCQ was divided into six stages which relate to developmental life stages. Results for each measure were:

Boston English: No stage could be seen to significantly correlate, suggesting that language behaviour over developmental stages could be related to later performance deterioration on Boston English.

Boston Welsh: As with Boston English no stages could be seen to be related to later performance on this test.

Token English: No stages could be related to later adult performance deterioration on this measure.

Token Welsh: Stages can not be related to performance on this measure.

Kendrick English: No stage can be related to this dementia measure.

Kendrick Welsh: No stage can be related to this dementia measure.

Thus findings do not support a hypothesis that background language factors would have an influence on language measures used in this study as performance deteriorated in dementia.

iii) QUALITATIVE ANALYSES OF FOUR CASES: (Chapter nine)

findings from four cases were presented, similarities and differences were described.

The use of Translation and Asides were identified as recurring themes.

iv) LANGUAGE SKILLS SENSITIVE AND RESISTANT TO DEMENTIA: (Chapter 10)

It was sought to establish which language processes could be sensitive and resistant to dementia in this bilingual sample of subjects suffering from dementia. An order of decline is tentatively suggested from the data. Figures 10.1 gave an overview of the results.

CHAPTER ELEVEN

OVERVIEW AND CONCLUSIONS

This final chapter has two aims. First, to present an overview of the study described here, highlighting the main findings and potential clinical implications. Methodological problems will be discussed and suggestions made for further investigations. Second, recommendations for the future will be made. These include specific proposals for bilingual older adult research and the wider implications of the assessment of dementia in bilingual older adults.

Thus the overview will proceed with discussion of the following areas:

I main findings
II methodological problems
III potential clinical implications
IV directions for future research

I MAIN FINDINGS

An extensive literature on the language changes in dementia was reviewed, in Chapter Three. It was stated that findings from monolingual studies of dementia form the basis for addressing the bilingual study of dementia. The presentation of key issues in bilingual research in Chapter Four was made in order to highlight potential differences which might be involved in bilingual older adults with dementia. It is not known if an assessment of impairment in the English language will prove a legitimate comparison on which to propose a theoretical explanation of

relevance to all impairment in dementia. No study, to this researcher's knowledge, has either made a comparison, systematic investigation, or explored, whether knowledge of more than one language might produce differences in deterioration. The review showed how other conditions, e.g. depression and aphasia, are influenced by bilinguality (page 25) and identified some evidence to justify this as an area worthy of investigation.

The findings from this study do not appear to support the hypothesis that contact and use of language are central issues which influence the manner two languages of the same individual will deteriorate in dementia.

It was hypothesised that bilingual older adults in a dementing process might lose parts of both their languages in relation to the use they made of those languages at critical periods during their lives. The loss of language processes might be influenced by variables from that person's language history, factors such as those encountered during adolescence and factors which govern how much dual language use there had been during that person's life. Many of the subjects had a childhood language history which was similar. No relationship could be established between childhood factors and performance above chance level. Thus the argument that the first learnt language will influence later language performance does not seem to be supported by the results of this study. It was thought that how individuals negotiate their languages throughout their adult life could subsequently influence the manner of their impairment in dementia. Neither do the findings from the study lend support to these hypotheses.

As outlined in the aims of this study (page 74) the work attempted to examine six basic questions. These questions appeared relevant from the review of the literature. It is intended to examine each of these questions in turn in the light of the findings from this study:

1. Has dementia affected language ability in bilingual older adults? If so is there a difference of decline in the two languages of the same individual?

It was predicted that those subjects diagnosed as having dementia (by the Kendrick and Wechsler measures) would show a significant deterioration over the course of the study as measured by Boston Welsh and English and the Token Welsh and English. It was further predicted that those without such a diagnosis would not show a significant deterioration in those measures. Findings of the study indicate that dementia has affected language ability in bilingual older adults. Overall performance as measured by Boston Welsh and English total score and the Token test in Welsh and English indicate that performance deterioration has occurred over the course of the study. For those without such a diagnosis no performance deterioration on those measures was observed.

It was unclear from the literature if there would be a difference in the rate of decline of the two languages of the same individual suffering from dementia. It was hypothesised that there would be no difference. No differences in the rate of decline was found.

These preliminary findings are in accordance with the

growing literature which shows that language deteriorates rapidly with the onset of dementia, (Miller, 1989; Bayles, 1987). Thus it appears that dementia affects language performance in bilingual as well as monolingual individuals.

2. Can bilingual linguistic variables which operate in older adults in the early stages of dementia be identified?

It was intended to examine this question by looking for a relationship between performance and language contact and use variables. As it is not clear how to obtain a measure of 'bilingualism' from the literature the study predicted that performance change could be used to provide a measure of bilingual proficiency. It was further predicted that the Language use and contact questionnaire (LUCQ) is related to performance as measured by the language measures used in the study.

It is not known whether some questions of the questionnaire might be more relevant than others or carry more significance as the questionnaire was not standardized. Nevertheless the questionnaire was based on grounded theory and sought to develop the ideas put forward by MacKey (1968) focusing on specific factors. Furthermore the questionnaire made no claim to be any more than a semi structured interview schedule aimed at obtaining as much background information from respondents as possible. Further research on the use of such measures needs to take place to substantiate any findings which this study could make.

Adopting a developmental approach was considered an appropriate method of conducting this investigation as a number of possible rationales for each stage could

be identified (as argued in Chapter Five). Thus six stage hypotheses based on language use and contact over developmental stages were proposed. It was predicted that each stage could have an influence on language measures in dementia.

In employing this rationale and looking for a relationship between the stages of the LUCQ and % change over time in the study, no evidence was found to support these hypotheses, on either the Boston or the Token test, administered in Welsh or English.
The findings from stage analyses on Kendrick English and Kendrick Welsh do support the hypothesis of no relationship between the LUCQ and the dementia measure. This can be said to indicate that the dementia measure is not influenced by language factors as measured in the study.

An implication for the study is the extent to which differences in difficulty between languages will influence performance. This has been identified as an important variable in other studies (e.g. Ellis et al., 1980; Lopez et al., 1991). With regard to the measures used in this study this suggestion bears further investigation. For example, the Token Test in this form is easily administered and has been used as a measure of comprehension in dementia in other investigations (e.g. Faber-Langendoen et al., 1988). It could then be argued that this makes it an especially usefull assessment tool. Differences in difficulty were however observed on this measure on the Welsh and English version. Indeed it is interesting to note that the mean score on the Welsh verion of the Token test is significantly larger than the English mean indicating better performance on the Welsh version. On the other hand the Boston test English mean is significantly larger than the Welsh

mean indicating better performance scores on the English version of the test.
This language preference variation is further supported by findings from detailed consideration of the Subscales where differences between Subscales were noted. Furthermore extensive individual differences were repeatedly observed and seemed regardless of reported language preference or estimated degree of bilinguality as measured by the LUCQ.

Furthermore, it must be recognised that bilingual proficiency has been artificially defined in this study. Performance on language tasks has been used as a measure of language competence. An assumption is made that performance is linked to contact and use. This then, assumes that background language contact will be related to performance and could result in misleading interpretation of the data.

In presenting findings from the stage analyses a cautionary note is therefore raised. The six stages are formed by summing together the 51 items of the questionnaire to form six hypotheses. Given the way these were generated it is possible that it is artefactual. Subsequent study could usefully explore the questionnaire item by item from the onset and help clarify these issues.

3) Can specific differences in the way the two languages decline be identified when subtests are selected on the basis of dementia severity and language use and contact history?

By looking at a random selection of individual subjects with different language background histories and dementia severity and looking for similarities and differences in responding to specific language tasks

it was intended to explore the above question. The guiding hypothesis was that variables related to language contact and use at specific life stages influenced performance decline. Thus, specific hypotheses were advanced for four group categories.

In all four cases there was evidence of differential and equivalent performance deterioration. The picture which emerges, seems to be one of variability. All the selected cases, show equivalent deterioration, on some of the Subscales, whilst on others there is differential decline. To interpret these findings, calls on addressing individual responses to specific language factors. Given that all the subjects showed similar school histories, i.e., mostly English, this may be the reason why performance on the Automatized Sequences Subscale, was better preserved for all subjects in English. Individual differences for subjects on specific language tasks, may only be understood, when a more detailed picture of language background factors are obtained. This information may inform the way two languages will deteriorate in dementia on specific subscales.

Recurring themes were identified in Chapter nine. The role which Translation plays in accessing an unavailable word requested in the other language, was identified. The use of Asides was evident for all subjects and played an important part in completing tasks. The following model is proposed to account for the findings of the study at this stage:

Consider Language 1 (L1) and language 2 (L2) of a bilingual. When a word is unavailable (or can not be named) in L1 it may continue to be available in L2. There may be a variety of reasons why a word is still available in L2, e.g., neurological damage caused by

dementia to parts of the storage system; or use - familiarity or frequent usage, where , for example a proficient Welsh speaker might be unfamiliar with some more formal Welsh as seen in the tests used but be familiar with the English word, e.g., `watch' for the Welsh word `oriawr'. The continued availability of a word in L2 can be irrespective of language preference, e.g., a person might perceive themselves to be L1 dominant, yet be unable to locate a word in L1. By the use of Translation and Asides a person with dementia is able to activate additional means of obtaining L1 and so overcome initial effects of dementia on language. Thus, language mixing, will be related to the extent of difficulty encountered in accessing L1 and L2. Mixing and interference may well vary across specific language skills and vary according to background language use and contact variables. Interference of L1 into L2 therefore, carries positive as well as negative consequences. Interference may have a facilitatory role in helping a bilingual person obtain a word only possible when first located by the other language. This idea that interference has a positive effect has also been advanced by Romaine (1989) and differs from the usual more negative views held concerning bilingual abilities (see chapter 4).

4) <u>Can specific language abilities be identified which are sensitive to dementia in bilingual older adults</u>?

Table 3.1 identified those language abilities which have been consistently reported to be sensitive to dementia. Included were semantics, naming, comprehension, word associations, interpreting homophones, verbal fluency, conversational speech, vocabulary, grammatical complexity and reading

comprehension.

Thus, Subscales were selected in the study which measured those abilities in a bilingual sample, namely Auditory Comprehension, Word Finding, Oral Expression, Repetition, Reading comprehension and conversational speech. It was predicted that subjects allocated to the Welsh group would show less performance decline in the measures in Welsh compared to the bilingual group. It was also predicted that the bilingual group would show relatively equivalent performance decline in both English and Welsh.

Figure 10.1 identifies those language tasks which are sensitive to dementia in this study. These are Commands, Complex Ideation Material, Repeating Phrases, Visual Confrontation Naming and Animal Naming. It can be seen that deterioration in performance on these Subscales is in keeping with findings from studies in monolingual dementia.

The reason that language is affected may be due to a number of factors. It may be, that these tasks identify aspects of cognition which are themselves influenced by dementia, in particular memory, and so these tasks will be influenced regardless of language. The confounding affects of other cognitive abilities have been reported previously (Miller, 1989; Britton, 1988). Bilingual skills could be influenced in the same way. This can explain the findings to some extent. The difficulty occurs when specific language tasks appear to show deterioration in one language, but not, in the other of a bilingual person. This has been shown irrespective of language proficiencies measured in this study. However, even when differential effects have been observed, on some Subtests, some deterioration has been noted in both

languages. Thus, it may be, that a combination of factors will be responsible, other cognitive influences, and also linguistic ones which can not be easily identified in this study.

Furthermore, the findings could mean that bilingual persons do not store two languages separately, but have a one store system. Further investigations to develop these proposals are required.

5) Can language skills which are resistant to dementia be identified for bilingual persons?

The review of the literature on language performance change in monolingual dementia reported some language skills which were consistently retained. These were phonology, syntax and reading aloud. Longitudinal studies which have used Subtests from the Boston test report performance is preserved on Body part Identification and Word Discrimination Subtests. By looking for maintained language abilities over time the following Subtests were observed to show no change from maximum scores or high scores for the four cases presented in chapter nine:

B2 - Body Part Identification
B9 - Repeating Words
B12 - Word Reading

These abilities appear to be preserved when dementia becomes severe. This finding is supported by the remaining subjects. 80% of subjects show preserved ability on both Welsh and English versions of the subtest. The others show differential preservation or little change in scores. 80% of subjects also show preserved abilities, with ceiling scores on Repeating Words. The other 20% show relatively little change in

scores over time. 75% of subjects perform at ceiling throughout the period of the study on Body Part Identification with little evidence of deterioration in the remaining subjects.

These language skills are preserved over the period of the study despite an increase in dementia severity and performance decline on other subtests. Thus in general, the answer to this question seems to be that certain language abilities are more resistant to dementia than others. These may provide a basis for the early detection of dementia when assessed along with other skills which show impaired performance.

6) Can an order of decline of language abilities be identified for bilingual persons with dementia?

An order of language skill deterioration was identified from monolingual studies in dementia. This order, is consistently reported in longitudinal studies, (see page 43). Semantic and pragmatic difficulties were seen to occur before phonologic and syntactic ones. Following semantic and syntactic difficulties came generative naming, confrontational naming, propositional use of language and automatic use of language. No prediction was made as to the order of language decline in dementia, in part due to lack of knowledge as to the influence bilingual factors might have. It was not known whether some abilities might be preserved in one language and lost in the other.

As significant performance deterioration was first observed at Time 3 in the dementia subjects, performance change on specific language skillls was investigated at this time. Given the small sample size, identifying frequencies was adopted as an

exploritative method of investigation.

Findings from this study suggest the following (see Figure 10.1). Word finding skills were seen to most frequently show deterioration in both Welsh and English assessment. Repetition skills and Oral Expression followed with most frequency, with evidence of differential effects between languages in these skills. Subjects variability in differential deterioration was observed. Auditory comprehension skills were least affected by dementia. Within these skills individual subscales measuring specific language skills were noted. Body Part Identification (an Auditory Comprehension skill) was seen to be preserved for all subjects, irrespective of language. Repeating Words and Word Reading (Repetition skills) were specific skills maintained over the course of the study, again irrespective of language assessed.

Further investigation focusing of these language skills would serve to advance this explorative study. Given the small sample size, caution is noted in interpreting the apparent findings of this study. This will be discussed further within the methodological problems of the study.

11 METHODOLOGICAL PROBLEMS

It is acknowledged that research concerning communication and cognition in dementia is beset by methodological problems (e.g. Bales et al., 1987). In selecting samples, measures and design, key difficulties occur, which influence the study's efficacy.

Subject selection

Due to the high drop out rate and the difficulty detecting dementia in the early stages, the sample size is small. It is therefore difficult to determine the accuracy of generalised findings.

Subject attrition

Subject loss has been identified by a number of researchers as being especially inherent in this population and a major problem in longitudinal studies of this kind (e.g. Searle, 1984; Burns et al., 1991; Bayles et al.,1987). For example, Searle in her community follow up study in Liverpool found that of 178 subjects selected for follow up interview, 34% were lost for various reasons over a period of 12 months. Burns et al., from their sample of 110, lost 23% over a similar time period. In this respect it might have raised doubts concerning the sample in this study had these similar difficulties at phase three not been encountered, where 39% (n=16) were lost.

This study's findings are impacted upon as a result of the small sample size. It also begs the question of whether the subjects who stayed in the study for the full set of follow up assessments were a biased sample of those entering the study.

