EVERYDAY MEMORY IN TEMPORAL LOBE
EPILEPSY: AN INVESTIGATION WITH THE
CURRENT ORIENTATION TEST

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ABSTRACT

Everyday memory in temporal lobe epilepsy (TLE) was investigated using a new test (the Current Orientation test) which aims to address temporal orientation as a core function of memory in everyday life. The Current Orientation Test (COT) was administered to 20 TLE subjects and 21 controls, along with the Rivermead Behavioural Memory Test, the Recognition Memory Test, and a Memory Checklist. The COT was found to discriminate between the two groups on measures of the speed of producing examples of everyday events and ranking these events in temporal order. Disappointingly, the two groups were not differentiated by a measure of consistency of ranking the events over two trials, thereby casting doubt on the clinical utility of the COT. Performance on the COT was correlated with performance on the RBMT, but not with the Memory Checklist. The TLE subjects were impaired on the RBMT indicating a considerable level of everyday memory impairment in this group. The clinical utility of the COT is discussed in the light of the failure to find a difference in terms of the consistency measure and with respect to the significant correlation with the RBMT. The RBMT is considered to be an adequate measure of everyday memory impairment in TLE subjects, and the need for an additional measure of everyday memory to complement the RBMT is also discussed. No differences were found between the two groups in terms of reported memory failures on the Memory Checklist; this finding is discussed in terms of general difficulties with this form self report. Higher levels of depression and anxiety were reported by the TLE subjects on the Hospital Anxiety and Depression Scale, in keeping with previous studies in this area; this suggests that mood is an important area of intervention in clinical work with TLE subjects.
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1 INTRODUCTION

1.0 Introduction

Within the area of memory research there is a growing body of literature which has considered everyday memory, rather than the memory assessed by clinical memory tests. This research has investigated everyday memory function in people with a number of types of acquired brain injury, for example, stroke and head injury, but has not considered people with temporal lobe epilepsy. This research has culminated in the development of assessment measures which are designed to evaluate memory functioning. There is, nevertheless, still a need for more assessment measures in this area, and more specifically, there is a need for a brief and valid measure of everyday memory which can be readily used in clinical practice. Such an assessment measure is considered in the present study in the context of people with temporal lobe epilepsy.

The following review considers the pertinent literature relating to a number of areas. Although the focus of this study is on temporal lobe epilepsy, there is a considerable amount of the relevant literature which considers people with epilepsy of unspecified type, rather than the more specific classification of temporal lobe epilepsy. This body of literature is considered here, since it is has much to offer both methodologically, and in terms of a consideration of memory from the distinctive perspective of epilepsy. In the following review, memory disorders in temporal lobe epilepsy (TLE) are discussed, along with methodological issues relating to the investigation of subjective memory complaints in people with epilepsy. Variables which affect memory function are also an important consideration here, and they are discussed with respect to the effects of mood and anti-epileptic drugs on memory complaints. Since there is a case for considering memory (as it is assessed by clinical memory tests) and everyday memory as separate entities, there is a discussion of everyday memory and the methods of assessing it. Finally, a new assessment measure is discussed which, it is claimed, has relevance for everyday memory functioning.
1.1 Memory Test Performance In Subjects With Temporal Lobe Epilepsy

There has been a considerable amount of research which has focused on memory in temporal lobe epilepsy. Much of this work has been based on the assumption that people with TLE are expected to show impairments of memory function based on the hypothesis that memory processing is localised largely within the temporal lobes. The discussion of the literature in this section, therefore, considers the evidence for episodic memory impairment in this group, and for the hypothesis that subjects with a left sided epileptic focus will show impairments of verbal memory, and subjects with a right sided focus will show impairments of non-verbal memory. This section begins, however, with a brief discussion of temporal lobe epilepsy, in terms of its nature and heterogeneity.

TLE is a heterogeneous entity. Paradiso et al (1995) proposed that this heterogeneity is not an issue in terms of the pharmacological treatment of TLE, since its treatment does not differ if the site of epileptic focus is defined more precisely than simply within the temporal lobes. Where this heterogeneity is an issue is in terms of the neurosurgical management of TLE, since there are a number of different neuropathologies which underlie it. These include hippocampal sclerosis, and a variety of structural lesions such as tumours, and head injury and stroke. In addition, although the site of the epileptic focus in TLE is in the temporal lobe, seizure activity may spread throughout the brain; there may also be multiple independent sites of focus in TLE (e.g. Kendrick & Gibbs 1957). Yet another source of variability in TLE subjects comes from the underlying neuropathology (as mentioned above). Studies which have selected subjects on the basis of scalp EEG findings or neuropathology have tended to show more consistent results (e.g. Delaney et al 1980, Sailing et al 1993) than studies which have used subjects with a diagnosis of TLE without information pertaining to the underlying pathology.

There is also considerable neuropsychological heterogeneity within TLE. Much of this reported heterogeneity may arise from comparisons of studies which have included two distinct types of subjects. On the one hand, subjects who have undergone (or who are about to undergo) temporal lobectomy, and on the other hand,
subjects who are not considered for neurosurgical intervention for their epilepsy. Intellectual functioning in TLE has been shown to be within normal limits (e.g. Powell et al 1985). Trimble and Thompson (1986), however, caution that IQ measures may not be informative about intellectual functioning in TLE since there is the possibility of confounding effects from anti-epileptic drugs (AEDs) and subclinical epileptic activity. The majority of the neuropsychological investigations of TLE which are reported in the literature, however, have focused on memory functioning. Gist recall is one such area of memory functioning which has been investigated. Prevey et al (1988) investigated recall of information from a narrative passage in subjects with temporal lobe epilepsy, where information in the passage was classified into one of four levels according to how important it was to the story. Both the control and TLE subjects were found to recall more higher level than lower level information units, but overall the TLE subjects recalled less information than the controls. One potential problem with this study, however, was that gist recall was assessed using written recall, whereas the original story had been presented verbally. Had the input and output modalities of the story and response been the same, then it is possible that subjects may have performed differently, and this makes comparisons with the standard clinical practice of spoken recall of a story difficult.

A distinction is also drawn in the literature between deficits in verbal and non-verbal memory processing and associated left and right hemisphere lesions (e.g. Coughlan 1979, De Renzi 1968). It would be expected, therefore, that since the temporal lobes are assumed to be crucial for memory processing (e.g. Milner 1972, Mishkin & Appenzeller 1987) that the verbal/non-verbal memory left/right hemisphere distinction would be seen in TLE. A brief review of this work follows.

In a study of non-surgical subjects with pharmacologically controlled TLE subjects with right or left sided epileptic focus, Delaney et al (1980) found that both groups were impaired on the Logical Memory subtest of the Wechsler Memory Scale (WMS). The two groups were, however, differentiated by their recall of the story after a delay. Here the left sided focus group showed the greatest memory loss. In contrast the right sided focus group were impaired on delayed recall of the WMS Visual Reproduction subtest, and on another test of non-verbal memory function.
This finding of divergent performance by right and left side focus groups only after a delay, has also been demonstrated in a number of other studies. For example, Hermann et al (1987), in a study of pre-surgical and non-surgical TLE subjects found that left side focus subjects showed poorer learning, poorer recall, and poorer semantic organisation after a delay on the California Verbal Learning Test. In contrast, there was no difference between left and right side focus groups on a word recognition task, a finding which has also been reported by Loiseau et al (1983). Mungas et al (1985) reported a similar effect of delayed recall in non-surgical TLE subjects on list learning. It appears then, that the memory disturbance in TLE is relatively subtle, especially in subjects who have not undergone temporal lobectomy.

The literature which shows differential specialisation of the temporal lobes for verbal and non-verbal information is more consistent in showing specialisation of the left temporal lobe for verbal information (e.g. Delaney et al 1980, 1982, Mungas et al 1985, Jones-Gotman et al 1993). Such discrepancies may be due to subject selection or because of confounding verbal compensatory strategies in subjects who have non-verbal memory impairments (Helmstaedter et al 1995). Helmstaedter et al found that although both left and right side focus subjects were impaired on the Benton Visual Retention Test (BVRT) and a test of verbal memory, the right side focus group retained less information from the BVRT as the items became more complex. This, it was proposed, indicates that the right side focus group relied on verbal memory to perform the BVRT, and that the selective impairment in these subjects only became evident when the demands of the items extended the capacity of their verbal memory. It sees then that

'a verbal overload which exceeds the limits of verbal learning and memory ability appears a necessary precondition to isolate visual learning deficits in patients with right sided temporal lobe epilepsy' (Helmstaedter et al 1995, page 354).

Other studies have attempted to demonstrate the verbal/non-verbal memory distinction using recognition memory. For example Morris et al (1995) used the Warrington Recognition Memory Test (RMT) to discriminate between left and right side focus groups who had undergone unilateral temporal lobectomy and found that
the right side focus group were significantly poorer than the left side focus group at recognition of faces, and significantly better than the left side focus group at recognition of words. Overall, both groups were significantly poorer at recognition of faces than words. Morris et al propose that on the RMT, recognition of faces is better at discriminating the two groups, since specificity and sensitivity of face recognition was over 65%, for words. Although specificity was high, the test was relatively insensitive. There are, however, a number of problems which arise when the RMT is used as a means of discriminating patients with verbal and non-verbal memory impairments (see Kapur 1987). Kapur provides a useful critique of this test and argues that faces in the RMT are easily verbalised stimuli and so performance may be affected by compensatory verbalisation strategies. Rapcsak et al (1994), from an in-depth study of 2 subjects with right hemisphere damage proposed that face recognition may require contributions from both hemispheres: local processing by the left hemisphere and more global processing by the right. According to the hypothesis of temporal lobe specialisation, subjects with a left side epileptic focus would be expected to show intact performance on recognition of faces since they are not expected to show impairments of non-verbal memory. Indeed, in the Morris et al study the left side focus group showed intact performance on the Rey Osterrieth Complex Figure test, indicating intact non-verbal memory. These subjects did, however show impaired performance on face recognition on the RMT, which suggests that either subjects were relying on verbalisation in order to recognise the faces with the result that verbal memory impairments in these subjects might have led to impaired faces recognition, or that face recognition on the RMT is sensitive to brain damage. Faces certainly are more complex stimuli than single words, and so it seems that the two components of the RMT are not equivalent assessments of memory.

The research discussed above provides converging evidence for a distinct pattern of memory impairment in TLE. It seems that clear lateralisation effects can be shown, such that right side focus subjects show non-verbal memory impairments and left side focus subjects show verbal memory impairments. Verbal memory impairments in left side focus subjects appear to be easier to demonstrate than non-verbal memory impairments in right side focus subjects. Various explanations for this phenomenon
are offered from the literature, the most satisfactory of which is that non-verbal memory impairments may be mediated by compensatory verbal encoding of visually presented information, including faces. Such clearly lateralised memory impairments may be easier to show in subjects who have undergone temporal lobectomy; impairments in non-surgical cases may be less pure. In addition, it may take specific retrieval conditions for such differences to be seen; for example, only after delayed recall.

1.1.1 The Effects Of Depression And Anxiety On Memory In Subjects With Epilepsy

The preceding discussion alluded to the relationship between mood and memory performance in subjects with epilepsy, and this has been reported in a number of studies. Depression has been found to be higher in subjects with epilepsy in a number of studies (e.g. Brown et al 1986, Indaco et al 1992), and has been proposed to be one of the most frequent psychological complications seen in epilepsy (Betts 1981, Robertson & Trimble 1983). An indication of the seriousness of this issue is that the suicide rate is considerably higher in epilepsy when compared with the rest of the population, and amongst people with epilepsy those with TLE have the highest rate (Baraclough 1981, 1987). Corcoran and Thompson (1993), in their study of 60 subjects drawn from an earlier study (Thompson & Corcoran 1992), used the Beck Depression Inventory (BDI) and the Hospital Anxiety and Depression Scale (HAD) to assess depressive symptomatology in epilepsy. Here, the epilepsy subjects (of unspecified aetiology) reported higher levels of depressive symptomatology on both the BDI and HAD than the controls, and also reported higher levels of anxiety on the HAD. In addition, depressive symptomatology was associated with poor scores on immediate recall of a story, and anxiety was associated with poor performance on both immediate and delayed recall of a story. This finding of higher levels of anxiety amongst patients with epilepsy was not supported, however, by Robertson et al (1994). This difference may be accounted for by the fact that the Robertson et al study considered subjects who had TLE, whereas the Corcoran and Thompson study used subjects with epilepsy of unspecified aetiology. In addition the Robertson et al study used the STAI (Spielberger et al 1971) to assess levels of anxiety, whereas the
Corcoran and Thompson study used the HAD. The Robertson et al study did support the finding of higher levels of depression in TLE subjects compared to control subjects, using a rigorously selected sample of TLE subjects and 5 self-report and clinician rated mood measures.

