VOLUME 1

EMOTIONAL MEMORY IN PEOPLE WITH KORSAKOFF'S SYNDROME

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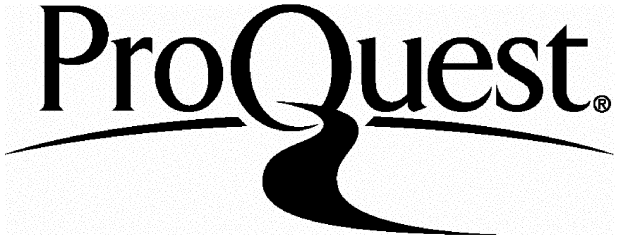

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In memory of my dearest Grandad Frank Morris.

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ABSTRACT

People with organic amnesia can show intact performance on implicit tests of memory despite profoundly impaired performance on explicit tests. There is some recent preliminary evidence suggesting that amnesics may also have a degree of preserved memory function for emotionally valent material as compared with their impaired function for neutral material. The study reported in this thesis aimed to explore whether people with Korsakoff syndrome remembered emotionally valent information more than neutral information. It also aimed to determine whether emotional / neutral differences depended on how memory was assessed.

The performance of 6 Korsakoff subjects was compared with that of 12 age-matched controls on four main memory tasks. All participants were assessed at two time points. Results suggested that the superiority of emotional memory depended on how memory was assessed. On tasks requiring explicit memory for novel information emotional material enhanced the performance of control participants, but not Korsakoff participants. The exception to this was enhanced performance on cued recall of positive information in the Korsakoff group (as also seen in the control group). However on a test of autobiographical memory assessing memories in response to positive, negative and neutral cuewords, although the Korsakoff group produced less specific memories overall than the control group, scores were very similar between the two groups in response to negative cuewords. This was interpreted as a superiority of memory for negative autobiographical experiences in the Korsakoff group. When memory was tested in an implicit priming task, the performance of the Korsakoff group and the control group did not differ and the effect of the emotional material was the same for both groups.

These findings are discussed in the context of the literature on emotional memory in both amnesic and normal subjects. Areas for further research are suggested and the possible clinical implications of the results are drawn out.

CHAPTER 1 INTRODUCTION

The focus of this thesis is on emotional memory in people with Korsakoff's Syndrome. This chapter is in three parts. Firstly the major characteristics of Korsakoff's syndrome will be outlined with a detailed description of neuropsychological deficits. The concept of emotional memory is then explained and the research on emotional memory in normal subjects and amnesic patients is reviewed. Finally a detailed rationale for the present study is presented.

1. Alcoholic Korsakoff's Syndrome

The first description of a Korsakoff like syndrome was in the late nineteenth century by Lawson (1878) who wrote an article in the journal 'Brain' on the symptomology of alcoholic brain disorders. He described various types of amnesias and suggested that memory loss which involved organic change in the brain would not be caused by 'the character of the exciting cause' (in this case alcohol), but by the 'physiological functions of the regions deceased' . He described symptoms where there was severe loss of recent memories and put forward the case for a neurological condition which was primarily caused by alcoholism.

Korsakoff then published a series of reports (e.g. 1887, 1889) describing a clinical picture where amnesic and confabulatory symptoms were present. As in Lawson's description, severe abuse of alcohol often preceded these symptoms, but he also noticed that other conditions such as persistent vomiting and typhoid fever may be present. He emphasised that these symptoms often occurred while other cognitive functions such as reasoning and language skills remained intact and emphasised that at on first meeting, the person 'gives the impression of a person in complete possession of their faculties'. Korsakoff described the loss of memory for recent events as everything that has happened since the onset of the illness and a short time before. He noted that in some cases there was also loss of memory 'from the long past' many years before the onset of the illness.

In terms of the confabulatory symptoms Korsakoff reported that some patients invent fiction and then continue to repeat the same information thereafter. He also talked about the confusion of old memories with present circumstances which resulted in the appearance of false recollections.