It has been suggested that no study can address all identifiable difficulties and that ensuring the accuracy of the sampling procedure is more a matter of trying to identify the features of data collection which are likely to give rise to biased results and try and avoid them (Clegg 1993). The implications of poor samples are in providing misleading information about the characteristics of a population. This can

lead to further erroneous conclusions of Type 1 or Type 2. Thus it is important to assess whether there is there any evidence that those subjects who stayed in the study were a biased sample.

An attempt was made to minimise some of the known potential hazards at the time of criterion setting (see page 76). At the beginning of the study, following consideration of sampling procedures, two stages of subject selection with identified selection criteria were employed. It was hoped that these criteria would help minimize the risk of obtaining a non representative sample from the general population in North Wales. Although these criteria were discussed with members of the randomly selected General Practices, of the 120 referred to the study, 99 subjects did not meet the criteria at phase two. Approximately one third of those were unwilling to participate in the study. Furthermore, of the 41 who entered phase three, 16 subjects were lost by the end of the study. 14 of the 16 subjects were lost as a result of withdrawing their consent. Of those, 11 were diagnosed as suffering from dementia. 8 subjects were lost at Time 1. As indicated previously, these refusals occurred on the second day of testing. Clearly, the main cause of subject attrition was withdrawal of consent.

As it is important to respect people's right to withdraw from studies it is difficult to determine to what extent this affects representativeness of findings. This researcher did not notice any obvious difference between those who withdrew consent and those who continued with the study at the point when all 41 subjects completed testing on day one of the first testing session at phase three. There is a view that individuals who agree to participate in any study

are inthemselves nonrepresentative (Clegg,1993). Might withdrawal of consent be of itself indicative of a critical difference between the parent population and the final sample?

Of special interest to this study is the relationship between language and dementia. Subjects were lost who were diagnosed as both suffering from dementia and those receiving no such diagnoses. Subjects were also lost from a variety of geographical locations. It is not possible to predict in what way compliance is itself related to later language loss and its relationship to dementia. It has been proposed however, that findings can be validated by being supported by different studies employing different methodologies (Bayles et al., 1987).

To this researcher's knowledge no comparable longitudinal study of bilingual deterioration in dementia has as yet been conducted with which to validate the findings of this study. Case studies have however been reported. In other bilingual populations, examples of older adults experiencing extreme difficulties in a once previously well know language which was not their native language, or reverting entirely and in inappropriate circumstances to exclusive use of the first language have been reported.

The picture of language loss which is evidenced in this study could account for the apparent contradictory literature in this field. It would be interesting to review cases in clinical practice with a reconsideration of language deterioration in bilingual older adults suffering from dementia where both languages are assessed. Developing a body of evidence in this way would usefully refute or support

the findings of this study.

Detection difficulty

A second reason for the small sample size is due to the difficulty in detecting dementia in the early stages (Binks et al., 1984; Woods et al., 1985; Searle, 1984 and Kendrick, 1985). It should be emphasised that general practitioners were aware of the aims and needs of the study and the researcher ensured that selection criteria were carefully adhered to by distributing information to the referring agents. Nevertheless, of the 120 referrals originally received, only 41 met the criteria at the second stage. Even then, some suspected cases, did not go on to develop dementia. Future studies will need to ensure larger sample sizes from onset, if a subject attrition rate above 30% is not unusual.

Measures

The Boston Diagnostic Aphasia Examination (BDAE) and the Token Test were devised to investigate change from normal language functioning in aphasia. Although the measures investigate many language skills, the fact remains that these tests were not intended to be used to assess a dementia population. A potential result might be identifying those changes which show the similarities between aphasia and dementia. This point has been raised by other authors as an inevitable consequence of adapting measures (e.g. Miller, 1989). Nevertheless, both measures have been used extensively to investigate language in dementia. As this study sought to determine similarities and differences in bilingual dementia these measures were used as they

form a basis for exploration. Given that similarities and differences have been identified, further investigation should proceed with measures better suited to a dementia population. This would entail further translation and development of more appropriate measures, which are at present unavailable.

A further point should be considered regarding the use of the Token Test in this study. This test was selected as a measure of comprehension, was easy to administer, and has been used in previous investigations of language in dementia. It has been suggested that this test measures many other cognitive skills, e.g. memory and intelligence (Miller, 1989). In using this test with a bilingual population this researcher found that many subjects had difficulty in comprehending the questions and this seemed to be due to task difficulty. Hence, differential effects on this measure could be due to a lack of familiarity with the Welsh equivalent form.

Furthermore, in translating the tests into Welsh it is likely that there will be differences in word frequency and hence task difficulty. It is clear, that direct translations of English to Welsh will not yield the same frequency. Although there are word frequency count tables available in English (Thorndyke-Lorge, 1944) they do not exist in Welsh. This may account for discrepancy between prediction and findings. Such factors may account for differential findings.

A recent study by Lopez and Taussig, (1991) raises some points of direct interest to this study. The authors sought to address cognitive intellectual functioning of Spanish speaking impaired and non impaired older adults addressing the issue of

culturally sensitive assessment. The authors aimed at testing whether cognitive intellectual functioning, of Spanish speaking adults is prone to be underestimated when using the WAIS-R and overestimated when using the EIWA, (a Spanish measure of intellectual ability with Spanish norms).

From their investigation they concluded that:
"...psychologists who currently test Spanish-speaking persons using the EIWA may judge persons with some impairment to be functioning within the average `normal' range. Further, persons with higher educational and occupational backgrounds than the standardization sample are likely to test rather high, not because they are necessarily high functioning, but because their backgrounds deviate from that of the standardization sample. In all, it seems possible then that applying the apparent culture-specific norms of the EIWA, psychologists may be at risk to overestimate the intellectual functioning of some Spanish-speaking adults."

Task differences were investigated by Ellis and Hennelly, (1980). They tested, whether in developing and modifying intelligence tests for use in different languages:
".....it might be reasonable to assume because its information content is similar across languages for the purpose of testing `a number is a number, whatever the language' and thus simple test translation would suffice."

They demonstrate that cross-lingual differences in word length may result in different magnitudes of digit span as measured in those languages. For this reason digit span norms cannot be compared across languages as an indicator of cultural intellectual

differences. The authors conclude that:
"There is no reason to doubt that this effect also operates in other languages."

To accurately identify language changes, appropriate measures which have been standardized for use with a bilingual population are urgently required.

The Kendrick Cognitive Tests for the elderly and the Wechsler Memory Scale were selected as measures to aid in the diagnoses of dementia in this study. At the time when the study was conducted the researcher was not a trained clinician. This was one of the reasons for selecting the Kendrick as the Test could be used for research purposes. Selection of appropriate referrals relied in part on the clinical judgement of General Practitioners. Nevertheless, the difficulty in obtaining appropriate subjects was evident in the final sample of 16 (from an initial 120 referrals).

These difficulties are in part due to problem of detecting dementia in the early stages. A highly reliable measure for early detection has yet to be developed. Clinical judgement and flexible assessment measures remain the method of diagnoses. The use of language measures in early detection shows most promise from recent studies of dementia in monolingual people. Equivalent measures for use with a bilingual population have yet to be developed.

Research Design

Drawbacks of longitudinal design have been identified by other authors. Obvious difficulties have been listed as:

1. time factor: Longitudinal studies are time

consuming, hence expensive; and confining as once the study begins the original procedures must be continued even if outmoded or obsolete. (Salthouse, 1982)

2. sampling may not be representative of the population - the drop out and those continuing may no longer be representative.
3. confounding of age and test sophistication - practice effects can colour the findings. (Siegler, 1983; Rabbitt, 1982)

Kaszniak, (1986) has suggested that longitudinal studies of dementia overcome some of the immediate difficulties identified in the methodology as cognitive changes in dementia occur more rapidly than normal ageing so that the research need not be extended over as long a period and thus reduce both cost and sample difficulties.

Bayles, (1987) suggests that confidence in the validity of conclusions often depend on the convergence and agreement of results reported from studies employing different research designs, subject sampling procedures and measurement approaches.

The difficulties involved in conducting a longitudinal study is one of the reasons why so few have been conducted (Burns et al., 1991). In their study they suggest that a follow up of 12 months is short. However, they say that an increased follow up period would be desirable but would merely increase the floor effect encountered, where it would not be possible to detect the subtle cognitive changes which have occurred.

This study encountered ceiling and floor effects which suggest that the measures were not sensitive enough.

These effects have been identified by other authors to be problematic in assessing language changes in dementia (e.g. Britton, 1988). A wide range of scores and variety of language abilities across specific skills have been noted in the literature. Findings in this study support the picture of a wide range of ability, both within and between subjects with dementia and is in line with observations from previous research. Indeed the extent of individual differences has prompted research looking specifically at ways of relating variations of linguistic communication abilities in subjects with dementia to *identifiable stages of the disease* (Bayles et al., 1992).

Thus, tentative results only can be drawn from the present investigation due to the methodological difficulties inherent in any research design employing subjects with dementia. Confidence in the validity of conclusions, therefore, requires further studies to investigate dementia in a bilingual population, employing different sampling procedures, measurement approaches and research designs.

III POTENTIAL CLINICAL IMPLICATIONS

Psychometric Assessment

It is suggested from the findings that although equal decline of languages occurs overall, there are specific components which decline differentially. It is, therefore, suggested that this could have major implications for clinical psychometric assessment of bilingual older adults suspected of suffering from dementia. It is suggested that, rather than advocate assessment in any one language, a more appropriate assessment might involve both languages.

This point is supported by the following observation by Grosjean (1989) who considered how bilingual people deal with their knowledge of languages:
"He or she has developed competencies (in the two languages and possibly in a third system that is a combination of the first two) to the extent required by his or her needs and those of the environment".

He continues: *"Because the needs and uses of the two languages are usually quite different, the bilingual is rarely equally fluent in the two languages".*

Thus: *"The bilingual's communicative competence cannot be evaluated through only one language; it must be studied instead through the bilingual's total language repertoire as it is used in his or her everyday life."*

In this study, many subjects were lost, as they withdrew their consent, once testing began. This at times occurred, when the language of assessment was English. Subjects who may have been ambivalent about participating, agreed on the first day, when tested in Welsh. On the second day, when testing was conducted in English, those subjects refused to continue. If this hunch is correct then management and intervention techniques may be better tailored to individuals when language preference is assessed. Future research could more rigorously explore this hypothesis, which, if supported would have important consequences for clinical practice.

Therapeutic Intervention

A bilingual assessment may help inform management. Given that dementia, as defined in this study, is an irreversible condition, treatment may be directed at dealing with the consequences of the condition. For

example, recent advances in Reminiscence Therapy, Memory Aid Work and Cognitive Therapy for depression in dementia could be better tailored for individuals when their preserved language skills are better assessed and a bilingual intervention offered, regardless of preferred language.

Hughes (1981) identified this on an earlier occasion:

"In most clinical settings, provided verbal communication is adequate, proficiency in a second language has little medical relevance. Studies of neuropsychiatric disorder in bilinguals and polyglots have, however, demonstrated that their cerebral organization and utilization of language is different to that observed in monolinguals. Such differences have important implications in the clinical management of neuropsychiatric illness in bilingual patients".

IV RECOMMENDATIONS FOR FUTURE RESEARCH

As outlined at the start of the study research concerned with the processes of cognitive change in dementia is urgently required. Communication difficulties and management problems occur as dementia becomes more severe leading to distress for the person involved and for those caring for individuals suffering from dementia.

1) Bilingual assessments:
Bilingual standardized measures for early detection and accurate assessment of dementia are required. This has implications both for management and assessment.

2) Development of Language History Measures
Although the findings from this study do not support the hypothesis that the manner of language

deterioration could be related to past language history, it has been shown from detailed observations of subject responding that both languages play a role in providing the requested response as dementia becomes more severe. A knowledge of an individuals linguistic history could provide important information and could come from the individual, family, or carers. Loss of language can be attributed to many masking influences, as highlighted in Chapter Two. Thus accurate assessment is crucial. The presence of depression can cause difficulties communicating and this may mask dementia. Assessment from an informed background history may inform therapeutic intervention and thus better address individual needs.

The present study has been able to suggest tentative answers to some of the questions identified. However, this study also generated a greater number of important questions for further investigations. Of particular interest, for example, is the question, at what level does impairment in language occur? Figure 11.1 which follows is a model developed in this study which may begin to address such questions:

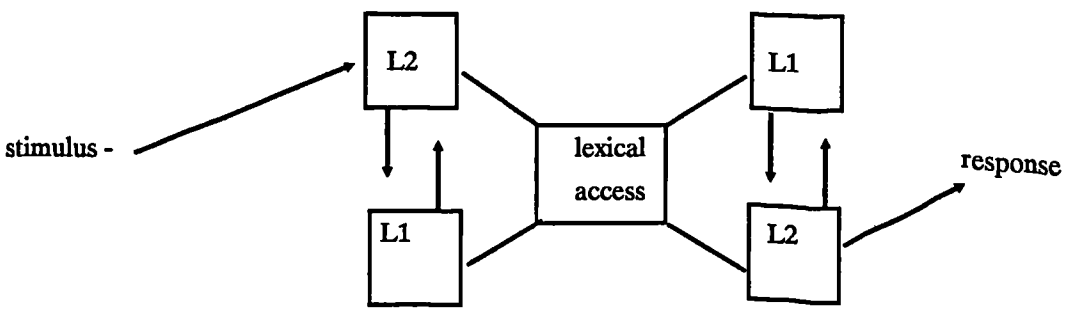


Figure 11.1: Model of Stimulus-Response in Bilingual Subjects

When a name is asked for in the example, English (stimulus) a subject is not able to provide an answer immediately. The Welsh equivalent is given. By doing this it is then possible to provide the correct word in English (response). This study might suggest that difficulty occurs at a lexical level in the early stages.

There are examples in Chapter Nine of breakdown at a number of levels. Might it be that there are two levels of deterioration? During the mild/moderate phase of dementia it may be that certain aspects of accessing L2 are lost as a result of dementia. This is in part compensated for by Translation and Asides, as strategies to overcome the difficulty in accessing words from L2. As dementia becomes more severe or, as the components of language more sensitive to dementia are influenced, these strategies no longer help. Thus differential decline occurs. Later in the illness the impairment may attack deeper levels of processing, as suggested by the literature, and insidious and *progressive damage to brain areas essential to* declarative memory and its subsystem, notably semantic and episodic memory occurs (Bayles and Kaszniak, 1987; Marin and Fedio, 1983; Nebes, 1989). At this stage impairment is observed regardless of language selected.

This proposal builds on an earlier suggestion by Obler, (1982). She suggested that when a lexical item is unavailable, certain information about its phonological properties may remain on the tip of the tongue. Helping a person find a word is thus phonemic cuing (mention of the entire first syllable of the largest word). In some instances, semantic cuing may help, but these cues seem to be more successful when they are generated by the subjects themselves. Thus

in discussing naming difficulties in older adults Obler suggests that successful name finding is often proceeded by the subjects talking themselves into the word, by providing semantically or syntactically related words (Obler and Albert, 1981). Access of words after semantic priming occurs because the concept is activated by the original stimulus which activates related concepts as well. This process has been described as spreading activation (Quillian, 1962; 1967) and occurs without the subject's awareness (Hasher and Zacks, 1979).

There are similarities here to the activation model proposed by Green, (1987). He suggests that a bilingual person in searching for a word in one language has to actively suppress the word in the other language. Sometimes the word has stronger associations in the language which has to be suppressed. Thus in dementia this system may be having to operate in a different way to compensate for the damage caused by dementia. As long as there is some method of activating the system (regardless of language) a response is possible. When no response is offered the meaning is finally lost. The picture of language impairment observed in this study may well be understood within this framework. Future investigation may be able to substantiate such claims.