In an attempt to explain the higher levels of depressive symptomatology seen in epilepsy, Hermann and Wyler (1989) proposed that people with epilepsy may be at risk of becoming depressed because of the psychosocial complications associated with epilepsy. These include potential loss of consciousness leading to embarrassment and potential stigmatisation, vocational problems, the inability to drive, and social exclusion (Dell 1986, Robertson et al 1987). Hermann and Wyler propose that an external locus of control may also lead to epilepsy subjects being as higher risk of becoming depressed. They found that pre-surgical TLE subjects had an external locus of control, and hypothesised that this would change to an internal locus of control following surgery. Although this was not found to be the case, this study did report a significant drop in levels of depressive symptomatology post-surgery in those subjects who became seizure free. For subjects who only had reduced seizure frequency post-surgery, there was no consequent reduction in depressive symptomatology. This is a potentially interesting finding and indicates that those subjects who become seizure free after surgery may have a more optimistic or positive outlook with respect to their epilepsy.

There is an interesting issue here as to whether depression is an understandable reaction to a chronic condition, or whether it is a consequence of the epilepsy itself. Mendez et al (1986) compared depressive symptomatology in a community based sample of subjects with epilepsy with depressive symptomatology in a group of subjects with chronic disability (including subjects with amputations, severe cardiac and pulmonary conditions, and mild cerebral palsy). These authors found that there were more depressive symptoms reported by the subjects with epilepsy, although there was no consistent relationship between depressive symptoms and seizure variables. Other studies have reported that the rate of depression is higher in epilepsy
compared to neurological conditions (e.g. Kogeorgos et al 1982), and so an explanation of Mendez et al's findings in terms of the lack of neurological subjects in the control sample does not seem warranted. Mendez et al also proposed that there may be a relationship between a left hemisphere focus for epilepsy, and depression, possibly due to left hemisphere hypometabolism. This proposal was further investigated by Altshuler et al (1990). These authors found that there was no relationship between side of epileptic focus and anxiety (assessed on the State Trait Anxiety Inventory), but that there were higher rates of depressive symptomatology reported on the BDI in subjects with a left hemisphere epileptic focus. This finding was not related more to differences in medication between left and right side focus groups, and suggests that depression in epilepsy may be related to left hemisphere functioning rather than the epilepsy itself. Altshuler et al propose that impairment to left hemisphere limbic structures may predispose a patient to depression. This proposal is supported by studies of stroke patients which have found that there are higher levels of depression following left hemisphere strokes (Robinson et al 1981, 1982, 1984), again suggesting that this may be a feature of left hemisphere functioning, rather than specific to the left temporal lobe. Lateralisation of TLE in the left temporal lobe is not associated with increased levels of depressive symptomatology in all the reported studies. The relationship has been found to hold only for males (e.g. Strauss et al 1992), and other studies have not found the relationship at all (Robertson et al 1987, Mendez et al 1986). Robertson et al (1994) argue that EEG investigations used to determine laterality of seizure focus may be unreliable (Wyler et al 1989), which may contribute to the equivocal findings in this area.

There are also suggestions in the literature that anti-epileptic drugs (AEDs) can have an effect of depressive symptomatology in TLE subjects. Several studies have suggested that Carbamazepine has beneficial effects on mood (e.g. Robertson et al 1987), and that barbiturate drugs are more associated with negative behavioural changes, with Phenobarbitone associated with higher rates of depressive symptomatology. AED's are discussed in more detail in 1.1.3 below.
This review of the literature on mood in people with epilepsy suggests that people with epilepsy, and especially TLE, report higher levels of depressive symptomatology when compared with non-epilepsy subjects. This is also the case when people with epilepsy are compared with other people with chronic disability. Various explanations are put forward in the literature to account for this raised level of reported depressive symptomatology in subjects with epilepsy. These include the psychosocial consequences of epilepsy, and issues connected with left hemisphere functioning (to explain the higher incidence of depressive symptomatology which is reported in subjects with left side focus epilepsy). Depressive symptomatology here is typically not associated with seizure related variables such as seizure frequency, age at onset, etc. Anxiety is also reported to be more common in subjects with epilepsy, although the findings in this respect are less consistent. The question remains here as to the effects of anxiety and depression on memory performance in these subjects. Corcoran and Thompson (1993) argue that the association of depression and impaired memory in epilepsy is not a simple one and that at present the direction of the relationship is unclear. In the Corcoran and Thompson (1993) study depression was associated with poor performance on immediate story recall and design learning, whilst anxiety was associated with both immediate and delayed story recall. These authors make an interesting point that the practical significance of the relationship is clear, and that interventions aimed at negative mood might have beneficial effects on memory.

1.1.2 The Effects Of Anti-Epileptic Drugs On Cognitive Function and Memory

A number of studies reported in the literature have suggested that anti-epileptic drugs (AEDs) can have adverse effects on cognitive functioning in epilepsy. Some of this research has focused specifically on memory functioning. Although there is a considerable amount of research in this area which has been reported in the literature, recent work has suggested that much of this may be methodologically flawed. Dodrill (1992) has suggested that these methodological flaws relate to a number of factors. Subjects who are included in studies examining the effects of AEDs typically already have established drug regimes. Even when this is not the case, subjects are rarely randomly assigned to an AED because of individual clinical considerations; related to this is that people with more frequent seizures tend to be prescribed more AEDs
A further problem is that where a relationship between an AED and impaired cognitive function is demonstrated, it is tempting to assume that this is due to the effect of the AED. There is, however, evidence to suggest that even before they begin taking AEDs subjects with epilepsy may demonstrate cognitive impairments (e.g. Smith et al 1986). Dodrill further argues that psychological tests which include a timed component are most likely to show effects of AEDs; in these cases it is just as likely that what is being measured is speed of response or speed of information processing, rather than the cognitive function in question.

Despite these problems, a number of themes emerge from the literature on the relationship of AEDs to cognitive function. The cognitive effects of AEDs are seen as being multifactorial in origin and so it is perhaps not surprising that isolating the effects of any one factor such as medication will be fraught with methodological difficulties (Thompson 1992). Thompson and Trimble (1983) found that performance on word recognition differed according to whether drug serum concentration was at peak or trough level, suggesting that the amount of AED in the body can affect cognitive performance. Related to this is the suggestion that more severe cognitive effects are seen with polytherapy (Trimble 1987). Some AEDs appear to have more detrimental effects than others; for example Phenytoin has stronger effects compared to Carbamazepine (Trimble 1987). Despite the evidence from these studies, no firm conclusions can be drawn about the effects of AEDs on cognitive functioning because of the methodological difficulties with this work.

1.2 Everyday Memory: Nature And Assessment

1.2.0 Introduction

Memory problems are a common consequence of many types of brain damage and neurological conditions. Such memory problems are typically assessed using one or more of a number of clinical memory tests which, although often well researched and standardised, may not address the everyday consequences of memory impairments. Clinical tests may show that there is no objective memory impairment when compared
with the general population, yet the person may still be experiencing considerable
problems in everyday life. The converse is also true, with people who show clear
impairment on clinical memory tests experiencing few or no problems in everyday life.
There is now a growing body of work which has looked at these everyday memory
problems (e.g. Sunderland, Harris and Baddeley 1983, 1984; Wilson, Cockburn,
Baddeley and Hiorns 1989; Schachter, Glisky and McGlynn 1990). One aim of this
research has been to attempt to develop ways of predicting which people with
memory problems are likely to experience problems in their everyday lives. This work
has also resulted in assessment measures which are claimed to provide good estimates
of the likelihood of people experiencing such problems (e.g. the Rivermead
Behavioural Memory Test, Wilson et al 1989). Issues relating to everyday memory
research and, in particular, the assessment of everyday memory problems are reviewed
below.

1.2.1 Memory and Everyday Memory

There is a considerable amount of research which has investigated the performance of
subjects with various types and degrees of brain damage (actual or suspected) on both
subjective reports of their memory performance and on clinical memory tests such as
the Wechsler Memory Scale (original and revised versions), the Rey Auditory
Learning Test, and the Recognition Memory Test. In recent years, however, a
growing number of researchers have begun to question the relevance of these clinical
memory tests to memory in everyday life (e.g. Sunderland et al 1983, Wilson et al
1989, Wilson 1993). This process has been largely influenced by the growing interest
in the rehabilitation of memory functions following, for example, head injury, and the
phenomenon (mentioned above) whereby subjects may show differential performance
on clinical memory tests and in everyday life.

1.2.2 Memory Complaints In Subjects With Epilepsy

A number of studies in the literature have investigated the memory complaints of
subjects with epilepsy of unspecified type. Although this research has not specifically
considered memory complaints in subjects with temporal lobe epilepsy, it remains relevant here as a more specific diagnosis may relate only to the site of epileptic focus (see above) and subjects with TLE may experience generalisation of their seizures to other areas. This is an important gap in the literature since, although, the research of epilepsy of unspecified type provides valuable background information, the difficulties faced by people with TLE may be different from the other epilepsies. For example, TLE tends to require more drugs to control it, and people with TLE are more likely to suffer from depression.

One interesting area of research relates to the reliability of subjects' reports of their memory problems. Corcoran and Thompson (1992) compared retrospective and prospective reports of everyday memory problems in order to investigate the hypothesis that subjects were overemphasising the extent of their everyday problems. This overemphasis may be as a consequence of a number of factors, such as subjects having overly high expectations of their memory, or experiencing increased impact from minor memory problems as a consequence of negative mood. In a large study (of 180 subjects) Corcoran and Thompson found that far from overemphasising their everyday difficulties, the epilepsy subjects tended to underestimate them. This study did not, however, include a control group against which to compare the relationship between retrospective and prospective reporting of memory problems. One potential difficulty with this study is that prospective and retrospective reporting of memory difficulties may lead to very different pictures of a memory impairment, since subjects may record every memory problem when reporting prospectively, but only remember particular problems when reporting retrospectively.

Several authors have compared epilepsy subjects' performance on clinical memory tests with their subjective reports of memory difficulties. McGlone and Wands (1994), in a study of subjects before temporal lobectomy and 1 year after, found that although subjects reported improved memory in their subjective ratings, their performance on clinical memory tests had declined 1 year after surgery. Although this appears to indicate that these subjects' subjective reports of their memory functioning were unrealistic, this may have been because the clinical memory tests
used had little relevance to everyday life, and in fact the subjects may not have been experiencing difficulties in everyday life.

Vermeulen et al (1993) also compared epilepsy subjects' subjective memory functioning with their performance on clinical memory tests, with the assumption that these subjective complaints may be related more to psychosocial factors than to the epilepsy itself. Vermeulen et al proposed that people's beliefs about memory may be multidimensional, so that someone may believe, for example, that they have a good memory for faces but a poor memory for names. This reflects the standard approach to assessing memory functions, where memory is assessed using a range of tasks assumed to require reliance on different memory abilities. These authors suggest that the relationship between memory complaint and performance on clinical memory tests may be complex, and report the development of a series of scales designed to tap into different types of subjective memory impairment. In the Vermeulen et al study subjects were given a memory questionnaire, factor analysed into 5 memory factors. Subjects in the study were a group with epilepsy who were to undergo neurosurgical intervention for medication resistant epilepsy, a second group with epilepsy who had been referred for evaluation of subjective memory complaints, and a control group. As might have been expected, the subjective complaint group reported more memory complaints in all 5 areas of the questionnaire. In contrast, the two epilepsy groups were similar in terms of their neuropsychological assessment results. One group of the epilepsy subjects in this study were, however, about to undergo neurosurgery in an attempt to control their seizures, and so were perhaps not an ideal comparison group. It would have been more interesting to have used a group of subjects with epilepsy who did not complain of poor memory, as the pre-surgical subjects in the Vermeulen et al study may have been biased towards underemphasising the chronic nature of their memory difficulties as they were about to undergo potentially beneficial surgery. Vermeulen et al, make this point, and propose instead that it may be the contribution of chronic illness variables rather than epilepsy-related variables which may have affected the level of subjective memory complaint. With respect to the contribution of psychosocial variables to the level of subjective memory complaint, Vermeulen et al found that neuroticism (as measured by a personality
questionnaire) was moderately correlated with subjective memory complaint. Whilst this is conceivable, it is also possible that the contribution of more specific psychological variables such as anxious and depressive symptomatology may be related to level of subjective memory complaint. Such variables might be expected to have an effect such that some individuals may attach unwarranted significance to commonplace memory failures, and as a result may view them as evidence of memory deterioration or impairment (Vermeulen et al 1993).