Studies carried out since this time have replicated the group of clinical symptoms initially described by Korsakoff. Victor et al, (1951) defined the syndrome as 'an abnormal mental state in which memory and learning are affected out of proportion to other cognitive functions in an otherwise alert and responsive patient'. For a clinical diagnosis in the present day, this definition is used in conjunction with an alcoholic or nutritional aetiology (Kopelman 1995).

1.2 Onset

Wernicke (1881) described some very acute symptoms in three cases where there was ataxia, optic abnormalities and a severe confusional state. This has now been termed 'Wernicke's encephalopathy'. It was later noted that this state sometimes but not always preceded the condition that Korsakoff described. For example, Victor and Adams (1953), reported that 96% of their Korsakoff's subjects had experienced symptoms of Wernicke's encephalopathy whereas in Riggs and Bowles (1944) study, none of their cases were noted to have had these symptoms preceding the Korsakoff's syndrome. Cutting (1978), in a retrospective study examining 50 Korsakoff's cases reported that the disorder could either have a very acute onset (consistent with Wernicke's encephalopathy) or a much more gradual onset where symptoms appear in a mild form, gradually getting worse. There is also some evidence that some patients who are diagnosed with Wernicke's encephalopathy first present in a coma (Wallis et al 1978). In his review of studies, Kopelman (1995) therefore concludes that it seems as if the initial presentation of the disorder may vary on a continuum from coma through to an insidious onset, where for some individuals symptoms are so mild that diagnosis is not made until an autopsy is carried out after the patient's death.

1.3 Aetiology

There has been much evidence to indicate a thiamine (B1) deficiency as a primary factor in the development of the condition. It has been suggested that this may be due to a poor diet accompanying chronic alcohol abuse resulting in malnutrition and avitimosis (Price 1985).

Butters and Cermak (1980) point out three areas of evidence to support this nutritional theory. Firstly other conditions which have been noted to precede the Wernicke's state besides alcoholism are linked with malnutrition such as starvation, carcinoma of the stomach and hypermesis gravidarium. (e.g.Pentland and Mawdsley 1982, Seehra et al 1996).

Secondly patients with Wernicke's encephalopathy can improve markedly when treated with large doses of thiamine (Dewardener and Lennox 1947). The opthalmic disturbances and confusional state start to improve after only a few hours of treatment and can usually clear within a week. The ataxia can show a more gradual improvement. Memory difficulties and personality changes have been shown to be the least resistant to thiamine treatment. It has been suggested that the variability in the reversibility of symptoms with thiamine treatment reflect the progressions in brain pathology (e.g. Victor et al 1971), and that the permanent features of Korsakoff's syndrome are due to permanent structural damage in the brain.

The third area of support comes from animal studies. Experiments have shown that when animals such as monkeys and rats are maintained on thiamine deficient diets, they will develop the major neurological symptoms of Wernicke's encephalopathy (Armstrong James et al 1981, Langlais,1992). However none of these studies have found that this leads to chronic, irreversible memory problems as seen in the human form of Korsakoff's syndrome.

Other factors have been proposed as contributing to the development of Korsakoff's syndrome. Ethanol itself may have a toxic affect on the brain. Evidence for this can be seen in Riley and Walker's experiments with mice (1978). Mice were fed on ethanol containing diets which also had nutritional deficits, and this resulted in

permanent learning deficits and brain pathology. As there is very little documented evidence of permanent memory deficits with thiamine deficiencies only, Butters and Cermak (1980) suggest that the amnesia in Korsakoff's syndrome may be a result of the interaction between a thiamine deficiency and the effects of alcohol. There is also some evidence to suggest alcohol reduces the absorption of thiamine (Holzback 1996).

It has been suggested that other neurochemicals such as acetylcholine (Barclay et al 1981) and noradrenaline (McEntee et al 1984) may also play a role. However, most existing evidence supports thiamine deficiency.

Parts of the brain where autopsies have found critical lesion sites in Korsakoff's syndrome are the brainstem, cerebellum and the diencephalon (thalamus and hypothalamus) (Butters and Cermak ,1980). In his review, (Kopelman 1995) suggests that it is lesions in a circuit made up of the hypothalumus, entorthinal and perirhinal cortex, the mammaliary bodies , mamillo thalamic tract and the anterior nucleus of the thalamus which are most implicated in the formation of memory which is affected in Korsakoff's subjects.