It is suggested that there is a need to account for a person's two languages when assessing for dementia and in addressing an individual's needs. Being able to communicate is to access both languages of an individual.

CONCLUSION

Bilingualism is present in over half the countries of the world. In addition given the growing older population it is likely that the numbers of older adults developing dementia will increase. The researcher was fortunate to be placed in an area where bilingualism is present in the general population. Thus it was possible to address the question.

Both languages of a bilingual deteriorate. Globally deterioration appears equivalent in both languages, especially with regard to Word Finding skills. Closer examination of specific language skills show deterioration is not equivalent. One language may be better retained that the other in some areas, while other skills will be better preserved in the other language. On the basis of findings in this study this is apparently irrespective of bilingual proficiency and expressed language preference. This could be explained in part as:

1. Different levels of difficulty between languages. There is evidence to support this suggestion.

2. Other variables, e.g., factors related to past language use and contact.

A central hypothesis had been that past language contact and use would have an impact on later language deterioration. Findings of this study do not appear to support this hypothesis. Extensive subject variation was observed in the nature of the impact of dementia.

In seeking to interpret the results, the researcher advocates caution given the small sample size and the methodological problems encountered.

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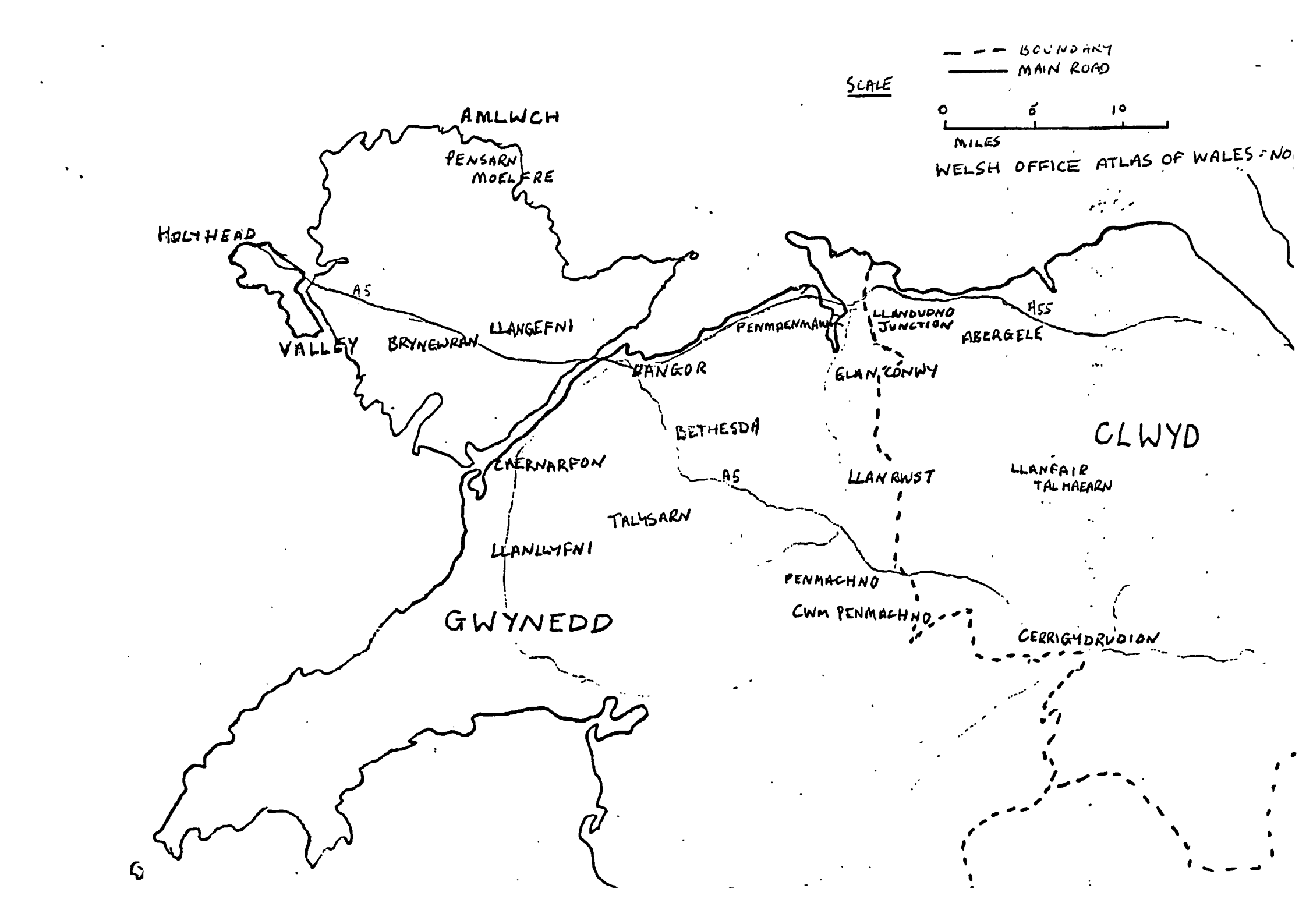
APPENDICES

APPENDIX I

Map of the Area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LLANFAIR TALHAEARN
TALYSARN
LLANLLYFNI
PENMACHNO
CWM PENMACHNO
GWYNEDD
CERRIGYDRUDION

APPENDIX II

Handout to General Practitioners

An investigation into the Differential effects of Dementia in Bilingual subjects; Implications for care and management.

The work involves a longitudinal investigation of elderly subjects before admission to hospital, who, it is envisaged will require hospitalization or increased care facilities shortly.

Subject Indicators

Bilingual Welsh-English
Male or Female
Over 65
Signs of memory impairment; Forgetfulness, difficulties increasing.
Needing day care facilities/increase in home support.
No physical impairments: eyesight and hearing adequate.

Testing will be conducted over 6 monthly intervals for a period of two years, and will involve an average of 3 hours testing over a period of two days, by the Research Psychologist.

The study will also require that a short Behavioural Assessment be completed at 2 weekly intervals throughout the period of study. This will have to be done by someone who has regular contact with the subject, for example nursing staff, relative, social worker etc.

For further information - please do not hesitate to contact the Research Psychologist.

Dwynwen A. Jones
Research Psychologist
UCNW BANGOR
351151 ext. 353

APPENDIX III

Criteria Checklist for Subject Selection

CRITERIA CHECK LIST FOR SUBJECT SELECTION

DIAGNOSIS OF DEMENTIA WITHIN LAST 6 MONTHS - PRESENTS EARLY STAGES OF DEMENTIA	
NEED DAY CARE FACILITIES/ HOME SUPPORT	
BILINGUAL W & E (SPEECH AND READING)	
AGE 65 OR OVER	
NO HISTORY OF STROKE	
ADEQUATE VISION AND HEARING	
WILLING TO CO-OPERATE IN STUDY	
MAINTAINS REGULAR CONTACT WITH RELATIVE OR ONE OF THE COMMUNITY AGENCIES	
NAME = G.P.=	ADDRESS =

APPENDIX IV

Language Use and Contact Questionnaire

LANGUAGE USE AND CONTACT QUESTIONNAIRE

L I N G U I S T I C H I S T O R Y

Name: Sex: Age:

Address where tested: Religion:

G.P. Name:

Next of Kin:

Carer:

Which language would you rather I speak to you? Welsh/English.

EARLY CHILDHOOD (0 -11)

1. Which language did you learn at home?

2. Did you ever speak second language at home?

3. Which primary school did you go to?

4. Was the primary school Welsh or English?

5. Which language did you speak with other children there?

6. Which language did you mostly speak at home when you were at primary schoo

7. Where did you live when you were at primary school

7 (a) If other than home:- Where? did they speak Welsh of English mostly?

9. How long were you living there for?

10. Were you the youngest/oldest/middle child?

11. Was there anybody else living at home with you during your childhood?

12. What was your father's occupation? What was your mother's occupation?

EARLY ADULTHOOD

1. Which secondary school did you go to?

2. How old were you when you left?

3. Was it Welsh or English speaking school?

4. Did you have lessons in Welsh or English?

5. Did you speak Welsh with your friends there?

6. Did you have different friends in your community Welsh or English?

7. Were the teachers Weslh speaking?

8. Was the headmaster Welsh speaking?

9. What qualifications did you have when you left school?

10. Where did you live then?

11. Where did you work when you left school?

12. Did you speak mostly Weslh or English at work?

13. Bosses . . . . . fellow workers coleagues . . . . . clients . . . . . ?

14. How long did you work there?

15. Did you work anywhere else?

ADULTHOOD

1.(a) Have you been married?

(b) Was your husband/wife Welsh?

2. Did you speak Welsh or English with your husband/wife?

3. Did you have children? Number? Sex?
1st names?

4. Which language did you teach your children?

5. Where were you living then?

6. How long were you living there for?

7. Where did your children go to primary school?

8. Was it a Welsh of English primary school?

9. Where did your children go to secondary school?

10. Which language do you speak with your children?

11. Do you have any grandchildren? Number? age?
Sex names.

12. Which language do you apeak with them?

13. Where do they live now?

Social Settings

1. Do/did you go regularly to chapel/church?

2. Do/have you belonged to any social clubs/W.I./Choirs etc.?

3. Do you attend any community centres?

4. Do/did you go to bingo?

5. Have you ever been involved in organising community/clubs

6. Did you speak Welsh or English at those?

7. Which language do you speak with next door neigbour/principal carer?

8. Have you got a bible, did you read it regularly
in Welsh or English?

9. Do/did you have a daily or weekly paper/magazine regularly for any period?

10. Which books did/do you enjoy reading?

Any welsh or mostly english (Some titles)

11. Did/do you go to Eisteddfodau - have you ever competed in any competitions

LIST OF ITEMS FROM THE LANGUAGE USE AND CONTACT QUESTIONNAIRE

1. Language with mother
2. Language with father
3. Language with paternal grandparents
4. Language with maternal grandparents
5. Language with aunts and uncles
6. Language with brothers and sisters
7. Language taught at primary school
8. Language with primary school friends
9. Language with friends in the community
10. Language spoken in community overall
11. Language spoken in Church/Chapel/Religion
12. Language spoken in activities
13. Language used in later schooling
14. Language of friends
15. Language spoken at home then
16. Language spoken with relatives or those most often seen, language with main people
17. Language spoken with community
18. Language used in social activities/interests
19. Language used in religion
20. Language used at work after school
21. Language spoken in living quarters
22. Language spoken with surrounding friends - in contact
23. Language spoken with people surrounding - in contact
24. Language used in community
25. Language used in activities/interests
26. Language used in religion
27. Language spoken with husband/wife
28. Language spoken at work
29. Language used in environment

30. Language spoken with surrounding friends - in contact
31. Language used with people surrounding
32. Language used in community
33. Language used in activities/interests
34. Language used in religion
35. Language spoken with children
36. Language used in their schooling
37. Language used with their friends
38. Language used in the community
39. Language used with friends
40. Language used with neighbours
41. Language used with family
42. Language used with son and daughter in law
43. language used with grandchildren
44. Language spoken on television
45. Language spoken on radio
46. Language used in daily papers
47. Language used in magazines
48. Language used in community
49. Language used in care centres, with daily help
50. Language used in religion
51. Language spoken with doctor

APPENDIX V

Kendrick - Welsh Administration

Copy of Digit Copying Test

KENDRICK = WELSH VERSION

ADMINISTRATION OF THE OLT

Yn y fan yma mae gen i bedwar cerdyn mawr. Ar y cerdiau mae yna luniau o amryw o bethau cyffredin y dylech eu hadnabod. 'Rwyf am i chi edrych ar y pethau a trio cofio gymaint ohonynt ag sy'n bosibl, oherwydd mewn byr o amser bydd y cerdyn yn cael ei droi trosodd. Pan ddaw'r amser byddaf am i chi ddweud wrthaf gymaint o'r pethau y gwelsoch ag sy'n bosible. Cewch eu dweud wrthyf mewn unrhyw drefn. Ydi hynny'n glir?

Daliwch i edrych tan i mi ofyn i chi beidio.

Mae'r amser i fynnu. 'Rwan dywedwch wrthyf gymaint o bethau ag y medrwch eu cofio, a oedd ar y cerdyn yna, mewn unrhyw drefn.

Gellwch chi gofio rhagor?

ADMINISTRATION OF THE DCT

'Rwyf am i chi gopio pob rhif cyn gyflymed ag y medrwch fynd. Os welwch chi 9 rhowch 9 yma (dangos) os 1 yna 1 yna.
Rhowch eich rhifau ar y llinellau oddi tanodd (pwyntio). Peidiwch a methu unrhyw rifau, gweithiwch ar draws y llinellau gan barhau tan y dywedir wrthyc i beidio. Peidiwch a phoeni gormod am fod yn daclus, ond cerwch cyn gyflymed ag y medrwch . Barod, cychwynwch.

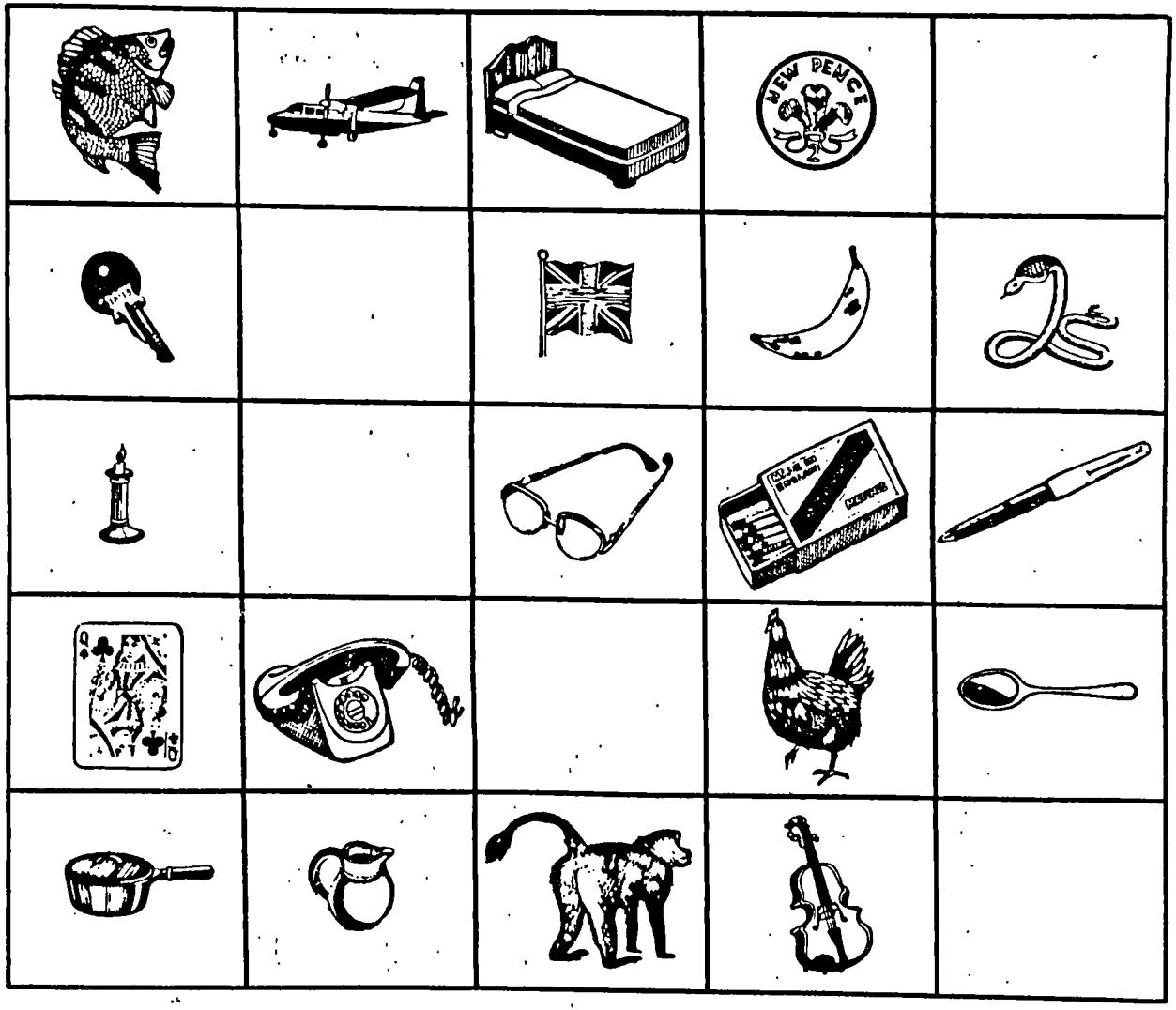
TABL A

O.L.T.