A moderate relationship between the subjective memory complaints of subjects with epilepsy and their clinical memory test performance was shown by Corcoran and Thompson (1993). In this study subjects who reported more memory problems performed more poorly on 2 out of 6 memory tests when compared with subjects who reported less memory problems. Although there is a methodological problem with this study, in that the questionnaire data relating to subjective memory impairment was collected some time before the memory tests were given, these results are still interesting. The memory tests on which the 'complaining' subjects scored most poorly were story recall and design learning. Story recall is perhaps the most 'real-life' of the memory tests used in the study (Sunderland et al 1986), and so subjects with subjective memory impairment might be expected to perform more poorly on this task. Interestingly in this study, the subjects who complained of more memory problems were using more significantly more memory aids than the non-complaining group. This suggests that subjects who are aware of their memory problems are more likely to use compensatory strategies such as memory aids.

1.2.3 Performance On Tests Of Memory And Everyday Memory In Subjects With Epilepsy

Several studies have compared the performance of the same subjects on clinical memory tests and on tests which are assumed to assess everyday memory performance. These studies have assessed everyday memory using a number of different methods, typically involving the use of questionnaires, checklists, and simulations of everyday memory tasks, and have tended to show moderate
correlations between subjects’ performance on clinical memory tests and their performance on measures designed to address everyday memory functioning. For example, Little et al (1986) compared subjects’ performance on a subjective memory problems questionnaire, and 2 clinical memory tests in normal subjects and found only moderate correlations between the subjective reports and clinical tests. With brain damaged subjects, a similar relationship is seen. For example Sunderland, Harris and Baddeley (1983) found correlations between relatives’ reports of subjects’ memory failures and six out of eight clinical memory tests. Here however, the relatives’ ratings did not correlate with two visual memory tests, which Sunderland et al propose may be because visual memory abilities were not assessed on the subjective questionnaires. This assertion is strengthened by the observation that the strongest correlation between subjective and objective memory in this study was for story recall which is proposed to have a particularly strong relationship with everyday memory (Sunderland et al 1986). Interestingly, in this study there was no correlation between subjects’ own self report of their memory problems, and their performance on clinical memory tests.

1.2.4 The Assessment of Everyday Memory

The studies considered above, which have compared what are assumed to be measures of everyday memory ability, and clinical memory tests may have found only moderate correlations. It is proposed that this is due to the measures designed to assess everyday memory not being direct measures of everyday memory ability. In this section, the discussion focuses on the issues surrounding the assessment of everyday memory ability, including the difficulties in tapping into performance in everyday life. The discussion here also considers the merits of 3 different approaches to the assessment of everyday memory.

i) Questionnaire and checklist approaches
Questionnaire and checklist approaches to the assessment of everyday memory problems are an attempt to capture the nature and extent of the difficulties that people may experience in everyday life. Questionnaires and checklists differ in that
questionnaires are typically retrospective recordings, whereas checklists are typically filled in at or around the time of the memory failure; as such, the two approaches will be considered separately here.

A number of questionnaires have been developed with the aim of assessing everyday memory problems. These include the inventory of Everyday Memory Experiences (IME, Hermann & Neisser 1978), the Subjective Memory Questionnaire (SMQ, Bennett-Levey and Powell 1980), and the Everyday Memory Questionnaire (EMQ, Sunderland et al 1983). These questionnaires typically include questions relating to the frequency of everyday memory failures, where subjects respond to items using a rating scale. There is, however, no opportunity for subjects to rate which everyday memory problems are the most intrusive or worrying. Inherent in the use of self report questionnaires of memory problems is the issue of whether subjects can give an accurate account of their memory difficulties. It is perhaps obvious that subjects with memory problems may not be able to remember instances where they have memory failures. It might also be the case that some people with everyday memory difficulties might be more able to make use of compensatory strategies and as a result experience fewer problems. Schachter et al (1990) argue that people with good insight into their memory problems might realise that there are things that they cannot do and adjust their activities accordingly, whilst others who do not have good insight may be confronted more often with frustrating failures.

In an attempt to overcome some of these problems, several questionnaires also include a relatives' report form, where relatives are asked to rate the frequency of a given set of everyday memory problems for the subject. Sunderland et al (1983) found that the EMQ relatives' form correlated with the subject's performance on clinical tests of everyday memory better than the EMQ self report forms. Schwartz and McMillan (1989) also found that EMQ relatives' form differentiated head injured and non-head injured subjects but that the EMQ self report form did not. For the SMQ, both forms differentiated the two groups, suggesting that the SMQ self report form may be a more sensitive measure of everyday memory problems following head injury than the EMQ self report form. Although relatives' reports appear to have more validity than self reports as measures of everyday memory, there are still
potential difficulties with this approach. The integrity of relatives' reports may be compromised unless the relative is in frequent and close contact with the subject; there would be difficulties, for instance, where the relative was out of the house for all or part of the day. Not all memory failures are obvious to an observer, and so relatives may not be aware that a memory failure has occurred if the subject does not mention it to them. In addition, Wilson et al (1989) argue that there may be potential problems where the relative is elderly, or has memory difficulties themselves.

Despite their shortcomings, memory questionnaires can provide important information about the types of memory problems being experienced, even if they cannot give an accurate picture of the frequency of such problems. Lincoln and Tinson (1989) propose that

> 'the ability of a particular form of measurement depends on the purpose of the assessment. Objective tasks are needed to identify the nature of cognitive deficits in patients with neurological damage. Subjective assessments are useful for identifying problems which affect daily life and planning treatment programs' page 61

There are then, a number of difficulties which arise when self report questionnaires of everyday memory problems are used. Checklists of everyday memory problems may provide an alternative measure of everyday memory which overcome some of the shortcomings of questionnaires. To begin with, most everyday memory checklists are designed to be filled in as soon after a memory failure occurs as possible. To achieve this, subjects are typically instructed to keep the checklist in a place where they will easily see it. Of course, just as everyday memory questionnaires are memory tasks, so are everyday memory checklists. Even if subjects keep their questionnaire in an easily seen location, they still need to remember to fill it in. Checklist reports of everyday memory problems have shown stronger correlations with clinical memory tests when compared against questionnaire reports of everyday memory failures (e.g. Sunderland et al 1983), suggesting that demands on memory are reduced when
checklists are used. The relationship between prospective and retrospective recording of memory failures using checklists has also been examined, and suggests that checklists do provide a more accurate picture of everyday memory problems. For example, Thompson and Corcoran (1992) found that subjects who filled in prospective memory check-lists reported more problems than they had done when they filled out a retrospective memory questionnaire. It is of course, possible that checklists provide merely an alternative, rather than a more accurate picture of everyday memory difficulties. A more accurate picture might only be obtained through direct observation over an extended period of time something which is not feasible.

One example of the use of checklists in this area comes from McKinlay and Hickox (1987). These authors used a memory checklist with three head injured subjects as a measure both of the extent of self reported everyday memory problems, and as a measure of the success of a rehabilitation program. Whilst it is disappointing that such a small sample size was used, and a larger study referred to in the 1987 study was never published, the memory checklist showed promise. The study revealed that the checklist used was a sensitive indicator of change following rehabilitation.

ii) Simulations of everyday activities
An alternative to using subjective reports of everyday memory problems is to use an approach based on simulations of everyday activities. This is the approach which is embodied in the Rivermead Behavioural Memory Test (RBMT, Wilson et al 1985), which contains simulated everyday memory activities selected on the basis of observations of brain injured subjects and memory problems reported by head injured subjects in the study by Sunderland et al (1983). The RBMT was designed to complement existing memory assessment, and to provide a bridge between clinical memory tests and the information contained in questionnaires and observations of everyday memory (Wilson et al 1989). The RBMT undoubtedly avoids some of the shortcomings discussed above with respect to questionnaire and checklist approaches, and appears to have good face validity as a test of everyday memory.
Several studies have looked at the validity of the RBMT both as a test of memory and as a test of everyday memory. Wilson et al (1989) compared the performance of a group of brain damaged and normal subjects on the RBMT and several clinical memory tests, including the Recognition Memory Test, Corsi blocks, and paired associate learning. The brain damaged group in this study were 176 subjects of mixed aetiology (e.g. head injury, CVA, subarachnoid haemorrhage), and there was also a sizeable control group (n = 118). Performance on the RBMT in a subset of the brain damaged sample (n = 80) was also compared against measures of everyday memory, which was assessed here by the number of memory failures observed by therapists over an average of 35 hours per subject. In this study the RBMT was found to be a valid measure of both memory, shown by significant correlations with all the clinical memory tests, and everyday memory, shown by significant correlations with the therapist rating of memory failures. Performance on the RBMT also correlated (although less highly) with a subjective rating of memory by subjects and their relatives. Wilson et al do not report the source of these ratings, but it is assumed that they come from the EMQ, as the items in the RBMT are based partly on problems reported in Sunderland et al (1983).

It is of interest to note here that correlations between subjective ratings of memory problems from subjects and relatives and the clinical memory tests were equally strong in the majority of cases. The exceptions were faces from the Recognition Memory Test where subjects' self rating were more highly correlated than relatives' ratings, words on the RMT, where the reverse pattern occurred, and a measure of speed of access to semantic memory where only the relatives' ratings were correlated (this latter correlation was significant only at the p<.05 level). This similarity between subjects' and relatives' ratings is in contrast to the findings reported by Sunderland et al (1983), and may reflect differences in the samples used in the Wilson et al and Sunderland et al studies. Sunderland et al's brain damaged patients had all sustained head injuries, whereas the subjects in Wilson et al's study were of mixed aetiology, but were treated as a homogeneous group, which makes comparisons with Sunderland et al's subjects difficult in this respect.
A second study (Malec, Zweber and DePompolo 1990) compared the performance of a group of brain damaged subjects on the RBMT with their performance on clinical memory tests and a measure of everyday functioning (the Portland Adaptability Inventory). Again, the brain damaged subjects were a mixed group, containing subjects with traumatic brain injury, penetrating head injury, resected tumours, and anoxia. Malec et al used a more extensive sample of neuropsychological tests than Wilson et al (1989), including the Logical Memory and Visual Reproduction subtests from the Wechsler Memory Scale and the Rey Auditory Verbal Learning Test (AVLT). Here the RBMT was found to correlate with the WMS subtests and AVLT, as well as with the overall Memory Quotient from the WMS, thereby confirming its validity as a general measure of memory. The RBMT was found not to correlate with three out of the four WAIS factors or part B of the Trail Making Test, suggesting that performance on the RBMT is not mediated by intellectual or attentional variables. In the Malec et al study the RBMT did not correlate with subjective or professionals' ratings of memory. However, these rating were based on a broad range of everyday function, (such as "finding interesting things to do with my spare time") not all of which related to everyday memory.

The RBMT then, has validity as a clinical test of everyday memory, shown by its correlation with therapists' ratings and clinical memory test performance. The RBMT does not, however, measure everyday memory in everyday life, and as such there may still be people who perform within normal limits on the simulations in the RBMT but who experience problems in everyday life. This may be because the simulated everyday activities which make up the RBMT are presented in an artificial way and preclude subjects from using any external aids which they would otherwise use (e.g. notes etc.). There remains, then, the need for a clinical test which measures everyday memory in a more naturalistic way.

iii) Memory for recent everyday events
An alternative to assessing everyday memory using questionnaires, checklists and simulations of everyday events is to look at peoples' memory for recent everyday events. Sunderland, Beech and Sheehan (1996) propose that everyday memory depends on orientation to the present, and that as such temporal orientation may be a
The core function of memory. Baddeley (1986) proposes that orientation may be a central function of memory in that it allows us to remember what we have just done and where we have just been, and serves to 'link us with a continuous web of consciousness'. Sunderland et al argue that the discrepancy often seen between neuropsychological test performance and performance in everyday life may in part be accounted for by a better understanding of orientation. People with mild memory problems might be expected to perform within normal limits on clinical memory tests and on tests of orientation (which typically contain a small number of questions about orientation to time and place). These subjects may, however, fail on a task which requires them to retrieve memories of recent events and put them in the order in which they happened.

Several authors have investigated the relationship between orientation (which is generally accepted to be separable into temporal, spatial and personal domains) and memory performance. Cossa et al (1995) investigated the hypothesis that subjects who show impaired performance on traditional orientation tests are impaired for information that needs frequent updating (such as age and day of the week) but not for information that does not change over time (such as date of birth and place of birth). Cossa et al argue that this distinction between variant (updated) information and invariant (constant) information has more explanatory power for cases of disorientation reported in the literature than an explanation of orientation in terms of progressive loss of temporal information, followed by spatial and finally personal information (e.g. Lipowsky 1990). These authors investigated this hypothesis in subjects with Probable Dementia of the Alzheimer Type (DAT) and so there is some danger that their results are confounded by the particular type of general cognitive decline seen in DAT. Nevertheless, their hypothesis was supported in that the DAT subjects showed significantly different performance on the variant and invariant orientation questions. In contrast, healthy aged subjects showed only slightly poorer performance on the variant questions. Cossa et al propose that this variant-invariant distinction may be mediated by attentional factors, with variant questions requiring more effortful retrieval of information in the presence of diminishing attentional resources.
Cooke and Kausler (1995) investigated the relationship between memory for actions and verbal memory, with the assumption that memory for actions is an important skill which may influence everyday functioning. For example, it is important for remembering details as such as ‘did I switch the oven off?’, and for remembering the temporal order of actions. Subjects in this study were requested to perform a set of everyday actions to command (e.g. buttoning a shirt, opening an umbrella) and a set of unusual actions (e.g. stirring water with a piece of chalk). Subjects with traumatic brain injury (TBI) were impaired at both recalling the content of the actions and reconstructing the events in the correct temporal order and were impaired on measures of verbal memory relative to control subjects. Cooke and Kausler interpreted these results in terms of diminished proficiency of effortful recall following TBI, since the TBI subjects were poorer at recall of the actions compared with recognition. They further proposed that memory for actions may be more related to everyday memory than is the case for verbal memory, and that this may account for the limited relationship between everyday memory and performance on verbal memory tasks.