1.4.Neuropsychology of Korsakoff's Syndrome

1.4.1 *Memory models*

There is considerable debate about how to conceptualise memory in terms of systems, processes and functions. Atkinson and Schiffirin's early 'modal' model of memory (1968) proposed a short term / long term memory distinction. Baddeley and Hitch (1974) developed the short term memory component into a 'working memory' model. This includes a 'central executive' where information can be manipulated as needed. There is a proposed limited capacity articulatory loop which can hold small amounts of phonological information and also a visuo spatial scratch pad which is a specific device for manipulating visual information (Parker 1990). The central executive, the articulatory loop and the visuo spatial 'scratch pad' and possibly other specific stores together make up working memory where information is stored short

term. This stage of memory has also been termed 'primary memory'. Information comes to the working memory through a sensory store via one or more senses (e.g. visual, auditory). If information is held for more than a short period of time (about 30 seconds), it goes into Atkinson and Shiffrin's Long Term Store, also sometimes termed secondary memory. Different theorists classify components of long term memory in very different ways. A useful classification is that of Tulving and Schacter (1990) which distinguishes episodic, semantic, procedural and PRS (Perceptual Representation System).

Much of the evidence to support models of memory has come from the study of memory disorders. Korsakoff's syndrome is often used in research of memory because of the relatively pure amnesia occurring in the context of other cognitive abilities remaining relatively intact. These studies have been very useful in informing models of memory, as well as providing clues as to what structures in the brain are involved in memory (neuro-anatomy) and what neurochemical processes are involved. The memory deficits in Korsakoff's syndrome outlined below are all described within the context of current concepts in memory research.

1.3.2 *Working memory*

Although it is clear that Korsakoff's patients have a very poor retentive ability and lose incoming information at a significantly higher rate than in normal subjects, several experiments have shown that to some extent the 'working memory' is spared and patients can remember information for brief periods of time (about 30 seconds) without having to rehearse (e.g. Baddeley 1990). One of the first studies investigating this was by Baddeley and Warrington (1970). Their subjects included Korsakoff's patients and other patients with amnesia of different aetiologies. In serial list learning tasks where subjects were required to learn a list of 10 words over a number of trials, amnesics seemed to have a normal recency effect, indicative of an intact working memory system.

Other experiments have since shown that in span tests (both verbal and non verbal), Korsakoff subjects performance does not differ from normal subjects (Kopelman 1991). This can clearly be seen on meeting somebody with Korsakoff's syndrome. They are capable of retaining instructions of a task and can retain a question long enough to answer it (Cermak 1982).

Rate of short term forgetting has also been studied as a way of trying to understand working memory in amnesics. These tasks have mainly consisted of distractors where subjects are required to retain information after distractor intervals of up to 60 seconds. Baddeley and Warrington (1970), found that a group of amnesics did not perform significantly differently on this task than normal controls, again evidence to support intact working memory. However some subsequent studies have failed to replicate these findings, instead finding that Korsakoff's subjects do perform poorly on this task (e.g. Cermak and Butters 1972). Many therefore have concluded that there are individual differences in this ability (e.g. Cermak 1982, Kopelman 1995), and although there has been suggestions for why this might be (frontal lobe dysfunction, cortical atrophy), there is as yet no substantial evidence on which to base any firm conclusions.

Secondary memory (long term memory)

1.3.3 ***Semantic Memory***

Semantic memory can be defined as knowledge of the world of language, concepts and facts which are not remembered as a particular episode or incident in a specific time or place (Tulving 1972). Some aspects of semantic memory seem well preserved in Korsakoff subjects. They have retained their knowledge of language including both vocabulary and sentence structure. However it has been suggested that memory for vocabulary for words learnt after or a short time before the onset of illness is impaired. For example, Butters and Cermak(1986) illustrate this in a case study of a professor who developed Korsakoff's syndrome. He was unable to

remember technical words in his file which were introduced in the later stages of his career, prior to the onset of his illness.