FFURF B

	ATEBION CYWIR	ATEBION DERBYNIOL
CERDYN 1	Het	–
	Tepod*	–
	Cloc	Cloc 'larwm
	Cyllell*	Bat criced
	Afal*	Ffrwyth
	Siaced	Côt, anorac
	Cadair*	–
	Llyfr	Beibl
	Crib*	–
	Potel*	– Ilefrith
	*Yn ymddangos ar y pedwar cerdyn	
CERDYN 2	Cot	–
	Corn Ffrengig	Corn, Trwmped, utgorn, offeryn pres
	Baban/babi	Plentyn
	Esgidiau	–
	Perth	Coeden, llwyn, prysgwydd
	Teliffon	–
	Matshes/Matsen	–
	Llong	Cwch
	Tei	–
CERDYN 3	Siwper	"Pullover"
	Ty	–
	Cadwyn	Paderau
	Cloch	–
	Menig	–
	Cwpan/Cawg o flodau	Addurn
	Siswrn	–
	Amlen	Llythr, barcutan, barcud
	Fiolin	Guitar, ffidil
	Ymbarel/Glawlen	–
	Sgarf	–
	Tegell	–
	Trowsus	–
	Cardiau	Brenhines cybiau, unrhyw gerdyn a enwir
CERDYN 4	Crys	–
	Brwsh paent	Gwynfall
	Canwyll	–
	Gwydyr gwin	Goblet
	Parsel	Paced, bocs
	Car	Mini
	Bŵt	Wellington, weli, botasen
	Cyllell	Cyllell boced

Socs	Sana
Dol	Merch, dynes
Sospan	Sospan chips, padall
Coeden	Llwyn, perth
Arian	Ceiniog, swllt, 2c, ceiniog newydd
Myg	Jwg
Trons	Nicers
Beic	—
Sgert	—
Awyren	Eroplen
Brwsh danedd	—


WELL DONE

DIGIT COPYING TEST Date. . . . . .
(1st trial) Address/. . . . . .
Name . . . . . Ward. . . . . .
. . . . . .

9	1	3	1	8	8	3	2	6	6
5	0	3	6	3	6	9	3	6	3
7	9	3	7	4	9	5	1	5	8
5	8	4	0	4	6	6	7	2	6
1	5	2	0	0	7	1	9	2	1
3	6	3	0	6	7	7	9	0	9
9	0	4	5	9	2	2	3	4	1
7	0	5	4	5	4	4	2	7	0
2	7	0	4	1	1	8	8	8	8
7	5	8	8	4	1	2	9	5	2

	No. Completed in 2 minutes
	Time to complete 100 items

APPENDIX VI

Wechsler Memory Scale - Welsh Version Administration

Copy of Score Sheet

PRAWF COF WECHLER: FFURF 1

I. Gwybodaeth Personol a Chyfoes

1. Faint ydych chi?
2. Pa bryd gawsoch chi eich geni?
3. Pwy ydi'r Prif Weinidog?
4. Pwy oedd y Prif Weinidog o'r blaen?
5. Pwy sydd ar orsedd Lloegr?
6. Pwy ydi ei gwr?

Mwyafrif sgôr - 6

II. Orientation

1. Pa flwyddyn yw hon?
2. Pa fis yw hwn?
3. Pa ddydd o'r mis yw hwn?
4. Beth yw enw'r lle yr ydych chi ynddo?
5. Ym mha dref yda ni?

Mwyafrif sgôr - 5

III. Rheolaeth Meddwl

1. Cyfrwch yn ôl o 20 i 1

   Dyweder: "Rydw i eisiau gweld pa mor dda y medrwch chi gyfri yn ol o 20 i 1, fel hyn - 20, 19, 18 - yr holl ffordd at 1."

   Gall yr ymholwr ailadrodd y cyfarwyddiadau ond peidier â chynorthwyo pa fo'r claf yn ymdrechu. Cofnoder camgymeriadau ac amser (mewn eiliadau)

   Mwyafrif amser 30"

   Sgôr = 2 cywir ac o fewn yr amser
   1 cywir ond am un camgymeriad o fewn yr amser.
   1 amser ychwanegol os cywir ac o fewn 10"
   (cyfrif cywiriadau gan y claf fel camgymeriad)

2. "Rydw i eisiau gweld pa mor gyflym y medrwch ddweud y wyddor wrthaf fi - A, B, C - ewch yn eich blaen."

   Cofnoder amser a chamgymeriadau (mewn eiliadau)
   Amser 30"
   Sgôr = 2 heb gamgymeriadau
   1 her camgymeriad
   1 extra os cywir ac o fewn 10"
   Max. 3

3. Cyfri bob yn dri

   "Mae gen i eisiau gweld pa mor gyflym y medrwch chi gyfri fesul 3, gan gychwyn efo 1. Fel hyn - 1,4,7. Ewch yn eich blaen."
   Diweddu ar 40. Cofnoder amser a camgymeriadau.
   Amser 45"
   Sgôr = 2 os cywir
   1 os 1 camgymeriad
   1 ychwanegol os cywir ac o fewn 20".
   Max sgor - 3.

   Max sgor ar y 3 is-brawf = 9

IV. Cof Rhesymegd(Immediate recall)

"Rwyf am ddarllen detholiad bach o ryw 4 neu bum llinell. Gwrandewch yn ofalus oblegid ar ôl imi orffen 'dwi am i chi ddweud popeth wrthyf fi, y darllenais i chwi. Ydych chi'n barod?"

Wedi darllen y detholiad 1af, dyweder
"Rwan beth nes i ddarllen i chwi?
Dywedwch popeth wrthyf, a cychwynwch ar y cychwyn".
Cofnoder popeth a sgorio yn ôl y nifer o syniadau a groeswyd o'r darn.
Wedi gorffen y detholiad 1af, dyweder "Rwan dwi am ddarllen detholiad bach arall i weld faint mwy y medrwch ei gofio o hwn."
Gwrandewch yn ofalus.
Darllener yr ail ddetholiad gan dddilyn yr un patrwm.
Sgôr terfynol - avarage syniadau
Max sgôr - 23

V DIGITS YMLAEN

Dyweder "Dwi eisiau gweld pa mor ddayy medrwch chi ddal sylw. Dwi am ddweud ychydig o rifau a phan dwi wedi gorffen dwi am i chwi eu dweud nhw yn syth ar fy ôl. Gwrandewch."

Dechreuir efo 4 rhif yma ymlaen neu ar bwynt ble mae'r claf yn sicr o'n cael yn gywir.

rhifau ymlaen

6 4 3 9
7 2 8 6

4 2 7 3 1
7 5 8 3 6

6 1 9 4 7 3
3 9 2 4 8 7

5 9 1 7 4 2 3
4 1 7 9 3 8 6

5 8 1 9 2 6 4 7
3 8 2 9 5 1 7 4

sgorio - y rhifau a adroddwyd yn gywir e.e. os 5 rhif yn gywir, ar un o'r 2 set, sgor = 5.

max sgor = 8

DIGITS YN ÔL

Dechreuir efo rhes o 3, ar ol dweud - "Dwi eisiau gweld pa mor dda y medrwch chi ddal rhifau yn eich cof. Dwi am ddarllen rhestr o rifau i chi a pan dwi wedi gorffen dwi am i chi eu dweud nhw ar fy ôl i on yn ôl e.e. os y buaswn i'n dweud 1,9,5, mi ddylsech chi ddweud (saith)." Os nad yw'r claf yn rhoi'r ateb cywir, dyweder "Doedd hynny ddim yn hollol gywir, dylsech fod wedi dweud ... Rwan gwrandewch eto a chofio, a'n dweud yn ôl wrthyf o'r chwith. Ydych chi'n barod? "Rhowch y rhestr.
Os yw'r rhestr 1af yn gywir, ewch yn eich blaen, os anghywir ceisiwch yr restr.

rhifau'n ol

2 8 3
1 1 4 1 5

3 2 7 9
4 9 6 8

1 5 2 8 6
6 1 8 4 3

5 3 9 4 1 8
7 2 4 8 5 6

8 1 2 9 3 6 5
4 7 3 9 1 2 8

sgôr - mwyafrif o'r rhifau y gall y claf eu hadnabod yn ol e.e. os 4 rh sgôr = 4.
mwyafrif = 7

O.N. Os methwyd adrodd 3 rhif yn ol, rhodder 2 a sgor o ddau ar ~~lwyd~~ lwyddiant

VI Visual Reproduction

3 cerdyn

(a) (b) "Dwi am ddangos darlun i chwi. 10 eiliad yn unig y cewch chi i edrych arno, yna mi rydwi am ei gymeryd a gadael i chwi ei lunio o'ch cof. Peidiwch â chychwyn llunio nes i mi ddweud "Ewch". Barod?"

Gadawer 10". Yna "Rwan darluniwch o, ffwrdd a chi".

(c) "Dyma un ychydig bach mwy anodd. Mae gan y cerdyn hwn ddau ddarlun arno. Dwi am i chi edrych ar y ddau yn ofalus - unwaith eto 10 eiliad yn unig y cewch chi i edrych ar y cerdyn, yna mi gymeraf o i ffwrdd a gadael i chwi wneud y ddau ddarlun, yr un ar yr ochr chwith (pwyntio i'r gwafle ble dylai'r person wneud y llun) a'r un ar yr ochr dde - yma (pwyntio) Barod?"

Dangos am 10" eto.

Sgorio

PRAWF COF WECHSLER - FFURF II

I. Gwybodaeth Personol a Chyfoes

1. Pa mor hen ydych chi?
2. Pa bryd gawsoch chi eich geni?
3. Pwy ydi'r Prif Weinidog?
4. Pwy oedd y Prif Weinidog o'r blaen?
5. Pwy ydi eich Aelod Seneddol?
6. Pwy oedd yr Aelod Seneddol o'r blaen?

Max 6.

II Orientation

1. Pa flwyddyn yw hon?
2. Pa fis yw hwn?
3. Pa ddiwrnod o'r mis ydi hwn?
4. Beth yw enw'r lle yr ydych ynddo?
5. Ym mha dref mae o?

III Rheolaeth Meddwl

1. Adrodd yr wyddor - Amser 30"

2. Cyfri yn ôl o 20 i 1 amser 30"

3. Cyfri yn ôl 4 9 53, gan ddechrau efo 1 (amser 30")

IV Cof Rhesymegol

1. Hyforddir cwn i ddarganfod y cleifion yn ystod amser rhyfel. Hyfforddir cwn yr heddlu hefyd i achub pobl sy'n boddi. Yn hytrach na rhedeg i lawr at y dwr a tharo allan (rhoi ergyd) fe'u dysgir i roi naid sy'n eu caniatau i achub amryw strosnofio ac eiliadau gwerthfawr o amser. Ci defaid Ewropiaidd sy'n gwaeud y ci heddlu gorau.

2. Lladdwyd neu anafwyd yn arw, nifer o blant ysgol yn Ne Ffrainc, ac anafwyd eraill yn ddifrifol pan ddrylliwyd yr ysgoldy gan ffrwydryn yn eu pentref. Taflwyd y plant i lawr ochr y bryn ac ar draws ceunant cryn bellter maith oddi wrth yr ysgoldy. Dim ond dau blentyn a ddihangodd yn ddianaf.

VII Associate Learning

1. DOD-MYND	1 CYLLELL-MINIOG	1 GWLAD-FFRAINC
2. PLWM-PENSIL	2. RHEITHGOR-ERYR	2. TEI-CRACER
3 I MEWN-SERCH	3 GWLAD-FFRAINC	3 LLOFRUDD-TROSEDD
4 GWLAD-FFRAINC	4 PLWM-PENSIL	4 PALU-EUOG
5 PALU-EUOG	5 TEI-CRACER	5 DOD-MYND
6 CLO-DRWS	6 LLOFRUDD-TROSEDD	6 I MEWN-SERCH
7 RHEITHGOR-ERYR	7 CLO-DRWS	7 CLO-DRWS
8 LLOFRUDD-TROSEDD	8 DOD-MYND	8 RHEITHGOR-ERYR
9 CYLLELL-MINIOG	9 PALU-EUOG	9 PLWM-PENSEL
10 TEI-CRACER	10 I MEWN-SERCH	10 CYLLELL-MINIOG

WECHSLER MEMORY SCALE FORM I

David Wechsler
Bellevue Hospital, New York

Sc	
I. Information	___
II. Orientation	___
III. Mental Control	___
IV. Memory Passages	___
V. Digits Total	___
VI. Vis. Reprod.	___
VII. Associate Lng.	___
Total Raw Score	___
Age Correction	___
Corrected Score	___
MQ (Table 3)	___

NAME _____ AGE _____ SEX _____

REFERRED FOR _____ DATE _____ EXAMINER _____

I. PERSONAL AND CURRENT INFO.	Score	II. ORIENTATION	Score
1. Age	___	1. Year . . .	___
2. When born	___	2. Month . .	___
3. President of U.S. . .	___	3. Day . . .	___
4. Before him	___	4. Where now	___
5. Governor	___	5. City in .	___
6. Mayor	___	Total	___
Total	___		

III. MENTAL CONTROL (Circle omits; cross out errors.)

		Time	Errors	Score	Total Score
1.	(30") 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1	___	___	___	
2.	(30") A B C D E F G H I J K L M N O P Q R S T U V W X Y Z	___	___	___	
3.	(45") 1 4 7 10 13 16 19 22 25 28 31 34 37 40	___	___	___	

IV. LOGICAL MEMORY

(A) Anna Thompson/ of South/ Boston/ employed/ as a scrub woman/ in an office building/ reported/ at the City Hall/ Station/ that she had been held up/ on State Street/ the night before/ and robbed/ of fifteen dollars/. She had four/ little children/ the rent/ was due/ and they had not eaten/ for two days/. The officers/ touched by the woman's story/ made up a purse/ for her/.

(B) The American/ liner/ New York/ struck a mine/ near Liverpool/ Monday/evening/. In spite of a blinding/ snowstorm/ and darkness/ the sixty/ passengers including 18/ women/ were all rescued/ though the boats/ were tossed about/ like corks/ in the heavy sea/. They were brought into port/ the next day/ by a British/ steamer/.