These two studies, then, implicate both verbal memory and attentional processes in successful performance on questions which are assumed to relate to orientation. It is suggested that memory for the content and temporal order of actions are important for everyday functioning, at least in people with one type of acquired brain damage. It is also suggested by Cooke and Kausler that memory for actions is rehearsal-independent, i.e. that intention to remember the actions does not enhance performance. It should be the case, then, that subjects’ memory for actions they have recently performed in a non-laboratory situation should have implications for their everyday memory functioning.

The Current Orientation Test (COT, Sunderland, Beech and Sheehan (1996)) is a recent attempt at assessing everyday memory using recently performed everyday actions, by allowing a direct assessment of everyday recent knowledge. The COT is, however, more than an attempt to look at temporal orientation; rather it aims to address temporal orientation as a core function of memory in everyday life. It was designed as a means of assessing the effects of normal ageing on awareness of the
current temporal context in everyday life, and as such was found to have a specific relationship to everyday episodic memory, but not to semantic memory. A similar distinction between preserved semantic memory ability and impaired episodic memory has been demonstrated in epilepsy by Nilsson et al (1984). Sunderland et al found that although older subjects performed at a normal level on a clinical test of orientation (from the Rivermead Behavioural Memory Test, which uses both variant and invariant orientation questions), they were slower at producing and ordering examples of recent everyday events when compared against a group of younger subjects. The older subjects were also less consistent at placing the items in the order that they had occurred over two separate trials. Sunderland et al argue that this decline in performance with age may indicate that the COT is a measure of episodic memory (which also shows deterioration with age).

The COT does not allow for objective checking of the accuracy of the recent everyday events which are recalled, but it does provide information about speed of responding, and the detail and consistency of responses. One feature of the COT is that subjects are required to sequence items in temporal context on two separate trials, which allows examination of the consistency of sequencing over these two trials. In the Sunderland, Beech and Sheehan study older subjects were less consistent in sequencing over the two trials when compared to younger subjects. This difference in the consistency of sequencing items over the two trials may be explained in terms of subjects on the second trial attempting to remember the sequencing order from the first trial, rather than the actual order in which the recent everyday events occurred. Sunderland et al do not say which explanation they favour for the lack of consistency in sequencing across the two trials for their older subjects, although the implication is that sequencing on the second trial is not on the basis of incidental memory. Sunderland and Beech (1996) report a recent study where the COT was given to elderly subjects with an interpolated task where subjects made judgements about the original order of presentation. Here there was no interference from the interpolated task. This lack of interference on the consistency of ranking further suggests that subjects are not relying on their incidental memory for the order of sequencing on part 1. In the Sunderland et al (1996) study the older subjects were able to retrieve the same examples of the everyday events over the two trials and it is likely that this is
mediated by automatic awareness of recent everyday events. In contrast, remembering the order in which recent everyday events occurred may be mediated more by effortful processing. It seems then that the inconsistency in sequencing across parts 1 and 2 of the COT in these elderly subjects suggests something about the integrity of episodic memory, rather than a reliance on incidental memory.

1.3 Hypotheses

The present study aims to test the following hypotheses:

1. The primary hypothesis is that the COT is a sensitive measure of everyday memory functioning in temporal lobe epilepsy. As such, subjects with TLE should show impaired performance on the COT relative to control subjects. More specifically, it is suggested that the TLE subjects will show less consistent sequencing of items over the two trials of the COT.

2. A second important hypothesis is that the COT will correlate with performance on the Rivermead Behavioural Memory Test (RBMT), and a self-report checklist of everyday memory failures, thereby showing its validity as a measure of everyday memory function. It was expected that these correlations would be moderate, since previous research has shown only moderate relationships between checklist measures of everyday memory problems and the RBMT.

3. A third hypothesis is that subjects with TLE will have impaired memory functioning, shown by poor performance on the Recognition Memory Test. Furthermore, it is expected that subjects with a right side epileptic focus would show impaired performance on recognition of faces on the RMT, and subjects with a left sided epileptic focus would show impaired performance on recognition of words on the RMT.

4. A further subsidiary hypothesis is that TLE subjects will report more everyday memory problems than control subjects on a self-report checklist of everyday memory failures.
5. A final subsidiary hypothesis is that TLE subjects will report higher levels of anxiety and depression on the Hospital Anxiety and Depression Scale compared with control subjects.
2 METHODOLOGY

2.1.1 Subjects

Subjects were recruited through the Consultant Neurologists at Queen's Medical Centre in Nottingham. Subjects were selected from the current patients of these Consultants, with the selection requirements that they had a diagnosis of temporal lobe epilepsy, and were aged between 16 and 65 years of age. Those subjects whose medical notes noted that they had learning disabilities were not selected for the study in order to make it more likely that the subjects would be of equivalent IQ levels. 39 suitable subjects were identified and each was sent a letter explaining the purpose of the study and asking them for their written consent to take part in the study (see appendices 1 and 2).

Of the 39 subjects identified, 25 (64%) replied to the initial letter (or a reminder letter) and of these 20 were included in the study; the 5 who were not included were unable to arrange a suitable appointment time. Table 1 below shows the relevant information pertaining to gender, occupation, estimated intellectual level, and relevant medical history for both the TLE and control subjects. For the TLE group, the median age of onset of their epilepsy was 17 years (range 1-55). The TLE subjects were taking a variety of anti-epileptic drugs (AEDs) to control their epilepsy. The median number of AEDs was 2 (range 1-3), and in total the TLE subjects were taking 8 different AEDs, the most common of which was Carbamazapine (16 subjects). Subjects were on a variety of different combinations of these 8 AEDs. A list of the medication taken by each subject is given in appendix 3. 5 of the TLE subjects had a right sided focus for their epilepsy, 5 had a left sided focus, 4 had bilateral foci, and 6 had no clearly lateralised focus. Site of focus was determined by examination of reports of EEG recordings and CT and MRI scans in the medical notes. All the subjects were given the National Adult Reading Test (NART) in order to obtain an estimate of their premorbid Full Scale IQ; the median scores of the 2 groups are given in table 1.
Table 1: TLE and Control Group Comparison Data

<table>
<thead>
<tr>
<th></th>
<th>TLE Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>14 Women</td>
<td>12 Women</td>
</tr>
<tr>
<td></td>
<td>6 Men</td>
<td>9 Men</td>
</tr>
<tr>
<td>Years of Education</td>
<td>Median 11.5</td>
<td>Median 11</td>
</tr>
<tr>
<td></td>
<td>Range 10-16</td>
<td>Range 8-16</td>
</tr>
<tr>
<td>Age</td>
<td>Median 43</td>
<td>Median 47</td>
</tr>
<tr>
<td></td>
<td>Range 19-59</td>
<td>Range 20-70</td>
</tr>
<tr>
<td>Occupation</td>
<td>11 Housewives</td>
<td>3 Housewives</td>
</tr>
<tr>
<td></td>
<td>4 Professional</td>
<td>8 Professional</td>
</tr>
<tr>
<td></td>
<td>2 Shop/Manual</td>
<td>8 Shop/Manual</td>
</tr>
<tr>
<td></td>
<td>2 Students</td>
<td>2 Students</td>
</tr>
<tr>
<td></td>
<td>1 Unemployed</td>
<td></td>
</tr>
<tr>
<td>NART Estimated Full Scale IQ</td>
<td>Median 105.5</td>
<td>Median 99</td>
</tr>
<tr>
<td></td>
<td>Range 73-124</td>
<td>Range 87-122</td>
</tr>
<tr>
<td>Neurological History</td>
<td>1 Head Injury</td>
<td>3 Minor Head Injuries</td>
</tr>
<tr>
<td></td>
<td>1 Arachnoid Cyst</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2 Migraines</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 Stroke</td>
<td></td>
</tr>
<tr>
<td>Other Relevant Information</td>
<td>1 pregnant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 with dyslexia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 with haemophilia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 with hypothyroidism</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 with kidney transplant</td>
<td></td>
</tr>
<tr>
<td>Memory Aids</td>
<td>Mean 3.85</td>
<td>Mean 3.19</td>
</tr>
<tr>
<td></td>
<td>SD 1.28</td>
<td>SD 1.33</td>
</tr>
</tbody>
</table>

Once subjects had agreed to take part in the study, a visit was arranged in order to carry out the assessments. Subjects were asked if they could arrange for a friend, neighbour, or relative to be present at the same time in order to act as a control subject in the study. In all 21 control subjects were recruited for the study. Table 1 above shows the comparison between the age, years of education, and NART estimated Full Scale IQ of the control and TLE subjects. None of these differences between the 2 groups was significant. 3 of the control subjects had suffered minor head injuries, but were all living and functioning independently within the community.

A questionnaire was also sent to each potential subject requesting details of occupation, years of education, age at onset of epilepsy, current medication, history of head injury, stroke, and neurological illness, and asking if they used any of 7 common memory aids (the questionnaire is reproduced in appendix 4). Table 1 also shows the median number of memory aids used by the 2 groups; the TLE group reported the use
of more memory aids than the controls (Mann-Whitney z = -1.912, p<.03). For the TLE group the most commonly reported memory aids were a notebook or diary, lists of notes, putting something in a special place so it will be seen, and asking to be reminded of something at the right time.

The questionnaire also asked subjects to rate their memory according to one of four statements; these were (a) 'no nuisance', (b) 'only a slight nuisance', (c) 'a moderate nuisance', and (d) 'a serious nuisance' (Corcoran and Thompson 1993). For ease of analysis of this data, the categories were collapsed into a 'little nuisance' group (subjects who responded (a) or (b)), and a 'nuisance' group (subjects who responded (c) or (d)). There were 15 subjects in the 'little nuisance' group and 5 in the 'nuisance' group. Mann-Whitney tests revealed that these groups did not differ significantly with respect to age, years of education, age at onset of epilepsy, or estimated Full Scale IQ. Table 2 below shows the breakdown of the groups by age, years of education, estimated Full Scale IQ and age at onset of epilepsy.

<table>
<thead>
<tr>
<th></th>
<th>Little Nuisance Group</th>
<th>Nuisance Group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td>Median 43</td>
<td>Median 47</td>
</tr>
<tr>
<td></td>
<td>Range 19-59</td>
<td>Range 24-56</td>
</tr>
<tr>
<td><strong>Years of Education</strong></td>
<td>Median 11</td>
<td>Median 13</td>
</tr>
<tr>
<td></td>
<td>Range 10-19</td>
<td>Range 10-18</td>
</tr>
<tr>
<td><strong>Estimated Full Scale IQ</strong></td>
<td>Median 101</td>
<td>Median 111</td>
</tr>
<tr>
<td></td>
<td>Range 73-120</td>
<td>Range 85-124</td>
</tr>
<tr>
<td><strong>Age at Onset of Epilepsy</strong></td>
<td>Median 16</td>
<td>Median 18</td>
</tr>
<tr>
<td></td>
<td>Range 1-52</td>
<td>Range 16-55</td>
</tr>
</tbody>
</table>

**2.1.2 Procedure**

i) **Current Orientation Test** (Sunderland, Beech & Sheehan, 1996)

The procedure for administering the COT was as described by Sunderland et al (1996), and in appendix 5. This was introduced to subjects with the following instructions:
'I want to find out how well you can remember details of things you have done recently. I am going to read you out some everyday actions and for each one I want you to tell me when you last did it. An example might be 'when did you last put on your outdoors coat?'; so can you tell me when you did last put on your outdoors coat? (subjects answers). The kind of thing I want you to tell me is when you last did the action, and in what context'.

The subjects were read each item and shown a white laminated card with the everyday action printed on it; a list of the COT items can be found in appendix 6. Subjects' responses to each item were written down verbatim, and the time from the end of reading the item out and the subject responding was timed with a stop-watch. If subjects gave insufficient detail they were prompted to give a more specific example. Subjects were then asked to lay the items out in the order that they last did them, with the most recent at one end and the furthest away at the other. The order of the cards and the time taken to order them was recorded. The COT was administered twice in exactly the same format, with the Recognition Memory Test as a filler between the two presentations (see below). On the second presentation of the COT subjects were instructed as described below. Subjects were then asked to rank the actions in the order that they last did them. Information relating to time of response, verbatim response and time to rank the items was recorded as before.