(A) Number of Memories_____ (B) Number of Memories_____ Average Score = $\frac{(A+B)}{2} = \frac{\quad}{2} = \quad$

V. (A) DIGITS FORWARD

	Score
6-4-3-9	4
7-2-8-6	4
4-2-7-3-1	5
7-5-8-3-6	5
6-1-9-4-7-3	6
3-9-2-4-8-7	6
5-9-1-7-4-2-3	7
4-1-7-9-3-8-6	7
5-8-1-9-2-6-4-7	8
3-8-2-9-5-1-7-4	8

Draw a line through any series failed. Circle score for maximum number repeated correctly.

(B) DIGITS BACKWARD

	Score
2-8-3	3
4-1-5	3
3-2-7-9	4
4-9-6-8	4
1-5-2-8-6	5
6-1-8-4-3	5
5-3-9-4-1-8	6
7-2-4-8-5-6	6
8-1-2-9-3-6-5	7
4-7-3-9-1-2-8	7

Forward Score_____ Backward Score_____ Digits Total_____

Printed in U. S. A. The Psychological Corporation, New York, N. Y. 10017 72-245A

VI-A

VI-B

VI C-1. C-2

Fold Part VII under on broken line before giving paper to subject for drawing in Part VI.

VI. VISUAL REPRODUCTION A_____ B_____ C-1_____ C-2_____ Total_____

VII. ASSOCIATE LEARNING

First Presentation		Second Presentation		Third Presentation	
Metal	- Iron	Rose	- Flower	Baby	- Cries
Baby	- Cries	Obey	- Inch	Obey	- Inch
Crush	- Dark	North	- South	North	- South
North	- South	Cabbage	- Pen	School	- Grocery
School	- Grocery	Up	- Down	Rose	- Flower
Rose	- Flower	Fruit	- Apple	Cabbage	- Pen
Up	- Down	School	- Grocery	Up	- Down
Obey	- Inch	Metal	- Iron	Fruit	- Apple
Fruit	- Apple	Crush	- Dark	Crush	- Dark
Cabbage	- Pen	Baby	- Cries	Metal	- Iron

First Recall	Easy	Hard
North	___	
Fruit	___	
Obey		___
Rose	___	
Baby	___	
Up	___	
Cabbage		___
Metal	___	
School		___
Crush		___
TOTAL	___	___

Second Recall	Easy	Hard
Cabbage		___
Baby	___	
Metal	___	
School		___
Up	___	
Rose	___	
Obey		___
Fruit	___	
Crush		___
North	___	
TOTAL	___	___

Third Recall	Easy	Hard
Obey		___
Fruit	___	
Baby	___	
Metal	___	
Crush		___
School		___
Rose	___	
North	___	
Cabbage		___
Up	___	
TOTAL	___	___

Easy 1)___
2)___
3)___
(A)Total___
A+2 ___
Hard 1)___
2)___
3)___
(B)Total___

SCORE
$\frac{A}{2} + B =$ ___

APPENDIX VII

Modified Stockton Behavioural Rating Scale

MODIFIED STOCKTON RATING SCALE

Name: ..... Age: .....

Address: .....

1. When bathing or dressing, he/she requires:
   - no assistance
   - some assistance
   - maximum assistance

2. With regard to walking, he/she:
   - shows no sign of weakness
   - walks slowly without aid, or uses a stick
   - is unable to walk, or if able to walk, needs frame, crutches or someone by his/her side

3. He/she is incontinent of urine and/or faeces (day or night):
   - never
   - sometimes (once or twice per week)
   - frequently (3 times per week or more)

4. He/she is in bed during the day (bed does not include couch, settee, etc.):
   - never
   - sometimes
   - almost always

5. He/she is confused (unable to find his way around, loses his possessions, etc.
   - almost never confused
   - sometimes confused
   - almost always confused

6. When left to his/her own devices, his/her appearance (clothes and/or hair) is:
   - almost never disorderly
   - sometimes disorderly
   - almost always disorderly

7. If allowed outside, he/she would:
   - never need supervision
   - sometimes need supervision
   - always need supervision

8. He/she helps out in the home/on the ward:
   - often helps out
   - sometimes helps out
   - never helps out

9. He/she keeps him/herself occupied in a constructive or useful activity (works, reads, plays games, has hobbies, etc.):
   - almost always occupied
   - sometimes occupied
   - almost never occupied

10. He/she socialises with others:
    - does establish a good relationship with others
    - has some difficulty establishing good relationships
    - has a great deal of difficulty establishing good relationships

- sometimes goes along 1
- almost never goes along 2

12. He/she understands what you communicate to him (you may use speaking, writing, or gesturing):
- understands almost everything you communicate 0
- understands some of what you communicate 1
- understands almost nothing of what you communicate 2

13. He/she communicates in any manner (by speaking, writing or gesturing):
- well enough to make himself easily understood at all times 0
- can be understood sometimes or with some difficulty 1
- can rarely or never be understood for whatever reason 2

14. He/she is objectionable to others <u>during the day</u> (loud or constant talking, pilfering, soiling furniture, interfering with affairs of others):
- rarely or never 0
- sometimes 1
- frequently 2

15. He/she is objectionable to others <u>during the night</u> (loud or constant talking, pilfering, soiling furniture, interfering in affairs of others, wandering about, etc.):
- rarely or never 0
- sometimes 1
- frequently 2

16. He/she accuses others of doing him bodily harm or stealing his personal possessions - if you are <u>sure</u> the accusations are true, rate zero; otherwise rate one or two:
- never 0
- sometimes 1
- frequently 2

17. He/she hoards apparently meaningless items (wads of paper, string, scraps of food, etc.):
- never 0
- sometimes 1
- frequently 2

18. His/her sleep pattern at night is:
- almost never awake 0
- sometimes awake 1
- often awake 2

Eyesight:
- can see (or can see with glasses) 0
- partially blind 1
- totally blind 2

Hearing:
- no hearing difficulties, without hearing aid 0
- no hearing difficulties, though requires hearing aid 0
- has hearing difficulties which interfere with communication 1
- is very deaf 2

Rated by: .....
Relative/staff (delete as appropriate)

LANGUAGE OBSERVATIONS

Over the past three days only

19. He/She speaks in Welsh:

- part of the time	0
- equally	1
- mostly	2

20. He/She speaks in English:

- part of the time	0
- equally	1
- mostly	2

21. He/She responds to questions put in English:

- in English	0
- in Welsh	1
- in mixture	2

22. He/She responds to questions put in Welsh:

- in Welsh	0
- in English	1
- in mixture	2

Reports of any physical illness during this period:-

23. Language used during meal times:

- mostly English	0
- equally	1
- mostly Welsh	2

24. Language used with staff:

- mostly English	0
- equally	1
- mostly Welsh	2

25 Language used when patient is agitated/excited:

- mostly English	0
- equally	1
- mostly Welsh	2

APPENDIX VIII

Token Test - Welsh

Token Test - English

Ffurf fer - Token Test

	Tic os cywir
1. Rhowch y cylch coch ar y triongl gwyrdd.	
2. Rhowch y sgwar glas y tu ôl i'r cylch melyn.	
3. Cyffyrddwch y cylch glas gyda'r triongl coch.	
4. Codwch y cylch glas neu'r triongl coch.	
5. Rhowch y sgwar gwyrdd oddi wrth y sgwar melyn.	
6. Os oes cylch du, codwch y triongl coch.	
7. Pan gyffyrddaf i y cylch gwyrdd, cymerwch chi'r sgwar gwyrdd (disgwylier enyd).	
8. Rhowch y sgwar gwyrdd ger y cylch coch.	
9. Cyffyrddwch y sgwariau, yn araf, a'r cylchoedd yn gyflym.	
10. Rhowch y cylch coch rhwng y triongl melyn a'r triongl gwyrdd.	
11. Arwahan i'r un gwyrdd cyffyrddwch y cylchoedd.	
12. Yn lle'r sgwar glas, cymerwch y cylch melyn.	
13. Ynghyd â'r cylch melyn, cymerwch y cylch glas.	
14. Ar ol codi'r gwyrdd, cyffyrddwch y cylch coch.	
15. Cyn cyffwrdd y cylch melyn, codwch y triongl coch.	
	cywir _____

Enw:

Dyddiad:

C.A.:

R.A.:

S.A.:

I.Q.:

Short Form of Token Test

	Tick if correct
1. Put the red circle on the green triangle.	
2. Put the blue square behind the yellow circle.	
3. Touch the blue circle with the red triangle.	
4. Pick up the blue circle or the red triangle.	
5. Put the green square away from the yellow square.	
6. If there is a black circle, pick up the red triangle.	
7. When I touch the green circle, you take the green square (wait briefly).	
8. Put the green square beside the red circle.	
9. Touch the squares, slowly, and the circles, quickly.	
10. Put the red circle between the yellow triangle and the green triangle.	
11. Except for the green one, touch the circles.	
12. Instead of the blue square, take the yellow circle.	
13. Together with the yellow circle, take the blue circle.	
14. After picking up the green square, touch the red circle.	
15. Before touching the yellow circle, pick up the red triangle.	
	Σ correct

Name:

Date:

C.A.:

R.A.:

S.A.:

APPENDIX IX

Boston Diagnostic Aphasia Examination Battery: Welsh Version

Boston Diagnostic Aphasia Examination Battery: English Version

BOSTON DIAGNOSTIC APHASIA EXAMINATION: WELSH VERSION

A. Cynnal Sgwrs

Dylid cynnal sgwrs gan ofyn y cwestiynnau canlynnol,

a. "Sut ydach chi heddiw ?"

b. "Beth ydi eich enw llawn chi?"

c. "Beth ydi eich cyfeiriad llawn?"

d. Anelir am sgwrs yn cynnwys cymaint o sgwrs ag y gellir, gyda er engraifft "Pa fath o waith oeddech chi yn arfer ei wneud?"

e. Dangoser y llun. Dywedwch "dywedwch bob peth y gwelwch chi sy'n mynd ymlaen yn y darlyn yma."

"Cookie theft picture"

1. WORD DISCRIMINATION

Dangoswch cardiau 2 a 3 yn annibynnol. Yna gofynnwch i'r person bwyntio at bob llun gan ofyn "Dangoswch y ..... imi"

cardyn 2					cardyn 3
	<5"	>5"	cateory	cue	methu
pwyntiau	2	1	1/2	1/2	0
LLUNIAU					GWEITHRED
cadair					Ysmygu
agoriad					yfed
maneg					rhedeg
pluen					cysgu
hamoc					disgyn
cactus					diferion
LLYTHRENNAU					LLIWIAU
L					glas
H					brown
R					coch
T					pinc

S	llwyd
G	piws

FFURFIAU	RHIFAU
cylch	7
pigwrn	42
sgwar	700
tiongl	1936
con	15
seren	7000

scor: 0 10 17 24 31 38 45 52 59 66 72

2. BODY PART IDENTIFICATION

Gofynnwch i'r person bwyntio i'r rhannau canlynnol:

RHANNAU'R CORFF		GWAHANIAETHU DE/CHWITH			
<5" pwynt 1	>5" 1/2	<5" pwynt 1	>5" 1/2	<5" pwynt 1	>5" 1/2
clust		garddwn		clust dde	
trwyn		bawd		ysgwydd chwith	
ysgwydd		gen		penglin chwith	
penglin		penelin		ffer chwith	
amrant		gwefus		garddwn dde	
ffer		ael		bawd chwith	
gwddf		boch		penelin chwith	
bys cannol		bys bach		boch chwith	

scor: 0 2 4 6 8 10 12 14 16 18 20

3. COMMANDS

Gofynner i'r person gyflawni'r gorchmynion canlynnol. Rhoddir bwynt am bob elfen sydd wedi ei danlinellu ag a gyflawnir yn gywir. Caniateir ail adroddiad os oes rhaid, ond rhaid ail adrodd y gorchymyn yn llawn.

1. Gwnewch ddwrn.
2. Pwyntiwch at y penfwd yna at y llawr.
(Ar ol rhoi pensil, oriawr a cherdyn ochor yn ochor ar y bwrdd o flaen y tyst dyweder).
3. Rhowch y pensil ar ben y cerdyn. yna rhowch o'n ol.
4. Rhowch yr oriawr ar yr ochr arall i'r pensil a throi drosodd y cerdyn.

5. Cyffyrddwch y ddwy ysgwydd ddwywaith gyda dau fys gan gadw eich llygadau ar gau.

scor: 0 1 3 5 7 11 13 15

4. COMPLEX IDEATIONAL MATERIAL

1. A wnaiff bord suddo mewn dwr?
   A wnaiff carreg suddo mewn dwr?

2. Ydi morthwyl yn dda am dorri coed?
   A ellir defnyddio morthwyl i darro hoelion?

3. Ydi dau bwys o flawd yn pwyso mwy nag un?
   Ydi un pwys o flawd yn drymach na dau?

4. A wnaiff dwr fynd i mewn i bar da o fwts rwber?
   A wnaiff par da o fwts rwber gadw dwr allan?

Dyweder: " Dwi am ddarllen stori fer ichi ac yna dwi am ofyn ychydig o gwestiynnau ichi amdani"

'Roedd yn rhaid i Mr. Jones fynd I Lundain. Penderfynodd fynd ar y tren. Gyrrodd ei wraig ef i'r orsef ond tra ar y ffordd cafodd olwyn fflat. Serch hynny bu iddynt gyrraedd yr orsef mewn pryd iddo gael dal y tren.

5. Ddaru Mr. Jones fethu ei dren?
   Ddaru o gyrraedd yr orsef mewn pryd?

6. A oedd Mr. Jones yn mynd i Lundain?
   A oedd o ar ei ffordd adref o Lundain?

Dyweder: "Dwi am ddarllen paragraff arall. Ydych chi'n barod?

Ceisiodd filwr newid siec mewn banc ger llaw ei faes. Ebe'r clerc yn gadarn ond yn cydymdeimlo, "Bydd yn rhaid ichi gael adnabyddiaeth oddi wrth rhai o'ch ffrindiau o'r maes". Atebodd y milwr yn ddigalon, "Ond does gen i ddim ffrindiau yn y maes - Fi ydi'r un sy'n canu'r corn."

7. A gafodd siec y milwr ei derbyn ar unwaith?
   A fu i'r clerc wrthwynebu newid y siec?

8. A oedd gan y milwr ffrindiau gudag ef?
   A oedd y milwr yn cael trafferth cael ffrindiau?

Dyweder: "Dwi am ddarllen un arall. Ydych chi'n barod?"

Cerddodd cwsmer i mewn i westy yn cario rhaff mewn un llaw a bag dillad yn y llall. Gofynnodd clerc y gwesy

wrtho,"Esgusodwch fi, syr, ond ellwch chi ddweud wrthaf fi beth ydi pwrpas y rhaff?"
"Medraf" atebodd y dyn " ar gyfer dihangfa tan!"
"Mae'n ddrwg gen i Syr", meddai'r clerc,"ond mae'n rhaid i bob gwestai sy'n cludo'i ddihangfa tan ei hun daly o flaen llaw".

9. A oedd y cwsmer yn cludo bag dillad yn ei ddwy law?
   A oedd o'n cludo rhywbeth anarferol mewn un llaw?

10. A oedd y clerc yn credu y gestai hwn?
    A oedd y clerc yn amheus o'r gwestai hwn?

"Dwi an ddarllen un arall. Gwrandewch yn ofalus"

Genir y llew bach hefo greddf naturiol i hela. Aiff un llew bach ar drywydd a neidio am ben un arall efo'r un awch a'r un wefr ag a ddangosir gan gath fach. Yn ystod y flwyddyn a hanner o fagwriaeth datblygir y chwarae i ddull hela a lladd. Daw medr gydag ymarfer hir, dynwared yr hen lewod ac ufuddhau i chwyrnu'r fam.