'you remember that I asked you if you could remember when you last did a number of everyday actions. I would like to ask you those questions again. The procedure is the same as before: I will describe an everyday action and I would like you to tell me when you last did it'
ii) Recognition Memory Test (RMT)
The RMT (Warrington, 1984) was administered to each subject as detailed in the test manual. The RMT was used here as a measure of recognition memory performance, and as a potential means of discriminating between the memory performance of subjects with left or right sided foci for their temporal lobe epilepsy. The RMT was also a convenient filler item between the two presentations of the COT.

iii) Rivermead Behavioural Memory Test (RBMT)
The RBMT was used as a way of assessing everyday memory functioning in the temporal lobe epilepsy subjects, both as a measure of everyday memory performance, and to allow comparison with subjects' performance on the COT. The test was administered as detailed in the test manual.

iv) Hospital Anxiety and Depression Scale (HAD)
The HAD was included in order to provide a measure of the subjects' reported symptoms of anxiety and depression. Subjects were told that the HAD was a test of mood, of how they have been feeling generally over the last week. They were requested to read each item and tick one box which corresponded to how they had been feeling in the last week. Subjects were asked to respond to each item quickly rather than spend a long time answering the items. Zigmund and Snaith (1983) recommend that a score of 9 or above on either of the HAD subscales should be considered as indicative of the presence of mood disorder.

v) Memory Checklist (MC)
The Memory Checklist (McKinlay & Hickox 1987) was included as a means of obtaining prospective recordings of the subjects' memory failures. Subjects were told that the checklist contained 14 common memory failures experienced by people in general. Subjects were asked to fill out the memory checklist for a week and to record each occurrence of a memory failure; they were told that if one memory failure occurred several times in one day that they were to put a tick for each time it occurred. Subjects were asked to keep the checklist in a place where it would be regularly seen throughout the day, such as by the kettle or telephone. Subjects were
provided with a stamped addressed envelope in which to return the checklist after 1 week. The checklist is reproduced in appendix 7.

The order of presentation of the assessments was as set out in Table 3 below.

Table 3: Order of Presentation for TLE and Control Subjects

<table>
<thead>
<tr>
<th>TLE SUBJECTS</th>
<th>CONTROL SUBJECTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Adult Reading Test</td>
<td>National Adult Reading Test</td>
</tr>
<tr>
<td>Current Orientation Test Part 1</td>
<td>Current Orientation Test Part 1</td>
</tr>
<tr>
<td>Recognition Memory Test</td>
<td>Recognition Memory Test</td>
</tr>
<tr>
<td>Current Orientation Test Part 2</td>
<td>Current Orientation Test Part 2</td>
</tr>
<tr>
<td>Rivermead Behavioural Memory Test</td>
<td>Hospital Anxiety and Depression Scales</td>
</tr>
<tr>
<td>Hospital Anxiety and Depression Scales</td>
<td>Memory Checklist</td>
</tr>
<tr>
<td>Memory Checklist</td>
<td></td>
</tr>
</tbody>
</table>

2.1.3 Analysis

Since the bulk of the data yielded scores based on rating scales, which did not have interval properties, nonparametric statistics were used to analyse this data. Visual inspection of the frequency histograms of the scores which had interval properties (e.g. time taken to sequence items in the COT, and normalised scores from the RMT) revealed that these scores were not normally distributed; as a result these scores were also analysed using nonparametric statistics. All significance levels reported are for 1 tailed tests, unless otherwise stated, and all tests are Mann-Whitney tests unless otherwise stated. Full data were not available for the following measures. On the COT sequencing times were unavailable for 1 TLE subject, and sequencing time and order of sequencing were unavailable for 1 control subject on Part 2. On the Rivermead Behavioural Memory Test data were unavailable for 1 subject. For the Memory Checklist data were only available for 16 TLE subjects and 16 control subjects.
3 RESULTS

3.1 Memory Impairments in the TLE Group

Evidence from the literature suggests that people with temporal lobe epilepsy have impaired memory functions. One of the hypotheses proposed in this present study was that the TLE group would show impaired everyday memory functioning on the RBMT. In order to determine whether this was the case, the performance of the TLE group on the RBMT was compared against that of the RBMT standardisation sample. Scores on the RBMT can be expressed in a number of ways, but for the purpose of this comparison the scores were expressed as standardised profile scores (STPS). 89% of the TLE subjects' STPSs were below the mean of the standardisation sample, with 62% more than 2 standard deviations below. When the TLE subject's scores were classified according to the criteria for level of memory function given in the RBMT manual, 4 subjects were classified as normal (21%), 9 were classified as having poor memory (47%), and 6 were classified as moderately impaired (32%). In all, 79% of the TLE group showed some evidence of memory dysfunction on the RBMT.

The TLE subjects' standardised profile scores from each of the RBMT subtests were also examined. Table 4 below shows the percentage of TLE who were impaired relative to the standardisation sample on each of the RBMT subtests. The percentage figures in the 'Number Below RBMT Standardisation Mean' column refer to the percentage of the TLE group; percentage figures in the 'Number 2 SD Below' column refer to the percentage of the subjects in column 2 who were more than 2 standard deviations below the mean.

Table 4 shows that when subjects were impaired on a particular subtest, this impairment tended to be of the magnitude of more than 2 standard deviations below the RBMT standardisation sample's mean. There were 4 subtests where approaching half of the TLE subjects were impaired: Belonging, Message, Immediate Story, and
Delayed Story. These findings provide evidence that the TLE subjects are impaired on a number of the simulated everyday memory tasks on the RBMT.

Table 4: Percentages of TLE Subjects who were Impaired on each RBMT Subtest

<table>
<thead>
<tr>
<th>RBMT Subtest</th>
<th>Number Below RBMT Standardisation Mean</th>
<th>Number 2 SD Below</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>6 (32%)</td>
<td>4 (67%)</td>
</tr>
<tr>
<td>Belonging</td>
<td>9 (47%)</td>
<td>6 (67%)</td>
</tr>
<tr>
<td>Appointment</td>
<td>6 (32%)</td>
<td>3 (50%)</td>
</tr>
<tr>
<td>Pictures</td>
<td>3 (16%)</td>
<td>3 (100%)</td>
</tr>
<tr>
<td>Immediate Route</td>
<td>4 (21%)</td>
<td>4 (100%)</td>
</tr>
<tr>
<td>Delayed Route</td>
<td>6 (32%)</td>
<td>1 (17%)</td>
</tr>
<tr>
<td>Message</td>
<td>9 (47%)</td>
<td>3 (33%)</td>
</tr>
<tr>
<td>Orientation</td>
<td>5 (26%)</td>
<td>2 (40%)</td>
</tr>
<tr>
<td>Date</td>
<td>1 (5%)</td>
<td>1 (100%)</td>
</tr>
<tr>
<td>Faces</td>
<td>5 (26%)</td>
<td>5 (100%)</td>
</tr>
<tr>
<td>Immediate Story</td>
<td>10 (53%)</td>
<td>4 (40%)</td>
</tr>
<tr>
<td>Delayed Story</td>
<td>9 (47%)</td>
<td>9 (100%)</td>
</tr>
</tbody>
</table>

3.2 Comparisons with Control Subjects

Having seen that the TLE group showed impaired everyday memory performance on the RBMT, the next step was to determine whether they performed differently on the other assessments. Given that the COT is assumed to assess everyday memory functioning, the most interesting comparison here was to see whether the TLE group would show impaired performance on the COT, compared to the controls. The TLE and control groups performances were also compared against each other for each of the assessments.

3.2.1 Current Orientation Test

On the COT, neither group had difficulty in carrying out the test or producing examples of all the everyday events, except for item 15 ("when did you last suffer a blow, a fall or a cut?"), where several subjects had difficulty in remembering the last
occurrence. Table 5 below shows a summary of the results from the COT for parts 1 and 2 for both groups of subjects.

Table 5: Summary of Performance on the COT

<table>
<thead>
<tr>
<th></th>
<th>TLE</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Part 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of events recalled</td>
<td>Median 14</td>
<td>Median 15</td>
</tr>
<tr>
<td>Range</td>
<td>13-15</td>
<td>13-15</td>
</tr>
<tr>
<td>Number in 5 seconds</td>
<td>Median 11.5</td>
<td>Median 13.5</td>
</tr>
<tr>
<td>Range</td>
<td>6-15</td>
<td>9-15</td>
</tr>
<tr>
<td>Sequencing time in seconds</td>
<td>Median 136.5</td>
<td>Median 84</td>
</tr>
<tr>
<td>Range</td>
<td>62-355</td>
<td>53-370</td>
</tr>
<tr>
<td><strong>Part 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of events recalled</td>
<td>Median 14</td>
<td>Median 15</td>
</tr>
<tr>
<td>Range</td>
<td>13-15</td>
<td>13-15</td>
</tr>
<tr>
<td>Number in 5 seconds</td>
<td>Median 15</td>
<td>Median 15</td>
</tr>
<tr>
<td>Range</td>
<td></td>
<td>13-15</td>
</tr>
<tr>
<td>Sequencing time in seconds</td>
<td>Median 114.5</td>
<td>Median 78</td>
</tr>
<tr>
<td>Range</td>
<td>50-256</td>
<td>47-192</td>
</tr>
</tbody>
</table>

Part one:
Table 5 shows that the TLE subjects produced a median of 14 events, and the controls a median of 15. When the speed of responding and sequencing the items were examined, the control group produced significantly more correct responses within 5 seconds than the TLE group ($z = -2.124$, $p < .02$), and were significantly faster at sequencing the items in temporal order ($z = -1.883$, $p < .03$).

Part two:
Table 5 shows that both groups produced a similar median number of events for parts 1 and 2. As was the case for part 1, the controls were again, significantly faster at sequencing the items in temporal order ($z = -2.417$, $p < .008$). Both groups showed a significant reduction in the time taken for sequencing the items in temporal order from part 1 to part 2 (controls: Wilcoxon $z = -2.837$, $p < .002$; TLE: Wilcoxon $z = -2.254$, $p < .01$). There was also a significant difference in terms of the number of items responded to within 5 seconds on part 1 and part 2 for both groups (controls: Wilcoxon $z = 3.724$, $p < .0001$; TLE: Wilcoxon $z = -3.621$, $p < .0002$)
Since the subjects had 2 opportunities to rank the items in temporal order, it is possible that the same items could be ranked differently in the 2 trials. Rank correlation coefficients were, therefore, calculated for each subject between their sequencing of events in part 1 and part 2. Once these had been calculated, their spread was found to be very narrow, and so in order to allow the differences between the coefficients to be seen more clearly, coefficients of determination were calculated by squaring the rank correlation coefficients; coefficients of determination also provide a less skewed distribution than correlation coefficients. The median of the coefficients of determination for the TLE group was 0.938 (range 0.536-0.993) and for the control group was 0.934 (range 0.613-0.997); this difference was not significant (2 tailed z = -0.412, N.S.), thereby indicating that both groups were as consistent in sequencing the items on the first and second trials, and that there was no difference between the two groups.

Since the two groups of subjects did not differ significantly in their ranking across the two trials, correlations for each item across the two trials were calculated in order to elucidate any differences between the two groups. Again, these correlations were converted into coefficients of determination, which are shown below in table 6.

**Table 6: Coefficients of Determination for Individual Items**

<table>
<thead>
<tr>
<th>Item</th>
<th>TLE Mean Rank and Range (Part 1)</th>
<th>Control Mean Rank and Range (Part 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Door</td>
<td>0.570 12.95 (6-15)</td>
<td>0.298 14.33 (12-15)</td>
</tr>
<tr>
<td>Out-of-doors</td>
<td>0.861 8.7 (3-15)</td>
<td>0.630 9.71 (3-14)</td>
</tr>
<tr>
<td>Drink</td>
<td>0.755 11.2 (7-15)</td>
<td>0.175 10.81 (6-15)</td>
</tr>
<tr>
<td>Switch</td>
<td>0.391 11.1 (5-15)</td>
<td>0.438 11.29 (2-14)</td>
</tr>
<tr>
<td>Tap</td>
<td>0.691 10.55 (5-14)</td>
<td>0.566 9.57 (3-15)</td>
</tr>
<tr>
<td>Write</td>
<td>0.518 6.75 (2-15)</td>
<td>0.719 6.95 (2-15)</td>
</tr>
<tr>
<td>Animal</td>
<td>0.743 9.25 (2-15)</td>
<td>0.901 10.14 (3-15)</td>
</tr>
<tr>
<td>TV/Radio</td>
<td>0.716 9.45 (3-15)</td>
<td>0.508 8.86 (3-13)</td>
</tr>
<tr>
<td>Drawer</td>
<td>0.832 8.6 (4-13)</td>
<td>0.783 7.57 (4-13)</td>
</tr>
<tr>
<td>Open jar</td>
<td>0.731 8.1 (2-14)</td>
<td>0.654 7.43 (3-12)</td>
</tr>
<tr>
<td>Buy</td>
<td>0.704 6.4 (2-13)</td>
<td>0.594 4.71 (2-10)</td>
</tr>
<tr>
<td>Chat</td>
<td>0.799 5.8 (1-13)</td>
<td>0.526 6.05 (1-14)</td>
</tr>
<tr>
<td>Telephone</td>
<td>0.407 5.6 (2-13)</td>
<td>0.869 7.76 (2-14)</td>
</tr>
<tr>
<td>Bus/train</td>
<td>0.966 2.75 (1-9)</td>
<td>0.585 2.29 (1-10)</td>
</tr>
<tr>
<td>Blow/cut</td>
<td>0.655 2.7 (1-15)</td>
<td>0.552 2.24 (1-12)</td>
</tr>
</tbody>
</table>
Table 6 shows that the TLE group produced a median coefficient of determination of 0.716 (range 0.391-0.966), and the controls produced a median of 0.585 (range 0.175-0.869). This difference was not significant, although it approached significance (p<.065) (z = -1.389, N.S.). It is of interest to note that the median of the TLE group was higher than that of the controls, and on 11 out of the 15 items the TLE group's coefficients of determination were higher.

3.2.2 Warrington Recognition Memory Test

Subjects' scores on the RMT were converted into age related normalised scores, as detailed in the test manual (Warrington 1984). Table 7 below shows the median and range of these scores for the TLE subjects and controls on the RMT words and faces (age normalised scores).

<table>
<thead>
<tr>
<th></th>
<th>TLE</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RMT Words</strong></td>
<td>Median 9</td>
<td>Median 11</td>
</tr>
<tr>
<td></td>
<td>Range 3-13</td>
<td>Range 7-15</td>
</tr>
<tr>
<td><strong>RMT Faces</strong></td>
<td>Median 10</td>
<td>Median 8</td>
</tr>
<tr>
<td></td>
<td>Range 4-15</td>
<td>Range 4-13</td>
</tr>
<tr>
<td><strong>HAD Anxiety</strong></td>
<td>Median 10.5</td>
<td>Median 7</td>
</tr>
<tr>
<td></td>
<td>Range 3-16</td>
<td>Range 2-16</td>
</tr>
<tr>
<td><strong>HAD Depression</strong></td>
<td>Median 6.5</td>
<td>Median 3</td>
</tr>
<tr>
<td></td>
<td>Range 0-17</td>
<td>Range 0-8</td>
</tr>
</tbody>
</table>

The control group were significantly better than the TLE group on recognition of words (z = -1.906, p<.03). For faces, there was no significant difference between the two groups (z = 0.918, N.S.). When performance on words and faces was compared within the groups, the TLE group did not differ significantly on recognition of words and faces (Wilcoxon z = -0.483, N.S.). The control subjects, however, were significantly better at recognition of words (Wilcoxon z = -3.173, p<.0008). Performance on word recognition on the RMT was also found to be correlated with the total Standardised Profile Score on the RBMT (r = 0.605, p<.01).
3.2.3 Hospital Anxiety and Depression Scale

The HAD yields scores for both Anxiety and Depression subscales, and for each of the 14 individual items; only the Anxiety and Depression scores are considered here. Table 7 above shows the median and range of the scores for the TLE and control groups for these subscales of the HAD. The differences between the 2 groups were significant for both Anxiety ($z = -1.93$, $p<.03$) and Depression ($z = -2.415$, $p<.008$). When the scores were categorised according to the cut-off of 9 points, 12 of the TLE subjects scored as 'anxious' compared to 7 of the controls, whilst 6 of the TLE group scored as 'depressed', compared to none of the controls.

3.2.4 Memory Checklist

The memory checklists were completed and returned by 80% of the TLE group and 76% of the control group. Scores were calculated for the total number of reported memory failures. The TLE group reported a median of 12.5 memory failures for the week (range 1-39); the control group reported a median of 8 memory failures (range 1-19). This difference between the 2 groups was not significant ($z = -1.529$, N.S.).

3.3 Comparison With Other Measures

Data from the COT were correlated with data from the other measures used in the study. Of specific interest were correlations between the COT and the RBMT. Since both measures are thought to address everyday memory functioning, correlations between performance on the two measures would be expected. Correlation Coefficients (2 tailed) for the TLE group are given in table 8 below; the RBMT scores cited are standardised profile scores (STPS). The asterisks refer to the following significance levels (2 tailed): *$p<.05$, **$p<.01$, ***$p<.005$. Table 8 also shows correlation coefficients for immediate and delayed story recall from the RBMT (total score), the HAD, RMT (age normalised scores), Memory Checklist total (MC), and the COT.
Table 8: Spearman Correlation Coefficients for the COT with Other Measures: TLE Subjects

<table>
<thead>
<tr>
<th></th>
<th>RBMT STPS</th>
<th>STORY RECALL</th>
<th>RMT</th>
<th>HAD</th>
<th>MC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part 1: No. in 5 seconds</td>
<td>0.33</td>
<td>imm 0.02</td>
<td>words 0.08</td>
<td>dep -0.12</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>del 0.22</td>
<td>faces 0.13</td>
<td>anx 0.00</td>
<td></td>
</tr>
<tr>
<td>Part 1: sequencing time</td>
<td>-0.35</td>
<td>imm -0.03</td>
<td>words 0.62**</td>
<td>dep -0.03</td>
<td>-0.29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>del -0.19</td>
<td>faces 0.46*</td>
<td>anx -0.35</td>
<td></td>
</tr>
<tr>
<td>Part 2: sequencing time</td>
<td>-0.52*</td>
<td>imm 0.08</td>
<td>words -0.40</td>
<td>dep -0.07</td>
<td>-0.49</td>
</tr>
<tr>
<td></td>
<td></td>
<td>del -0.27</td>
<td>faces 0.00</td>
<td>anx 0.11</td>
<td></td>
</tr>
<tr>
<td>Decrease in sequencing time</td>
<td>-0.18</td>
<td>imm 0.67***</td>
<td>words 0.39</td>
<td>dep -0.02</td>
<td>0.20</td>
</tr>
<tr>
<td></td>
<td></td>
<td>del -0.06</td>
<td>faces 0.07</td>
<td>anx -0.51*</td>
<td></td>
</tr>
<tr>
<td>Correlation: part 1 &amp; 2</td>
<td>0.48*</td>
<td>imm 0.48*</td>
<td>words 0.45*</td>
<td>dep 0.06</td>
<td>0.26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>del 0.27</td>
<td>faces 0.06</td>
<td>anx 0.02</td>
<td></td>
</tr>
</tbody>
</table>

Table 8 shows that there were two significant correlations between the RBMT and the COT, for sequencing time on part 2 and consistency of sequencing across part 1 and part 2. These were, however, moderate. The COT also correlated significantly with the age normalised score for words and faces on the RMT but again, these correlation was only moderate. There were no significant correlations between the COT and either reported failures on the Memory Checklist, or Depression from the HAD, indicating that there was no relationship between performance on the COT and either self report of memory failures, or depression, although there was a moderate relationship with anxiety.

For the control group there were no significant correlations between the COT and any of the other measures.

Since the COT aims to assess everyday memory, it is of interest to see how well the RBMT correlated with the other measures given to the TLE subjects. Table 9 below shows these correlation coefficients.
Table 9: Spearman Correlation Coefficients for RBMT Total STPS with Other Measures

<table>
<thead>
<tr>
<th>HAD anxiety</th>
<th>HAD depression</th>
<th>RMT words</th>
<th>RMT faces</th>
<th>Immed. story recall</th>
<th>Delayed story recall</th>
<th>MC total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.07</td>
<td>0.04</td>
<td>0.61**</td>
<td>-0.25</td>
<td>0.29</td>
<td>0.49*</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Table 9 shows that the TLE subjects' performance on the RBMT correlated significantly with performance on word recognition and delayed story recall (total score from the RBMT), although these correlations were moderate. Interestingly, there was no significant correlation between the RBMT and the total failures reported on the Memory Checklist, and no significant correlation with the self-report mood measures.

3.4 Comparisons Within The TLE Group

3.4.1 Memory rating:

In order to determine the relationship between the subjects' ratings of their memory performance (from the initial questionnaire) and the actual number of memory failures they reported over the period of a week, their memory ratings were correlated with their total score on the Memory Checklist using Spearman Rank Order Correlation Coefficients. This correlation was not significant ($r_s = 0.361$, N.S.).

3.4.2 Side of epileptic focus

The TLE group were also separated into those with a right sided focus for their epilepsy, and those with a left sided focus. Table 10 below shows the breakdown of these subjects according to age, years of education, estimated Full Scale IQ, and age at onset of epilepsy.
Table 10: Left and Right Side Focus Comparison Data

<table>
<thead>
<tr>
<th></th>
<th>Left Side Focus</th>
<th>Right Side Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Median 46.5</td>
<td>Median 25.5</td>
</tr>
<tr>
<td></td>
<td>Range  43-56</td>
<td>Range  24-32</td>
</tr>
<tr>
<td>Years of Education</td>
<td>Median 10</td>
<td>Median 18</td>
</tr>
<tr>
<td></td>
<td>Range  10-13</td>
<td>Range  13-19</td>
</tr>
<tr>
<td>Estimated Full Scale IQ</td>
<td>Median 102.5</td>
<td>Median 109</td>
</tr>
<tr>
<td></td>
<td>Range  97-111</td>
<td>Range  85-112</td>
</tr>
<tr>
<td>Age at Onset of Epilepsy</td>
<td>Median 29</td>
<td>Median 16</td>
</tr>
<tr>
<td></td>
<td>Range  16-55</td>
<td>Range  11-18</td>
</tr>
</tbody>
</table>

Since the right side focus group were significantly younger than the left side focus group ($z = -2.323, p<.01$), had developed epilepsy at a significantly younger age ($z = -1.775, p>.04$) and had had significantly more years of education ($z = -2.247, p<.007$), and because the sample sizes were so small ($n = 4$), it was decided that further comparisons between the two groups in this respect would be of little use.
4 DISCUSSION

4.0 Introduction

A number of hypotheses were proposed in connection with the present study. The discussion that follows considers the results from this study within the framework of these hypotheses. To begin with the results are summarised as follows.

The TLE subjects showed impaired performance on two clinical memory tests, indicating impairments of word and face recognition, and impaired performance on simulations of everyday activities. Performance on specific aspects of the COT was impaired in the TLE group, particularly on tasks where speed was measured, both in terms of speed of response and speed of sequencing the items in temporal order. The TLE subjects were as consistent as the controls at sequencing items across the two presentations of the COT. Performance on the COT was found to be moderately correlated with aspects of performance on the RBMT, but not with the Memory Checklist. In addition, the TLE group reported more symptoms of anxiety and depression on the HAD than the controls.

The two groups were discriminated by the following measures:
- COT: speed of response to items on part 1
  speed of sequencing the items in temporal order on part 1
  speed of sequencing the items in temporal order on part 2
- RMT: recognition of words
- HAD: Anxiety and Depression scores

The discussion of these results begins with the evidence for impaired memory functioning in the TLE group, and the reporting of everyday memory problems. Performance on the COT is then considered in terms of its sensitivity as a measure of everyday memory, and its relationship to other measures. Reported symptoms of depression and anxiety are then considered, along with a number of clinical implications arising from the study.
4.1 Impaired memory functioning in the TLE group

It was anticipated that the TLE subjects would show impaired performance on the Recognition Memory Test, since a number of studies reported in the literature have found impaired performance on clinical memory tests in TLE subjects. In the present study the TLE group were found to be poorer at recognition of words when compared with the controls; for faces there was no difference between the groups. Interestingly, when recognition of words and faces was compared within the groups, there was no difference between the TLE subjects' recognition of words and faces, suggesting that the TLE subjects as a group did not demonstrate a material specific memory impairment. This interpretation is made with caution, however, given Kapur's (1987) highlighting of the quite considerable limitations of the RMT as a means of detecting material specific memory impairments. In addition, Morris et al (1995) found that word recognition on the RMT had limited sensitivity in detecting material specific impairments in TLE subjects. Disappointingly, the hypothesis that TLE subjects with either a right or left side epileptic focus would be differentially impaired on recognition of faces and words on the RMT could not be tested, as the numbers in the two respective groups were too small.