11. Ydi'r paragraff yma'n dweud sut i hela llewod?
    Ydi o'n dweud sut mae llewod yn dysgu sut i hela?

12. Ydi'r paragraff yma'n dweud bod llewod yn helwyr medrus o amser eu geni?
    Ydi o'n dweud bod llewod angen ymarfer cyn y gallent ladd?

5. AUTOMATIZED SEQUENCES

Gofynnwch i'r person adrodd pob cyfres yn y pedwar set canlynnol:

	1 pwynt	2 pwynt
1. Dyddiau'r wythnos		
Sul, Llun, Mawrth, Mercher, Iau, Gwener, Sadwrn, Sul.	4 mewn rhes	oll
2. Misoedd y flwyddyn		
Ionawr, Chwefror, Mawrth, Ebrill Mai, Mehefin, Gorffennaf, Awst Medi, Hydref, Tachwedd, Rhagfyr.	5 mewn rhes	oll
3. Cyfri i 21		
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	8 mewn rhes	oll

4. Yr Wyddor

a b c ch d dd e f
ff g ng h i l ll
m n o p ph r rh
s t th u w y 7 mewn rhes oll

scor: 0 1 2 3 4 5 6 7 8

6,7,8. RECITATION, SINGING AND RHYTHM

Gofynnwch i'r person gwblhau y canlynnol

1. Adrodd

Dau gi bach... Bachgen bach of Felin y Wig....

A fuo chi 'rioed yn morio....

Ein Tad..... Gras ein Harglwydd....

2. Canu

Yr Anthem Genedlaethol Hoff gan

3. Rhythm

(see English Version)

9. RECEPTION OF WORDS

Gofynnwch i'r person ail adrodd y canlynnol:

beth
cadair
hamoc
brown
W
pymtheg
1066
pwyslais
Methodist Esgobol

Scor: 0 1 2 3 4 5 6 7 8 9 10

10 and 11. RECREATING PHRASES (High and low probability)

Gofynnwch i'r person ail adrodd y canlynnol:

a. Wyddoch chi sut
   Mae'r cerwyn yn gillwng
b. A'i draed ar y ddaear
   Mae lemon yn chwerw
c. Cyrraedd adref o'r gwaith
   Dihangodd y sbeiliwr i Groeg
d. Paid a dweud wrthi
   Tynna gaead y tin i ffwrdd
e. Dos yn dy flaen a'i wneud os medri
   'R oedd gan y Chinese ffan Emerald prin
f. Ger y bwrdd yn yr ystfell fwyta
   Daliodd gwennol ysgubor bryf genwair nobl
g. Clywsant ef yn siard ar y radio neithiwr.
   Fe'i berswadwyd gan sylwadau'r cyfreithiwr wrth gloi
h. Arhosais ger ei ddrws ffrynt a chanu'r gloch
   Ymsaethodd y bwgan dros y rhos niwlog

scor 1) 0 1 2 3 4 5 6 7 8
     2) 0 1 2 3 4 5 6 7 8

12. WORD ENDING

Gogfynnwch i'r person ddarllen y geiriau bob yn un oddiar cerdyn 5.

	0-3"	3-10"	10-30"	Methu
pwyntiau	3	2	1	0

cadair
cylch
hamoc
triongl
pymtheg
piws
saith-ugain-un
diferion
ysmygu

scor: 0 3 6 9 12 15 18 21 24 27 30

13. RESPONSIVE NAMING

Gofynnwch i'r person ateb mewn un gair i'r cwestiynnau a ganlyn:

	0-3"	3-10"	10-30"	methu
pwyntiau	3	2	1	0

Efo beth yda ni'n dweud amser?
Ateb: cloc neu oriawr
Beth ydach chi'n ei wneud hefo rasar?
Ateb: shafio
Beth ydach chi'n ei wneud hefo sebon?
Ateb: Ymolchi neu molchi
Beth ydych chi'n ei wneud hefo pensil?
Ateb: ysgrifennu
Efo beth ydach chi'n torri papur?
Ateb: siswrn
Efo beth yda ni'n goleuo sigaret?
Ateb: matchen
Faint o bethau sydd mewn dwsin?
Ateb: deuddeg neu un deg dau
Pa liw ydi glo?
Ateb: du
Ble ydych chi'n mynd i brynu ffisig?
Ateb: fferyllydd

scor: 0 3 6 9 15 18 21 24 27 30

14. VISUAL CONFRONTATION NAMING

Gofynnwch i'r person enwi pob eitem ar y cerdyn yn y drefn canlynnol. Pwyntiwch chi at y llun cyfatebol ar gardiau 2 a 3.

	0-3"	3-10"	10-30"	methu
pwyntiau	3	2	1	0

FFURFIAU

cadair
goriad
maneg
pluen
hamoc
cactus

LLYTHRENNAU

H
T
R
L
S
G

FFIGYRAU

sgwar
triongl

GWEITHRED

rhedeg
cysgu
yfed
ysmygu
disgyn
diferion

RHIFAU

7
15
700
1936
42
7000

LLIWIAU
coch
brown
pinc
glas
llwyd
piws

RHANNAU CORFF

clust
ysgwydd
penelin

scor: 0 15 25 35 45 55 65 75 85 95 105

15. BODY PART NAMING

	0-3"	3-10"	10-30"	methu
pwyntiau	3	2	1	0

clust
trwyn
ysgwydd
ffer
garddwn
bawd
penelin
ael
cymal bys (migwrn)
crimp (crimog)

scor: 0 3 6 9 12 15 18 21 24 27 30

16. ANIMAL NAMING

Dywedwch " Dwi eisiau gweld faint o wahanol anifeiliaid y medrwch chi feddwl amdanynt a'u henwi am ryw funud, tra mod i'n eu cyfri. Fe wnaiff unrhyw anifail y tro, gallent for o'r fferm, o'r jwngl, y mor neu yn anifeiliaid anwes.Er engraifft, gellwch chi gychwyn hefo ci..."

0-15" 15-30" 30-45" 60-75" 75-90"

Rhif=

scor: 0-2 3-5 6-8 9-12 13-15 16-19

17. WORD PICTURE MATCHING

Defnyddiwch cardiau 2 a 5. Gofynnwch i'r person bwyntio at y llun cywir o'r gair a ddangosir. Dywedwch " Pa un o'r llunia hyn ydi'r gair yma?"

cadair
cylch
hamoc
riongl
pymtheg
piws
saith-ugain-un
diferion
brown
ysmygu

scor: 0 1 2 3 4 5 6 7 8 9 10

BOSTON DIAGNOSTIC APHASIA EXAMINATION

Date:

Patient: Case #:

Residence:

Age: Birthplace:

Date of birth:

Education: Grade completed:

At what age?:

Occupational history:

Language background (circle one): *English only* *Bilingual*
(If bilingual, brief language history)

Handedness history (including data on other family members):

Nature and duration of present illness:

Localizing information:

Hemiplegia (circle one): *Right* *Left* *Recovered* *Absent*

Hemianopsia (circle one): *Right* *Left* *Recovered* *Absent*

EEG Focus:

Operative information:

Other localizing information (e.g., scan findings, arteriogram, etc.):

I. CONVERSATIONAL AND EXPOSITORY SPEECH

Conduct informal exchange, incorporating suggested questions, to elicit as many of the desired responses as possible. Record verbatim. Tape record, if possible.

a. Response to greeting. (Q. "HOW ARE YOU TODAY?" or equivalent):

b. Response with "yes" or "no." (Q. "HAVE YOU EVER BEEN IN THIS HOSPITAL BEFORE?" or "HAVE I TESTED YOU BEFORE?"):

c. Response with "I think so," or equivalent. (Q. "DO YOU THINK WE CAN HELP YOU?" or ". . . HAVE HELPED YOU?"):

d. Response with "I don't know" or equivalent. (Q. "WHEN ARE YOUR TREATMENTS GOING TO BE FINISHED?"):

e. Response with "I hope so" or equivalent. (Q. "BEFORE TOO LONG LET'S HOPE. WHAT DO YOU SAY?"):

f. "What is your full name?":

g. "What is your full address?" (Accept as correct any response which includes street and number or street and city.):

h. *Open-ended conversation:* In order to elicit as much free conversation as possible, it is suggested that examiner start with familiar topics such as, "What kind of work were you doing before you became ill?" and, "Tell me what happened to bring you to the hospital." Encourage patient to speak for at least *ten minutes*,

if possible. (Minimize use of "yes"-"no" questions and probing for specific facts.) If tape recording is not used, record as much as possible verbatim.

i. Presentation of picture. Show the test picture and tell patient to, "Tell everything you see going on in this picture." Point to neglected features of the picture and ask for elaboration if patient's response is skimpier than his apparent potential. A minute is usually enough time.

Cookie Theft (Card 1)

II. AUDITORY COMPREHENSION

A. *Word Discrimination*

Present test Cards 2 and 3 separately. Have patient look over all pictures on the card presented before starting. Then ask him to point out each picture or symbol by saying, "Show me the _____." Rotate at random from one category to another. One repetition is permitted, on request. If the patient does not find the correct category, then show him the category, to the exclusion of the others, and repeat the name of the item to be identified. (Score in the "cued" column.) Correct discrimination ("identification") is scored 2 points if within 5 seconds, 1 point otherwise. Attention to the correct category without correct discrimination is scored ½ point (check category).

Card 2	IDENTIFICATION		CATE-GORY	CUE	FAIL	Card 3	IDENTIFICATION		CATE-GORY	CUE	FAIL
OBJECTS:	Under 5 seconds 2 points	Over 5 seconds 1 point	1/2 point	1/2 point	0	ACTIONS:	Under 5 seconds 2 points	Over 5 seconds 1 point	1/2 point	1/2 point	0
chair						smoking					
key						drinking					
glove						running					
feather						sleeping					
hammock						falling					
cactus						dripping					
LETTERS:						COLORS:					
L						blue					
H						brown					
R						red					
T						pink					
S						gray					
G						purple					
FORMS:						NUMBERS:					
circle						7					
spiral						42					
square						700					
triangle						1936					
cone						15					
star						7000					

Raw Scores: 0 10 17 24 31 38 45 52 59 66 72

B. *Body-part Identification*

Ask patient to point to the following body parts. Record incorrect responses.

Scoring: Items in the first two columns are scored 1 point if recognized promptly (within approximately 5 seconds) and ½ point if identified correctly, but after hesitation. The third column is for right-left discrimination and receives a total of 2 points if all 8 are correct (the body part may be incorrect as long as right-left discrimination is made), 1 point if 6 or 7 items are correct, otherwise 0.

BODY-PART IDENTIFICATION

	Correct		Fail		Correct		Fail
	<5"	>5"			<5"	>5"	
	1 point	½ point			1 point	½ point	
ear				wrist			
nose				thumb			
shoulder				thigh			
knee				chin			
eyelid				elbow			
ankle				lips			
chest				eyebrow			
neck				cheek			
middle finger				index finger			

RIGHT-LEFT DISCRIMINATION

	Correct	Failed
right ear		
left shoulder		
left knee		
right ankle		
right wrist		
left thumb		
right elbow		
left cheek		
8 correct 6 7 correct	2 points 1 point	

Raw Score: 0 2 4 6 8 10 12 14 16 18 20

C. *Commands*

Have the patient carry out the following commands, giving credit for each underlined element which he carries out. One repetition is permitted on request, but command must always be repeated as a whole, not broken up.

1. Make a *fist.*
2. Point to the *ceiling,* then to the *floor.*
   (After lining up a pencil, watch and card, in that order, on the table before the patient.)
3. Put the *pencil on top of the card,* then *put it back.*
4. Put the *watch* on the *other side of the pencil* and *turn over* the *card.*
5. Tap *each shoulder twice* with *two fingers* keeping your *eyes shut.*

Raw Score: 0 1 3 5 7 9 11 13 15

D. *Complex Ideational Material*

The only response required is either agreement or disagreement. Both questions for each numbered item must be answered correctly to receive credit. One repetition of each question is permitted.

1. Will a board sink in water?
   Will a stone sink in water?

2. Is a hammer good for cutting wood?
   Can you use a hammer to pound nails?

3. Do two pounds of flour weigh more than one?
   Is one pound of flour heavier than two?

4. Will water go through a good pair of rubber boots?
   Will a good pair of rubber boots keep water out?

"I am going to read you a short story and then I will ask you some questions about it. Are you ready?" (Read at a normal rate.)

Mr. Jones had to go to New York. He decided to take a train. His wife drove him to the station but on the way they had a flat tire. However, they arrived at the station just in time for him to catch the train.

5. Did Mr. Jones miss his train?
   Did he get to the station on time?

6. Was Mr. Jones going to New York?
   Was he on his way home from New York?

"I am going to read another paragraph. Are you ready?"

A soldier tried to cash a check in a bank near his camp. The teller, firm but sympathetic, said, "You will have to have identification from some of your friends from the camp." The discouraged soldier answered, "But I don't have any friends in camp—I'm the bugler."

7. Was the soldier's check cashed at once?
   Did the teller object to cashing the check?

8. Did the soldier have a friend with him?
   Did the soldier have trouble finding friends?

"I will read another one. Are you ready?"

A customer walked into a hotel carrying a coil of rope in one hand and a suitcase in the other. The hotel clerk asked, "Pardon me, sir, but will you tell me what the rope is for?"
"Yes," responded the man, "that's my fire escape!"
"I'm sorry, sir," said the clerk, "but all guests carrying their own fire escapes must pay in advance."

9. Was the customer carrying a suitcase in each hand?
   Was he carrying something unusual in one hand?

10. Did the clerk trust this guest?
    Was the clerk suspicious of this guest?

"I am going to read one more paragraph. Listen carefully."

The lion cub is born with a deep-seated hunting instinct. One cub will stalk and pounce on another with the same eagerness and thrill exhibited by a kitten. During the year and a half of cubhood this play develops into a hunting and killing technique. Skill comes through long practice, imitation of the old lions and obedience to warning growls of the mother.

11. Does this paragraph tell how to hunt lions?
    Does it tell how lions learn to hunt?

12. Does this paragraph say lions are skillful killers from the time they are born?
    Does it say lions need practice before they can kill their prey?

Score number correct: 0 1 2 3 4 5 6 7 8 9 10 11 12

III. ORAL EXPRESSION

A. *Oral Agility*

1. *Nonverbal agility:* Have the patient carry out the following rapidly repeated mouth movements as well as he can, after you demonstrate and describe the movement.
   Count the number of full alternations carried out in 5 seconds.

2. *Verbal agility:* Have the patient repeat the following words as rapidly as he can, while you time the number of repetitions for 5 seconds. Any assistance which helps patient to produce the desired word initially is permitted.* Use printed words on Card 4.

Action Required	*Number of times in 5"* 2 points	1 point
a. Purse lips, release	8	4–7
b. Open and close mouth	10	6–9
c. Retract lips, release	8	4–7
d. Tongue to alternate corners of mouth	8	4–7
e. Protrude and retract tongue	8	4–7
f. Tongue to upper and lower teeth	7	3–6

Raw Score: 0 1 2 3 4 5 6 7 8 9 10 11 12

Test Words	*Number of times in 5"* 2 points	1 point
a. Mama, mama ... etc.	9	3–8
b. Tip-top, tip-top	6	2–5
c. Fifty-fifty, fifty-fifty	5	2–4
d. Thanks, thanks	9	3–8
e. Huckleberry	7	3–6
f. Baseball player, Baseball player	5	2–4
g. Caterpillar	7	3–6

Raw Score: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

*If patient cannot get started on *one or two items at the most*, either because of perseveration or paraphasic substitution, eliminate items and prorate score. If more than two items are unscoreable, do not enter total score.

Coding of Paraphasia Columns

Paraphasic errors in single words.

1. *Neologistic distortion*—more than half of the sounds produced are extraneous to the desired word. This term applies only to responses which are spoken as a unit with some fluency of articulation. It does not apply to sounds produced by subjects groping for the correct articulatory position. Latter responses would simply be scored as failures or as severely distorted in articulation if the word is recognizable.

2. *Literal paraphasia*—response contains sounds or syllables which have slipped out of sequence, have been deleted or are entirely extraneous to the desired response, but more than half of the response corresponds to more than half of the required word.

3. *Verbal paraphasia*—substitution of an inappropriate word during the effort to say something specific.

Paraphasic errors in connected speech.

4. *Other*—this category applies to a number of types of paraphasia involving more than a single word and to some nonparaphasic responses. Examiner should write in an abbreviation of a category-rather than use a checkmark only.

enj—extended neologistic jargon
eej—extended English jargon
irrel—irrelevant speech
cl—circumlocution

B. *Automatized Sequences*

Have patient recite each of the following four series, giving him assistance with the first word, if necessary. Provide further assistance as needed, but discontinue a series when patient fails with four successive words. Record assistance given by circling the word; cross out words omitted by patient. Allow 0, 1 or 2 points, as indicated.

ARTICULATION						PARAPHASIA			
Normal	Stiff	Distorted	Fail		1 point / 2 points	Neologistic Distortion	Literal	Verbal	Other
				1. *Days of the week:*					
• • •	• • •	• • •	• • •	Sun. Mon. Tues.		• • •	• • •	• • •	• • •
• • •	• • •	• • •	• • •	Wed. Thur. Fri. Sat.	4 consecutive / all	• • •	• • •	• • •	• • •
				2. *Months of the year:*					
• • •	• • •	• • •	• • •	Jan. Feb. Mar. April		• • •	• • •	• • •	• • •
• • •	• • •	• • •	• • •	May June July Aug.		• • •	• • •	• • •	• • •
• • •	• • •	• • •	• • •	Sept. Oct. Nov. Dec.	5 consecutive / all	• • •	• • •	• • •	• • •
				3. *Counting to 21:*					
• • •	• • •	• • •	• • •	1 2 3 4 5 6 7 8 9		• • •	• • •	• • •	• • •
• • •	• • •	• • •	• • •	10 11 12 13 14 15 16		• • •	• • •	• • •	• • •
• • •	• • •	• • •	• • •	17 18 19 20 21	8 consecutive / all	• • •	• • •	• • •	• • •
				4. *Alphabet:*					
• • •	• • •	• • •	• • •	a b c d e f g h		• • •	• • •	• • •	• • •
• • •	• • •	• • •	• • •	i j k l m n o p q		• • •	• • •	• • •	• • •
• • •	• • •	• • •	• • •	r s t u v w x y z	7 consecutive / all	• • •	• • •	• • •	• • •
				Raw Score: 0 1 2 3 4 5 6 7 8					

C. *Recitation, Singing and Rhythm*

Instruct patient to complete the line for the following rhymes. Words in parentheses may be given as additional cues, if necessary. Use a natural or slightly exaggerated inflection to encourage completion of the rhyme. If patient fails, or is not familiar with the material, attempt other memorized or automatized matter, such as the Lord's Prayer, the Pledge of Allegiance, etc. Circle qualitative ratings below.

1. *Reciting:*

Jack and Jill (went) .....

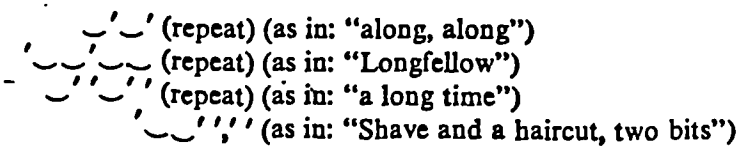
There was an old woman who lived in a shoe, (she had) .....

Baa, Baa, black sheep (have) ...

My country ('tis) .....
(Sweet) .....
(Of thee) .....

2. *Singing:* After recitation of "My Country 'Tis of Thee," have patient sing this or any other song with which he is familiar.

3. *Rhythm:* Examiner taps out the following rhythms on the desk in continuous fashion (6 times) until the patient demonstrates that he can or cannot repeat tempo.



RATINGS:	*Reciting*	*Singing* (Melody)	*Rhythm*
2 = Good			
1 = Impaired			
0 = Failed			

D. *Repetition of Words*

Have patient repeat each of the following words. One repetition by examiner is permitted when it appears that this may help, or when it is requested. For credit, all syllables must be in their proper order, although distortion of individual sound elements is permitted, provided it is in keeping with patient's general articulation difficulty and that the word is recognizable.

ARTICULATION					PARAPHASIA			
Normal	Stiff	Distorted	Fail		Neologistic	Literal	Verbal	Other
				what				
				chair				
				hammock				
				purple				
				brown				
				W				
				fifteen				
				1776				
				emphasize				
				Methodist Episcopal				

Raw Score: 0 1 2 3 4 5 6 7 8 9 10

E. *Repeating Phrases*

Have patient repeat the following phrases. Alternate between columns 1 and 2. On patient's request, a single repetition of the entire test phrase is permitted without loss of credit.

ARTICULATION						PARAPHASIA			
Normal	Stiff	Distorted	Fail	1. *High Probability*	2. *Low Probability*	Neologistic Distortion	Literal	Verbal	Other
				a. You know how.					
					a. The vat leaks.				
				b. Down to earth.					
					b. Limes are sour.				
				c. I got home from work.					
					c. The spy fled to Greece.				
				d. You should not tell her.					
					d. Pry the tin lid off.				
				e. Go ahead and do it if possible.					
					e. The Chinese fan had a rare emerald.				
				f. Near the table in the dining room.					
					f. The barn swallow captured a plump worm.				
				g. They heard him speak on the radio last night.					
					g. The lawyer's closing argument convinced him.				
				h. I stopped at his front door and rang the bell.					
					h. The phantom soared across the foggy heath.				

Raw Score: 1) 0 1 2 3 4 5 6 7 8
2) 0 1 2 3 4 5 6 7 8

F. *Word-reading*

Have the patient read the words, one at a time, from test Card 5. Check approximate lag between your pointing to the word and the patient's adequate response. Assist as required, but give no credit for responses obtained with help.

ARTICULATION				Test Words	Approximate response lag				PARAPHASIA			
Normal	Stiff	Distorted	Fail		0–3" 3 points	3–10" 2 points	10–30" 1 point	Fail 0	Neol. Dist.	Literal	Verbal	Other
				chair								
				circle								
				hammock								
				triangle								
				fifteen								
				purple								
				seven-twenty-one								
				dripping								
				brown								
				smoking								

Raw Score: 0 3 6 9 12 15 18 21 24 27 30

G. *Responsive Naming*

Have patient supply the one-word responses required by the stimulus questions. Check approximate lag

ARTICULATION				Question	Approximate response lag				PARAPHASIA			
Normal	Stiff	Distorted	Fail		0–3" 3 points	3–10" 2 points	10–30" 1 point	Fail 0	Neol. Dist.	Literal	Verbal	Other
				What do we tell time with?								
				What do you do with a razor?								
				What do you do with soap?								
				What do you do with a pencil?								
				What do we cut paper with?								
				What color is grass?								
				What do we light a cigarette with?								
				How many things in a dozen?								
				What color is coal?								
				Where do you go to buy medicine?								

Raw Score: 0 3 6 9 12 15 18 21 24 27 30

H. *Visual Confrontation Naming*

Have the patient name each item in the order listed as you point to it on Cards 2 and 3. Assist, if necessary, to preserve rapport, but do not credit responses so obtained. Check under column which indicated appropriate lag in giving response, and score accordingly. Articulation and paraphasia should be rated wherever possible.

ARTICULATION					Approximate response lag				PARAPHASIA			
Normal	Stiff	Distorted	Fail	Test Items	0-3" 3 points	3-10" 2 points	10-30" 1 point	Fail 0	Neologistic Distortion	Literal	Verbal	Other
				Objects: chair								
				key								
				glove								
				feather								
				hammock								
				cactus								
				Letters: H								
				T								
				R								
				L								
				S								
				G								
				Geometric Forms: square								
				triangle								
				Actions: running								
				sleeping								
				drinking								
				smoking								
				falling								
				dripping								
				Numbers: 7								
				15								
				700								
				1936								
				42								
				7000								
				Colors: red								
				brown								
				pink								
				blue								
				gray								
				purple								
				Body parts: ear								
				shoulder								
				elbow								

Raw Score: 0 15 25 35 45 55 65 75 85 95 105

J. *Body-part Naming*

ARTICULATION					*Approximate response lag*				PARAPHASIA			
Normal	Stiff	Distorted	Fail		0–3″ 3 points	3–10″ 2 points	10–30″ 1 point	Fail 0	Neologistic Distortion	Literal	Verbal	Other
				ear								
				nose								
				shoulder								
				ankle								
				wrist								
				thumb								
				elbow								
				eyebrow								
				knuckles								
				shin								

Raw Scores: 0 3 6 9 12 15 18 21 24 27 30

K. *Animal-naming (Fluency in Controlled Association)*

Instruct the patient: "I want to see how many different animals you can call to mind and name for about a minute, while I count them. Any animals will do; they can be from the farm, the jungle, the ocean or house pets. For instance you can start with dog." Start timing from this point and continue for a minute and a half. Score is based on the most productive consecutive 60 seconds. Record verbatim below.

First 15″ 15–30″ 30–45″ 45–60″ 60–75″ 75–90″

Raw Score: 0–2 3–5 6–8 9–12 13–15 16–19

L. *Oral Sentence-reading*

Have the patient read the following sentences aloud from test Cards 6 and 7. Indicate by marking on this record any assistance given, omissions, substitutions, etc. One point credit is allowed for each completely correct sentence.

	Correct 1 point	Fail
You know how.		
Down to earth.		
I got home from work.		
Near the table in the dining room.		
They heard him speak on the radio last night.		
Limes are sour.		
The spy fled to Greece.		
The barn swallow captured a plump worm.		
The lawyer's closing argument convinced him.		
The phantom soared across the foggy heath.		

Raw Score: 0 1 2 3 4 5 6 7 8 9 10

C. *Word-picture Matching*

Assorted objects, colors, etc. Using Cards 2 and 3, and Card 5, have patient pick out appropriate picture for each word shown him. ("Which of these pictures is this word?") Discourage patients from reading aloud.

chair	_____	purple	_____
circle	_____	seven-twenty-one	_____
hammock	_____	dripping	_____
triangle	_____	brown	_____
fifteen	_____	smoking	_____

Raw Score: 0 1 2 3 4 5 6 7 8 9 10

D. *Reading Sentences and Paragraphs*

Patient is presented with Cards 12, 13, 14, 15 and 16 successively. Patient indicates his selection on the card and the examiner underlines the choice in the test booklet. Assistance may be given in the two examples, but not in the test proper.