Although not specifically tested as a hypothesis in the present study, the TLE subjects’ performance on the RBMT was suggestive of a considerable level of everyday memory impairment. It was anticipated that the TLE group would show some degree of impairment on the RBMT, but their performance revealed that only 4 out of the 20 subjects scored at what the RBMT manual classifies as a 'normal' level. At least one TLE subject was impaired relative to the RBMT standardisation sample on each of the RBMT subtests, indicating that the nature of the everyday memory impairment in this group is wide-ranging. When subjects were impaired, this impairment tended to be of the magnitude of more than 2 standard deviations below the mean of the standardisation sample. The subtests which were failed by most subjects were generally those where subjects were required to retain information over a time interval (i.e. immediate and delayed story, message, and belonging).
4.2 Reporting of everyday memory problems

Since the TLE subjects showed impaired performance on a test of everyday memory, it would be expected that they would report the occurrence of more problems in everyday life. It was hypothesised that the TLE group would report more everyday memory failures on the Memory Checklist than the control group. Encouragingly, a high proportion of the checklists were returned by both TLE and control subjects, indicating that this checklist is 'user friendly'. In an unexpected finding the total number of reported memory failures over the week the checklists were used did not differentiate the two groups. What is not known, however, (as mentioned above) is the accuracy of the information provided by subjects on the checklist. This failure to find a significant difference between the number of reported memory failures by the TLE and control groups is unlikely to be because the range of failures sampled by the checklist was too small. Indeed the range of failures included on the checklist is broad, and the items are all failures which may commonly occur in everyday life. It is a distinct possibility that this checklist (or any other checklist filled out solely by subjects) may not be sensitive enough to detect differences between the two groups; this is certainly supported by the literature (see for example, Sunderland, Harris and Baddeley 1983, 1984). The checklist was originally designed for use with head injured subjects, and it is possible that subjects with TLE may experience subtly different everyday memory problems which are not addressed by this checklist. The literature suggests that self-report of memory is less reliable than relatives' reports. Although most of this research has considered memory report using retrospective questionnaires, it is possible that the same is also true of checklists. The checklist used in the present study was designed to be filled out as soon as possible following a memory failure, but it is likely that this was not the case in practice. Subjects were instructed to keep the checklist in a place where they would see it, but there is no way of knowing how soon it was filled out; in addition, for those subjects who were at work for all or part of the day, filling out the checklist is likely to have been more difficult. Furthermore, different subjects reported widely differing numbers of memory failures over the week. This most likely reflects actual differences in the numbers of memory failures experienced, but may reflect failures in filling out the checklist by some subjects. It could also be proposed that because of the nature of
the everyday memory impairment in the TLE subjects, they were more likely than the controls to forget to fill out the checklist soon after a memory failure. There is, however, no way of ascertaining if this was the case or not. One strategy which could have been used to find out how accurately the checklist was filled out would have been to ask subjects at the end of the checklist period to estimate how often they forgot to fill out the checklist, although this is in itself would require intact memory processes. An alternative would have been to use a relatives' checklist, although the literature suggests that this in itself is not without its problems, including the need for relatives to be with the person throughout the week, and the fact that some memory failures are not apparent to an observer. An explanation in terms of there being no difference between the two groups in terms of the number of memory failures experienced seems unlikely, since the TLE subjects' performance on the RBMT demonstrated an impairment of everyday memory.

In addition to not differentiating the two groups, the memory checklist did not show a significant correlation with performance on the RBMT. This is disappointing, and adds weight to the suggestion that the checklist was not sensitive enough. Previous studies which have correlated subjective memory questionnaires with performance on the RBMT have found strong correlations. For example, Schwartz and McMillan (1989) found a correlation between the RBMT and the SMQ and EMQ. This result was, however, found using subjects who had suffered a severe head injury (post-traumatic amnesia of more than 24 hours), and it seems likely that these subjects would to exhibit different everyday memory problems from TLE subjects, given the very different nature of head injury and TLE. Another explanation for the failure of the checklist to show differences between the two groups in the present study may be related to the use of memory aids. The TLE group reported the use of significantly more memory aids, and it may be the case that the use of memory aids in this group led to fewer everyday memory failures.

The TLE subjects also rated their memory performance at the beginning of the study on a four point rating scale. Comparisons between subjects who rated their memory as no nuisance/little nuisance (non-complainers) and a moderate/severe nuisance (complainers) were difficult, however, since only 5 out of the 20 subjects rated their
memory as a moderate/severe nuisance. Not surprisingly given the very different
group sizes there was no difference between the two groups in the total number of
memory failures reported on the Memory Checklist. Corcoran and Thompson (1993),
from where the memory rating categories were taken, found that their ‘complainer’
subjects and their relatives reported significantly more memory failures on a modified
version of the EMQ than ‘non-complainers’. It is possible that similar results were
not found in the present study for reasons other than the different group sizes. For
example, Corcoran and Thompson used a modified version of the EMQ which
includes more items than the Memory Checklist, and also included relatives’ reports.
With hindsight, it might have been prudent to have used the EMQ in the present
study, perhaps in addition to the MC in order to provide some other external criteria
against which to evaluate the MC. This would have had the drawback, however, of
giving the subjects an unreasonable number of assessments to fill out, and may have
resulted in a lower return rate. It may, however, be a useful addition to future studies
which use the Memory Checklist.

4.3 The sensitivity of the COT as a measure of everyday memory

Since the TLE subjects showed an everyday memory impairment, they were expected
to show impaired performance on the COT, since it was assumed that that the COT
assesses everyday memory. Performance on the COT is not expressed as either a
single score or in terms of pass or fail, and as such, it was possible that the TLE
subjects could show impaired performance on any one of a number of aspects of the
COT. Both groups of subjects were able to perform the COT, suggesting that they
were able to retrieve examples of recent everyday activities without too much
difficulty. There were only two items which were problematic; several subjects were
unable to remember when they last suffered a blow, a fall or a cut, and the item
relating to travel on a bus or a train was also difficult for a number of subjects. A
possible explanations for difficulties with this latter item is that a number of subjects in
the TLE and control groups lived in remote villages where there was no public
transport, and as such they had not travelled on public transport for a number of
years. The difficulties with these items are not serious, however, since subjects were
able to remember if it had been months or years since they last used public transport,
and were able to remember whether they last suffered a cut weeks or days ago. If subjects recalled the items in this way then it is unlikely that this would have affected performance on the COT.

The aspect of the COT which was expected to differentiate the two groups of subjects most clearly was the correlation between the ranks given to items on part 1 and part 2 of the COT. Indeed, this was one of the major hypotheses for the present study. Sunderland et al (1996) found that young and old subjects could be distinguished by the consistency of their rankings over the two parts of the test with the older subjects less consistent than the younger subjects. In the present study, however, the TLE and control subjects did not differ from controls with respect to consistency when the correlations were examined either for each subject or for each item. Indeed for the item correlations, the TLE subjects were more consistent on 11 of the 15 items. This is somewhat difficult to explain, since there is no obvious reason why the control subjects should be less consistent in ranking the items. An explanation in terms of the TLE subjects’ recent everyday experiences being in some way more memorable than those of the controls, for example, seems unlikely. There were also no differences between the controls and TLE subjects in terms of age, estimated premorbid IQ, or years of education which might help to explain this finding. If consistency of ranking is considered to be governed by non-effortful (automatic) processes, then it might be the case that the older subjects in the Sunderland et al study showed impairments of such processes relative to the younger subjects, but that in this study the TLE subjects did not differ in the same respect from controls.

The failure to find a difference between the two groups on the consistency measure suggests that the COT may not be a good indicator of everyday memory impairment, when considered in the light of the impaired performance shown by the TLE group on the RBMT. Such a finding suggests that the COT may not be useful as a clinical measure of everyday memory, at least in TLE.

When the other aspects of the COT were considered, the TLE subjects were found to be significantly slower at retrieving examples of the everyday actions on part 1. This may indicate either that the TLE subjects found it harder to retrieve the examples, or
it may reflect a general slowness of responding in the TLE subjects. On part 2 of the COT the TLE subjects were no longer significantly slower at responding than the controls. This provides some support for the proposal that they found it harder to retrieve the examples on part 1, since if their slower retrieval of examples on part 1 was a reflection of a general slowness of responding, then they would also have been expected to be slower than the controls on part 2.

A difference between the two groups in terms of speed was again seen when subjects were required to rank the items in temporal order; here the controls were significantly faster on both part 1 and part 2. Ranking the items in this way requires subjects to both remember the examples they gave for each item, and to remember the sequence in which they occurred. It is possible that the TLE subjects were slower because they could not remember either the examples or the correct temporal sequence, or because handling both sets of information at once results in slowed performance. Evidence from the literature suggests that cognitive functioning may be compromised in TLE (both with and without anti-epileptic medication); it is possible, therefore, that the TLE subjects’ slowed performance was contributed to by difficulties in processing competing cognitive tasks. A complicating factor for this argument, however, is that the TLE subjects were significantly faster at sequencing items on part 2 compared with part 1 (although on part 2 they were still significantly slower than controls). In this case their performance may have improved from part 1 because of the recent rehearsal of both sets of information. Slowed cognitive processing (or slowed speed of responding) here would still, however, result in slower performance relative to the non-epileptic control subjects, which was the case here. Further research here is needed, as it would have been useful to know how the TLE subjects dealt with competing cognitive tasks under experimental conditions, and whether they showed slowed information processing speed.

4.4 The relationship of the COT to other measures

Evidence from the literature suggests that the RBMT is a valid measure of everyday memory function, and as such, if the COT correlates with the RBMT, then this would indicate that the COT has validity as a measure of everyday memory. As predicted,
correlations between the COT and the RBMT were found to be modest. Previous research (e.g. Sunderland et al 1986) has suggested that story recall is related to everyday memory function, and indeed there was a significant correlation for immediate story recall with both the consistency of ranking across parts 1 and 2 of the COT, and the decrease in sequencing time from part 1 to part 2. In addition the total standardised processing score on the RBMT was significantly correlated with both the consistency of temporal sequencing and sequencing time on part 2 of the COT. Since the RBMT does not include any speeded tasks, the proposed slowed speed of processing or responding in the TLE subjects cannot have contributed to poor performance on the RBMT. This suggests that the TLE subjects’ everyday memory difficulties are mediated by factors other than speed of processing or responding.

Although aspects of the COT and RBMT correlated significantly, there was no correlation between the COT and the total number of memory failures reported on the Memory Checklist. This result is disappointing, although not altogether surprising for a number of reasons, which were discussed in 3.2 above.

A further correlation was found between RMT word and face recognition and both the sequencing time for part 1 of the COT and the consistency of ranking items on the COT, suggesting that for the TLE subjects the ability to rapidly retrieve the COT items and sequence the recent everyday events in the same order over the two trials is related to recognition memory performance. Although a potentially interesting finding, this does not shed light on Sunderland et al’s (1996) debate as to whether subjects sequence items on the second trial according to how they were sequenced on the first trial, or according to their memory for the actual temporal sequence of the items. If word recognition affects consistency of ranking then the TLE subjects in the present study would be expected to show less consistency than the controls, given that they are significantly worse than controls on word recognition, but this was not the case. Word recognition on the RMT has previously been associated with performance on the RBMT. Wilson et al (1989) found that both the total Screening Score and total Profile Score on the RBMT were significantly correlated with the raw score on word recognition. In the present study this was also the case. Interestingly,
the consistency of sequencing items on the COT was also correlated with immediate story recall on the RBMT, and immediate story recall was found to be correlated with word recognition, providing some additional (although limited) support for the validity of the COT as a measure of everyday memory performance.

Since the COT has been shown to differentiate the TLE and control subjects only on its subsidiary aspects (i.e. speed of retrieving the items and speed of temporal sequencing) this raises the question as to whether the RBMT is in itself an adequate measure of everyday memory in temporal lobe epilepsy. The TLE subjects in the present study were clearly impaired on the RBMT and this impairment was evident across a wide range of the RBMT subtests. Given the limitations of the COT, which have been discussed above, it seems that for the TLE subjects in the present study that the COT does not add much to the information gained from their performance on the RBMT, and the RBMT does seem to be an adequate measure of everyday memory impairment in these subjects. The TLE subjects' performance on the RBMT was found to correlate significantly with performance on RMT word recognition and on delayed story recall (from the RBMT). The correlation with story recall is not unexpected given Sunderland et al's (1986) findings, and the fact that the story recall measure is taken from the RBMT. The correlation with word recognition suggests that the RMT may also be a good indicator of everyday memory functioning. Wilson et al (1989) found that RMT word recognition correlated with performance on the RBMT. Although Wilson et al found the RBMT to be a valid measure of everyday memory, it was also found to be a valid measure of memory as assessed by standard clinical memory tests, and so further research is needed here to determine whether all subjects who show impaired RMT word recognition also show impairments of everyday memory.