EXAMPLES

WATER IS_____
FLY WET DRY RED

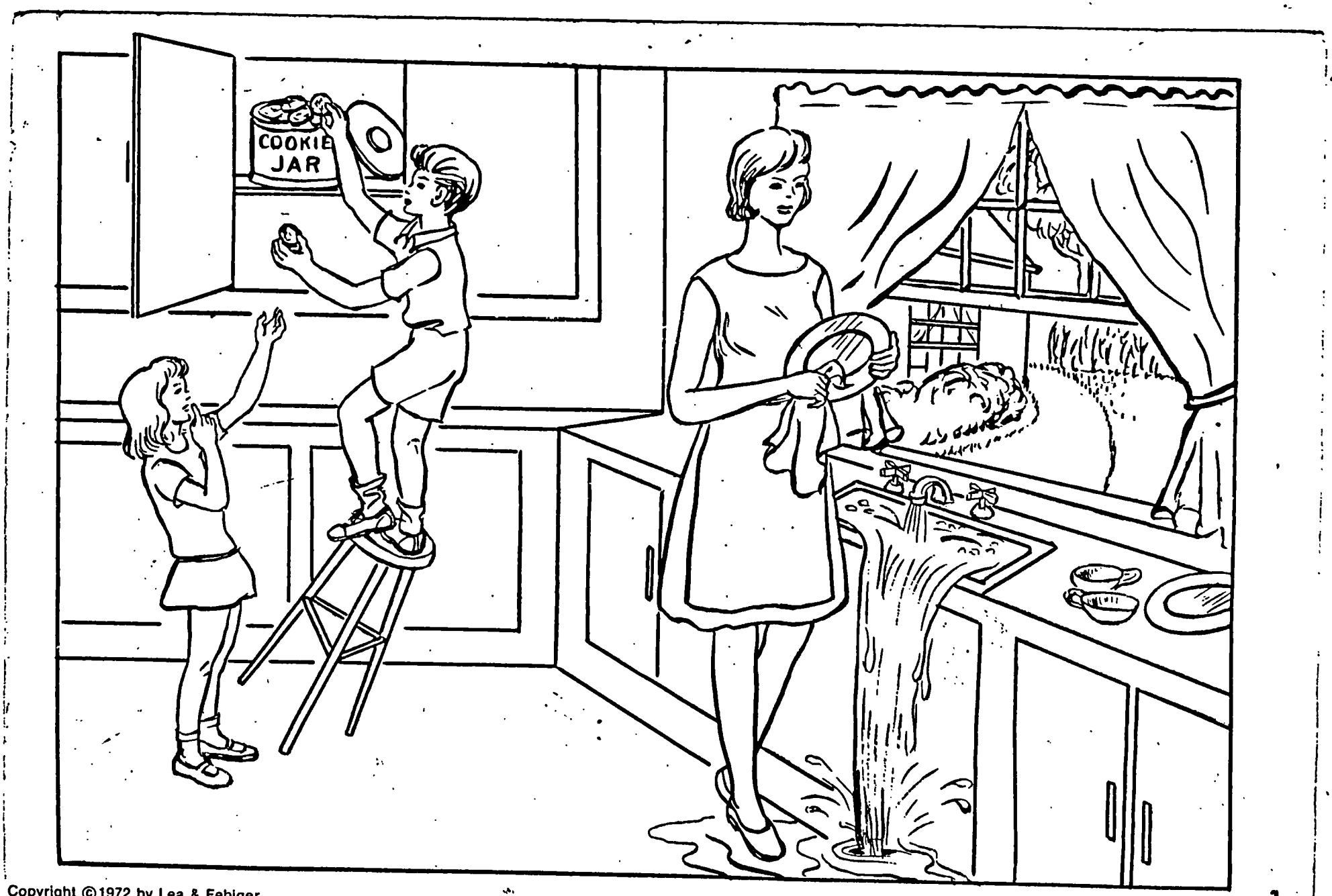
CHILDREN PLAY_____
DOOR SHOE DIME BALL

1. A DOG CAN_____
TALK BARK SING CAT

2. A MOTHER HAS A_____
TREE COOK CHILD TRUCK

3. MR. JONES GIVES HAIRCUTS AND SHAMPOOS. HE IS A_____
SHAVING BOY BUTCHER BARBER

4. MANY BIRDS COME BACK IN THE SUMMER. THEY BUILD_____
NESTS EGGS SPARROW CAT



CADAIR

CYLCH

HAMOC

TRIONGL

PYMPTHEG

PIWS

SAITH-UGAIN-

DIFERION

BROWN

YSMYGU

CHAIR

CIRCLE

HAMMOCK

TRIANGLE

FIFTEEN

PURPLE

SEVEN-TWENTY-ONE

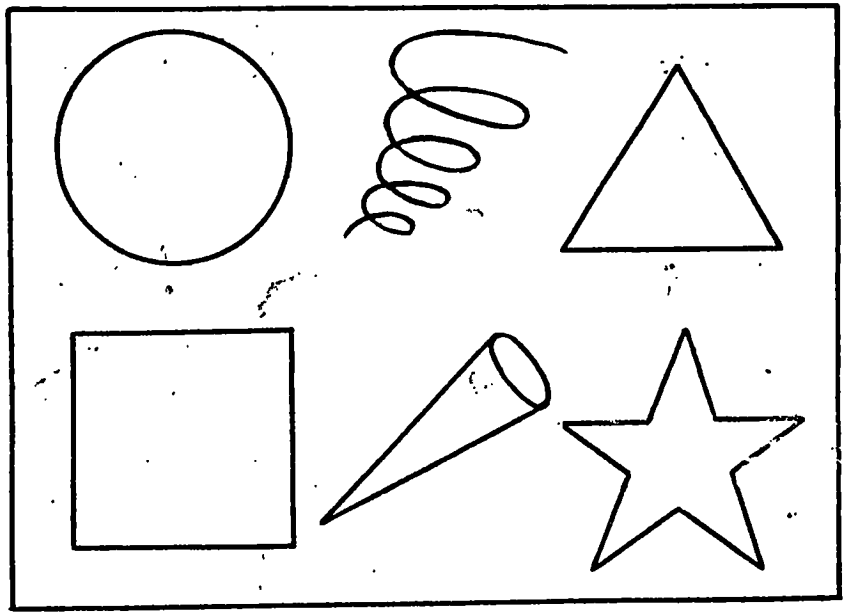
DRIPPING

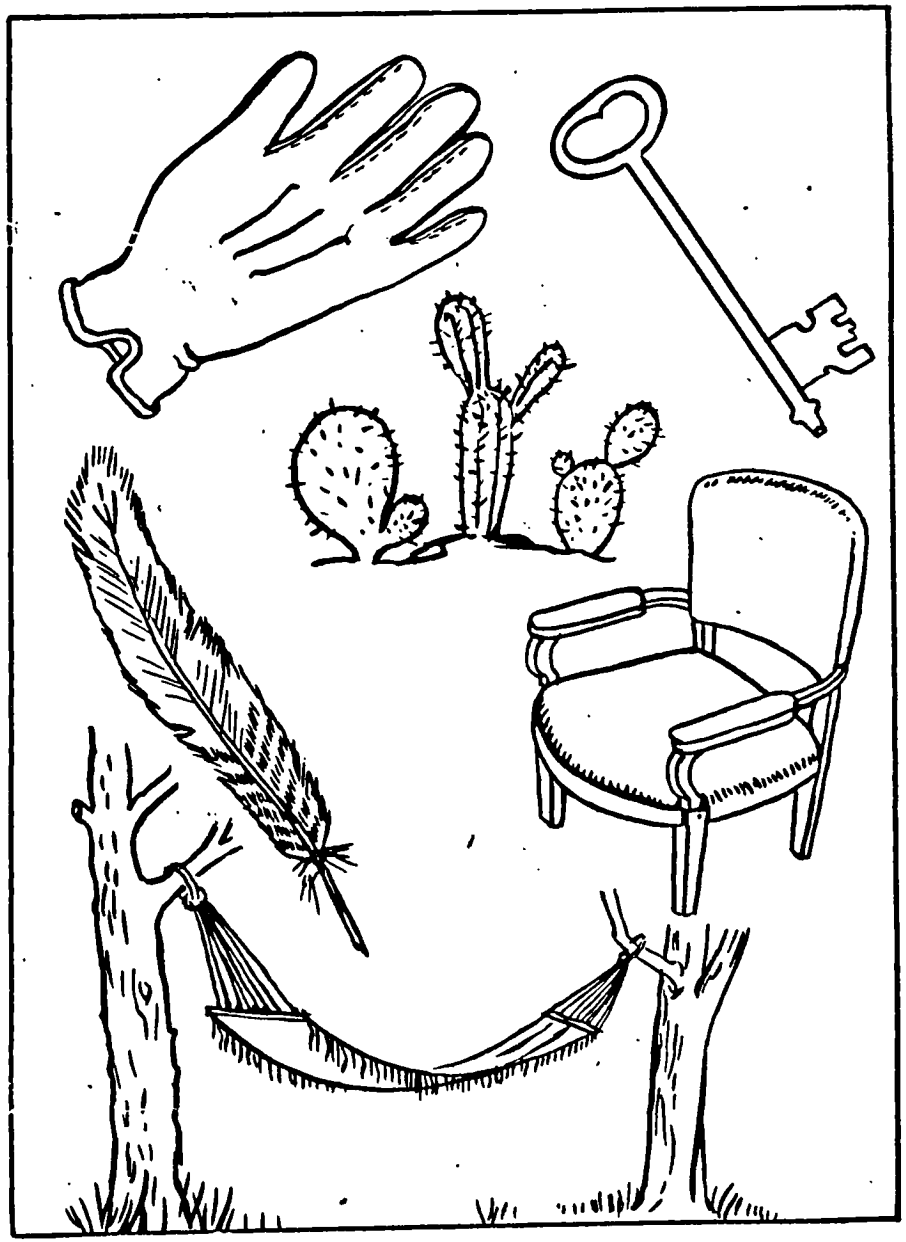
BROWN

SMOKING

S H G

L R T





APPENDIX X

Groupings from the Boston

GROUPINGS

Group One = Welsh
Group Two = Bilingual

Subject 1
Group One: Subscales 6, 15, 9.
Group Two: Subscales 18/18, 3, 14, 13, 16, 11.

Subject 2
Group One: Subscales 18E, 3, 14.
Group Two: Subscales 18W, 6, 13, 9, 11, 15, 16.

Subject 3
Group One: Subscales 6.
Group Two: Subscales 18/18, 3, 13, 9, 14, 11, 15, 16.

Subject 4
Group One: Subscales 6, 15, 16.
Group Two: Subscales 18/18, 3, 13, 11, 14, 9.

Subject 5
Group One: Subscales 6, 11.
Group Two: Subscales 18/18, 3, 13, 14, 9, 15, 16.

Subject 6
Group One: Subscales 18W, 16.
Group Two: Subscales 18E, 3, 6, 13, 14, 15, 11, 9.

Subject 7
Group One: Subscales 18/18, 14, 15, 16.
Group Two: Subscales 3, 6, 13, 11, 9.

Subject 8
Group One: Subscales 18/18, 3, 13, 14, 15, 16.
Group Two: Subscales 6, 9, 11.

Subject 9

Group One: Subscales 18E, 3, 6, 13, 14, 9, 15, 11, 16.

Group Two: Subscales 18W.

Subject 10

Group One: Subscales 18W, 3, 11, 15, 16.

Group Two: Subscales 18E, 6, 13, 14, 9.

Subject 11

Group One: Subscales 18/18, 3, 6, 13, 14, 15, 9.

Group Two: Subscales 16, 11.

Subject 12

Group One: Subscales 18/18, 3, 13, 14.

Group Two: Subscales 6, 11, 9, 15, 16.

Subject 13

Group One: Subscales 18/18, 3, 13, 14, 15, 16.

Group Two: Subscales 6, 9, 11.

Subject 14

Group One: Subscales 16, 9.

Group Two: Subscales 18/18, 3, 6, 11, 13, 14, 15.

Subject 15

Group One: Subscales 6, 14, 15.

Group Two: Subscales 18/18, 3, 9, 11, 13, 16.

Subject 16

Group One: Subscales 18/18, 3, 9, 15, 16.

Group Two: Subscales 6, 11, 13, 14.

APPENDIX XI

ANOVA RESULTS BOSTON AND TOKEN TEST

ANOVA Summary Table for 40 mb:stats folder:CLR Anova:dwyn's data1

Source of Variation	df	Sum of Squares	Mean Square	F	p	Epsilon Correction
d	1	126617.700	126617.700	9.286	.0057	
Error	23	313607.930	13635.127			
t	3	11571.002	3857.001	3.777	.0143	
dt	3	9531.302	3177.101	3.111	.0318	
Error	69	70460.428	1021.166			.77
l	1	3992.456	3992.456	4.688	.0410	
dl	1	1100.196	1100.196	1.292	.2674	
Error	23	19588.374	851.668			1.00
tl	3	918.066	306.022	.799	.4984	
dtl	3	802.566	267.522	.699	.5559	
Error	69	26413.664	382.807			.79

SIMPLE MAIN EFFECTS

Effect	MSn	DFn	DFe	MSe	F	p	
d at t 1	13333.445	1	23	2474.038	5.389	.029	
d at t 2	21321.125	1	23	4153.647	5.133	.033	
d at t 3	46675.309	1	23	3441.766	13.561	.001	
d at t 4	54819.123	1	23	6629.174	8.269	.009	
t at d 1	37.914	3	69	1021.166	.037	.990	← nondementia
t at d 2	4817.389	3	69	1021.166	4.718	.005	← dementia

d 1 : nondementia

d 2 : dementia

Vermenting

X_1: time 1: welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
302.125	29.4027	7.3507	864.5167	9.732	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
219	343	124	4834	1473440	0

X_2: time 1: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
314.5	49.3883	12.3471	2439.2	15.7037	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
188	371	183	5032	1619152	0

X_3: time 2: welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
296.25	49.5385	12.3846	2454.0667	16.7219	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
170	369	199	4740	1441036	0

X_4: time 2: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
303.375	60.0254	15.0064	3603.05	19.7859	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
137	375	238	4854	1526628	0

X_5: time 3: welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
282.3125	51.1804	12.7951	2619.4292	18.129	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
158	343	185	4517	1314497	0

X_6: time 3: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
278.9375	51.124	12.781	2613.6625	18.3281	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
150	331	181	4463	1284103	0

X7: time 4: welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
269.625	61.3698	15.3424	3766.25	22.7612	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
116	356	240	4314	1219656	0

X8: time 4: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
271.1875	78.7665	19.6916	6204.1625	29.045	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
77	348	271	4339	1269745	0

Range Restrictions

	Column Name:	Restriction:
AND	group	dementia

Non-demented

X_1: time 1: welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
336.4444	37.6102	12.5367	1414.5278	11.1787	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
280	383	103	3028	1030070	0

X_2: time 1: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
348.2222	22.7968	7.5989	519.6944	6.5466	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
302	372	70	3134	1095486	0

X_3: time 2: welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
335.7778	32.6679	10.8893	1067.1944	9.729	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
271	372	101	3022	1023258	0

X_4: time 2: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
349.8889	31.2708	10.4236	977.8611	8.9373	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
276	380	104	3149	1109623	0

X_5: time 3: welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
340.8889	26.3507	8.7836	694.3611	7.73	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
289	374	85	3068	1051402	0

X_6: time 3: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
347.6667	19.3197	6.4399	373.25	5.557	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
314	381	67	3129	1090835	0

X7: time 4: welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
327.3333	31.4523	10.4841	989.25	9.6087	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
271	373	102	2946	972238	0

X8: time 4: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
351.4444	40.7986	13.5995	1664.5278	11.6088	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
290	432	142	3163	1124935	0

Range Restrictions

	Column Name:	Restriction:
AND	group	non-dementia

Effect	MSn	DFn	DFe	MSe	F	p
d at t 1	88.223	1	23	22.022	4.006	.057
d at t 2	99.170	1	23	21.167	4.685	.041
d at t 3	399.031	1	23	22.260	17.926	.000
d at t 4	463.094	1	23	32.217	14.374	.001
t at d 1 (Non-dem)	1.500	3	69	6.572	.228	.876
t at d 2 (Dem)	70.233	3	69	6.572	10.687	.000

SIMPLE MAIN EFFECTS

ANOVA Summary Table for 40 mb:stats folder:CLR Anova:dwyn's stuff:dwyn's data2

Source of Variation	df	Sum of Squares	Mean Square	F	p	Epsilon Correction
d	1	925.575	925.575	11.874	.0022	
Error	23	1792.805	77.948			
t	3	190.983	63.661	9.687	.0000	
dt	3	123.943	41.314	6.286	.0008	
Error	69	453.477	6.572			.57
l	1	47.613	47.613	7.728	.0107	
dl	1	16.293	16.293	2.644	.1175	
Error	23	141.707	6.161			1.00
tl	3	11.498	3.833	1.379	.2565	
dtl	3	7.698	2.566	.923	.4343	
Error	69	191.782	2.779			.93

Ex Non-demented

X_1: time 1: Welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
13.3333	1.5	.5	2.25	11.25	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
11	15	4	120	1618	0

X_2: time 1: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
10.8889	3.2956	1.0985	10.8611	30.2659	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
7	15	8	98	1154	0

X_3: time 2: welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
13	1.8708	.6236	3.5	14.391	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
10	15	5	117	1549	0

X_4: time 2: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
10.5556	2.9627	.9876	8.7778	28.068	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
6	15	9	95	1073	0

X_5: time 3: welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
12.4444	2.555	.8517	6.5278	20.5309	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
7	15	8	112	1446	0

X_6: time 3: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
11.8889	2.5712	.8571	6.6111	21.627	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
8	15	7	107	1325	0

X_7: time 4: welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
11.7778	2.8626	.9542	8.1944	24.305	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
7	15	8	106	1314	0

X_8: time 4: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
10.7778	4.1164	1.3721	16.9444	38.1931	9
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
2	15	13	97	1181	0

Range Restrictions

	Column Name:	Restriction:
AND	group	non-demented

Demented

X_1: time 1: Welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
9.375	4.3031	1.0758	18.5167	45.8997	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
2	15	13	150	1684	0

X_2: time 1: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
9.3125	3.8939	.9735	15.1625	41.8138	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
0	15	15	149	1615	0

X_3: time 2: welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
9.3125	4.0615	1.0154	16.4958	43.6135	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
0	14	14	149	1635	0

X_4: time 2: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
8.375	3.7925	.9481	14.3833	45.284	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
0	15	15	134	1338	0

X_5: time 3: welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
6.375	4.1613	1.0403	17.3167	65.2758	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
0	15	15	102	910	0

X_6: time 3: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
6.1875	3.7986	.9496	14.4292	61.3911	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
0	13	13	99	829	0

X7: time 4: welsh

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
5.1875	4.3699	1.0925	19.0958	84.2386	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
0	12	12	83	717	0

X8: time 4: english

Mean:	Std. Dev.:	Std. Error:	Variance:	Coef. Var.:	Count:
4.6875	4.757	1.1893	22.6292	101.4829	16
Minimum:	**Maximum:**	**Range:**	**Sum:**	**Sum of Sqr.:**	**# Missing:**
0	12	12	75	691	0

Range Restrictions

	Column Name:	Restriction:
AND	group	demented