4.5 Reported symptoms of anxiety and depression

Previous studies which have investigated reported symptoms of anxiety and depression in epilepsy have typically found that these symptoms are reported more frequently by people with epilepsy (e.g. Corcoran and Thompson 1993), although in TLE this has not been such a consistent finding for symptoms of anxiety (e.g.
Robertson et al. 1994). It was hypothesised in the present study that the TLE group would report more symptoms of anxiety and depression on the HAD than the control group, and this was born out in the results. This finding is in keeping with that reported by Corcoran and Thompson (1993) who found that the HAD discriminated epilepsy and control subjects, although in that study the epilepsy subjects were of unknown aetiology. The present study also supports the findings of Robertson et al (1994) who found that depression was higher in subjects with TLE compared to controls. Robertson et al, however, did not find that TLE subjects reported more symptoms of anxiety, although the anxiety measures used in the present study and in Robertson et al were somewhat different. It may also be the case that the more rigorous criteria for selecting subjects in the Robertson et al study may have accounted for the difference with the present findings. Robertson et al selected subjects on the basis of EEG recordings and only selected subjects with a sole diagnosis of TLE. In the present study the subjects were, by necessity, selected from a limited pool (of Neurologists' current contacts), and as such it was not possible for specific neurophysiological investigations to be carried out on these subjects. Since these subjects were a clinical sample, selecting subjects who had only a sole diagnosis of TLE was not possible, and as a result a number of the subjects in the present study had suffered minor head injuries, and one had suffered a stroke.

The HAD was used in the present study partly because it is brief and quick to administer, but also because it includes symptoms of both anxiety and depression. One problem with the HAD which arose from the study is that although it is a brief measure, a number of the items refer to symptoms which are similar to many of the features associated with temporal lobe epilepsy. For example, subjects with TLE frequently report that seizures are preceded by a strange feeling in the stomach, something which is closely related to item 9 on the HAD ('I get a sort of frightened feeling like butterflies in the stomach'). In addition, item 8 ('I feel as if I am slowed down') may reflect the slowing effects reported by subjects on anti-epileptic drugs, and item 3 ('I get a sort of frightened feeling as if something awful is about to happen') may reflect subjects' anxieties about having a seizure. It might have been more appropriate to have used different measures of anxiety and depression for this group, although this would have had the drawback of having to use two separate and
more lengthy measures and would have meant that assessment sessions were longer and, consequently, would have meant a smaller sample size. The possible confusion between symptoms of anxiety and depression and factors related to TLE mean that the suggestion that the TLE subjects report more symptoms of anxiety and depression must, in this study, be treated with caution.

In the Corcoran and Thompson (1993) study, although there was a relationship between mood and both memory test performance and self-reported memory problems, the direction of this relationship could not be determined. In the present study there was a relationship for the TLE subjects between anxiety score on the HAD and the decrease in sequencing time from part 1 to part 2 of the COT, shown by a significant correlation between these two measures. There was, however, no corresponding correlation between depression on the HAD and performance on the COT. As was the case in the Corcoran and Thompson study, there is no easy way to determine the direction of the relationship between anxiety on the HAD and decrease in sequencing time on the COT.

4.6 Clinical implications

There are a number of important clinical implications arising from this study. The main aim of the study was to evaluate the efficacy of the COT as a measure of everyday memory for use in clinical practice. Although the COT was easy to administer and complete, the principal measure (consistency of ranking) did not differentiate the TLE and control subjects. The two groups were discriminated by the speed measures, but the results of the study with respect to the COT are seen as disappointing, and cast doubt on its clinical utility. One area of future research would be to use the COT with other memory impaired populations (for example head injured subjects or subjects with alcohol related memory impairments) in an attempt to investigate whether the effect of consistency found in the Sunderland et al (1996) study is merely an age effect. It seems likely, however, that other groups of subjects would also fail to show an effect of consistency, although there remains the possibility that the different measures on the COT are differentially important for different groups of subjects.
Despite the failure to find an effect of consistency the COT did show a relationship to everyday memory performance in the TLE subjects, which is a promising finding. This finding is in keeping with Sunderland et al (1996) who found that performance on the COT correlated with performance on story recall and the overall problem rating on the relatives' form of the EMQ. The evidence from the present study, however, suggests that although the COT showed a relationship to everyday memory (as assessed by the RBMT) the fact that it failed to discriminate subjects on its key measure means that its clinical utility at the present time is limited. Future research will need to extend the use of the COT to other populations in order to investigate this relationship with everyday memory measures still further.

One thing to clearly emerge from the study was that the RBMT was able to detect everyday memory impairment in the TLE subjects. Although the performance of the controls on the RBMT is an unknown quantity, it is assumed that they would have performed within normal limits. The TLE subjects were clearly impaired on this test, and it seems likely that if the controls had shown any degree of impairment on the RBMT it would not have been of the magnitude shown by the TLE group. The RBMT was, therefore, clearly shown here to be a valid and reliable measure of everyday memory with this population. The strength of the RBMT in detecting impairment in this population might suggest that there is not in fact the need for a further assessment of everyday memory performance. The RBMT remains, however, a test which uses simulated everyday activities to detect everyday memory impairment, and there are likely to be subjects who can succeed on the RBMT whilst experiencing considerable problems in everyday life. There is, therefore, a need for an alternative measure of everyday memory which is not based on simulations. The COT in its present form appears to lack the ability to detect everyday memory impairment on its consistency measure, and only future study will show whether its speed measures are able to detect such impairment in other populations.

There was also an important finding with respect to self reported symptoms of anxiety and depression amongst the TLE subjects. The two groups differed significantly on these measures, which indicates that this is an important issue which needs to be
considered in the psychological assessment of people with TLE. These findings support the results reported by Corcoran and Thompson (1993), and although neither study was able to shed light on the direction of the relationship between mood and everyday memory impairment, both studies suggest that mood is an important area of intervention in temporal lobe epilepsy.
5 CONCLUSIONS

A number of hypotheses were proposed at the beginning of this study, not all of which were supported. The COT was expected to be a sensitive measure of everyday memory impairment in the TLE subjects and to differentiate between the two groups on the basis of the consistency of ranking items in temporal order across two trials. Although the COT proved to be successful in differentiating the two groups, this was only on the basis of speed of producing examples of recent everyday events and ranking them in temporal order. The TLE subjects proved to be as consistent as the controls at ranking the items. This latter finding casts doubt on the clinical utility of the COT and it is suggested that further study is needed in order to determine how other groups of subjects compare with the TLE subjects and with Sunderland et al's (1996) young and old subjects.

The hypotheses that performance on the COT would correlate with performance on the RBMT was supported for the TLE subjects. There were however, no significant correlations between performance on the COT and the Memory Checklist for either group of subjects, which casts some doubt on the COT as a measure of everyday memory. There are, however, a number of limitations associated with the use of memory checklists, and future studies will need to use a more appropriate self report measure, such as the EMQ, or alternatively a relatives' report questionnaire or checklist. Sunderland et al (1996) found a correlation between the COT and the relatives' form of the EMQ and so this would seem to be a promising measure to use in future studies.

It was hypothesised that the TLE subjects would show impaired memory functioning, and this was found to be the case. The TLE subjects were impaired relative to controls on the RMT, although it was not possible to investigate the effects of lateralised TLE on performance on this test. The TLE subjects' impaired performance on the RMT, and the associated correlation between the COT and performance on the RMT would seem to suggest that the COT might be detecting memory impairment instead of everyday memory impairment. There is some evidence, however, to suggest that word recognition on the RMT is related to
everyday memory functioning, both in this study and reported by Wilson et al (1989) and so the situation in this respect is far from clear. It may be the case that word recognition on the RMT is in fact a good indicator of everyday memory functioning.

The disappointing performance of the Memory Checklist was also shown by its failure to differentiate the TLE and control subjects, and it might have been more informative to have followed Sunderland et al (1996) and used the EMQ. The possibility that the Memory Checklist may not have been sensitive enough to pick up differences between these two groups was discussed, since the checklist was designed for use with head injured subjects.

The hypothesis that the TLE subjects would report more symptoms of anxiety and depression was supported. Although the HAD proved to have some limitations with this group of subjects, this finding is in keeping with previous reports from the literature and suggests that this is an important area in work with clients who have TLE.
Appendix 1: Information Sheet

Some people who suffer from epilepsy may report that they have problems with their memory. These problems may include forgetting everyday things, such as remembering what they have just read in a newspaper, or forgetting to do something which they meant to do.

I am conducting a research study with people with epilepsy to see if they experience any of these common memory problems. The study involves getting people to complete a number of tests which are designed to assess their memory, which should take about an hour. Everyone in the study will also be asked to keep a 'memory diary' for a week in order to see what kinds of problems are experienced in their everyday life. Some people will then be asked to complete a short questionnaire which asks questions about their mood. At the end of their involvement in the study, anyone taking part will be offered an opportunity to discuss any concerns that might arise from any of the tests carried out.

It is anticipated that people will be seen in their own homes or at the Queen's Medical Centre, whichever is most convenient. Anyone taking part in the study will have an opportunity to ask questions, and the identity of all people taking part will remain confidential. Anyone taking part in the study will, of course, be free to withdraw at any time and this will not prejudice them in any way, nor will it in any way affect the standard of medical care they expect to receive.

Any questions about this project can be directed to:
Katie Reid (Trainee Clinical Psychologist)
Linden House
261 Beechdale Road
Aspley
Nottingham
Telephone: (0115) 9346279
Appendix 2: Consent Form

If you are willing to participate in the research study which is explained in the accompanying information sheet I should be grateful if you could give your written consent by signing below. You will be free to withdraw your consent at any time and your identity will remain fully confidential.

I have read the information in the information sheet and have had any questions answered to my satisfaction. I agree to participate in the study and understand that I may withdraw at any time.

-------------------------------  -------------------
Participant                    Date
Appendix 3 Questionnaire

Name ____________________________ Date of birth __/__/__

How would you rate your memory?  
a) no nuisance  
b) only a slight nuisance  
c) a moderate nuisance  
d) a serious nuisance

What is your occupation? ____________________________

How old were you when you finished your education? ____________

How old were you when you developed epilepsy? ____________

What medication are you taking (please include the dosage) ____________________________

Have you ever had a head injury that required hospitalisation? □

Do you suffer from any neurological condition other than epilepsy? (Please give details) □

Have you ever had a stroke? (If yes, please give date) ____________

Do you use any of the following memory aids to remind yourself about something?  
A notebook or diary □
A wall-chart or noticeboard □
List of notes to yourself □
An alarm watch or timer □
Putting something in a special place so you will see it □
Asking to be reminded of something at the right time □
Other memory aids □
Appendix 4 Anti-Epileptic Drugs Taken By Each Subject

Subjects were asked for details of their current medication; these details are shown in the table below. Because the same drug is prescribed under different names, column 3 of the table shows the classification of the AEDs in to one of the following 8 categories:

1 - Carbamazapine, Tegretol, Tegretol Retard
2 - Phenytoin
3 - Gabapentin, Neurontin
4 - Phenobarbitone
5 - Sodium Valproate, Epilim
6 - Vigabatrin
7 - Lamotrigine, Lamictal
8 - Clozozam

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<td>Sodium Valproate</td>
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<tr>
<td>LA</td>
<td>Epilim</td>
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Appendix 5  Memory Checklist

NAME __________________DATE __________________

Please tick the items which occur each day. If you forget an item more than once, put a tick for EACH time it occurs.

1. Forgot to take pills

2. Misplaced an item (e.g. spectacles)

3. Lost concentration while reading

4. Went into a room or shop - forgot what you went to get

5. Forgot someone’s name

6. Forgot day/date

7. Forgot to write down something important (e.g. phone message)


9. Forgot an appointment with a friend/doctor

10. Forgot about a plan or arrangement you had made for the near future

11.Forgot sequence of previous day’s events

12. Forgot sequence of today’s events

13. Forgot whether or not you did something you meant to do (e.g. post a letter)

14. Lost concentration while listening to conversation or television

ADD any other things which you tend to forget

1. ........................................

2. ........................................

3. ........................................

4. ........................................

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Appendix 6 Current Orientation Test items

When did you last open a door?
When did you last switch something on or off?
When did you last have a drink?
When did you last go from inside a building to out of doors?
When did you last open a jar, tin or other container?
When did you last watch TV or listen to the radio?
When did you last buy something?
When did you last travel in a bus or on a train?
When did you last put something in a drawer or cupboard?
When did you last see an animal?
When did you last turn a tap on or off?
When did you last write something down?
When did you last use a telephone?
When did you last meet and chat with a friend or relative who does not live with you?
When did you last suffer a blow, fall or cut?
Appendix 7  Current Orientation Test Procedure

1. **Questioning:**
   15 'when did you last...?' questions. Subjects prompted as necessary for specific examples.

2. **Temporal sequencing:**
   Subjects rank the 15 everyday events in the order of occurrence.

3. **Interpolated task:**
   Recognition Memory Test given to each subject.

4. **Questioning:**
   As (1) above

5. **Temporal sequencing:**
   As (2) above.
REFERENCES