An experiment however claiming to demonstrate that new semantic knowledge could be acquired was carried out by Verfaelle and Cermak (1994). Korsakoff's patients were presented with a list of high frequency words, with some items presented twice and others once. Each item was presented in a unique colour. Recall of colours in which the words were presented indicated that the specific presentation of non repeated items were more likely to be remembered than the specific presentations of the repeated items. However the actual recall of the repeated items exceeded the items of the non repeated items. The authors concluded that semantic information could be learned from episodes even if the context of the episodes are not remembered, therefore again suggesting a more intact semantic memory in people with Korsakoff syndrome. However there was still less recall overall than normal subjects, indicating that although the ability to learn the generic information was preserved to some extent, it was not as efficient as in controls. Other experiments which have claimed to demonstrate the acquisition of semantic memory to a greater or lesser degree are the teaching of computer related vocabulary to amnesics (Glisky et al, 1986) and amnesics learning new facts (Shimamura and Squire, 1987).

In summary there is evidence to suggest some deficits in semantic memory in Korsakoff's patients, particularly in acquiring semantic knowledge and concepts after the onset of illness. However some experiments have shown that semantic knowledge can be acquired to some extent following the onset of illness, independent of remembering the actual episode of learning.

1.4.4. *Episodic memory*

Episodic memory is memory for specific episodes where the information is held longer than the few seconds in the working memory. Episodic memory can be

defined as memories which people are consciously aware of or can be made aware of (Schacter 1987).

Korsakoff's patients have severe deficits in this type of memory, evident in the severe anterograde amnesia richly described by Korsakoff. Exactly what processes are implicated and affected in this group of patients is still an area of some uncertainty.

It has been suggested that episodic memory relies on a specific 'encoding' process (Butters and Cermak 1980). Several experiments have indicated that the encoding of contextual information is important in being able to remember specific memories long term. For example, Tulving (1972) found that recall would be better if the same contextual cues were present at retrieval as for when the information was initially encoded. Parkin (1990), defines contextual information as " the information associated with a memory which enables that memory to be distinguished from all others". Therefore the greater and richer the encoding of contextual information, the easier it is to recall a specific memory (this is often termed encoding specificity theory first put forward by Tulving and Thomson 1973).

Frith et al (1992), in a case study found that the performance of a Korsakoff subject on various tasks indicated that there may be a specific memory impairment for the representation of the significance of objects in contexts, whereas representation of the properties of the objects themselves was not impaired. This is further evidence to support the encoding specificity theory. Kopelman (1995) however argues that whilst there may be some deficits in the processing and encoding of this information, this is unlikely to be sufficient to account for the severity of the episodic memory deficits and is not the core component . This conclusion is based on studies which have shown that in relation to remembering target information, deficits in semantic coding and contextual memory are evident in some subjects but not in others (e.g. Shimamura and Squire 1987, Huppert and Piercy 1976).

Long term forgetting rates of Korsakoff's patients have been examined to explain deficits in episodic memory. These can be calculated by measuring the rate of

decline in retrieving target information which has been learned to a sufficient criterion level. The subject can be given as much exposure as needed in order to reach this level and be matched with a control subject who has learned information to the same level. The rate of forgetting is then compared between control and amnesic subjects. Several studies have found that there is no difference in the long term rate of forgetting between the two groups of subjects (Martone et al, 1986; Huppert and Piercy, 1978). It is highlighted however by Kopelman (1995) that these studies have only looked at recognition memory and have not measured forgetting rates over any time periods longer than 10 minutes.

In summary, although it is very evident that there is a severe deficit of episodic memory in Korsakoff's patients, it is not clear precisely why and how this occurs. Evidence suggests that it is at the encoding stage rather than the retrieval stage as long term forgetting rates have been found to be normal once the information has been encoded to an adequate standard. There is some evidence to suggest that this may be due to these subjects not encoding the context of the target information, although findings across studies of individual patients have been variable.

1.4.5 *Conceptualisation of episodic and semantic memory*

The findings of experiments on episodic and semantic memory are difficult to interpret. This is because not enough is known about episodic and semantic memory systems in normal subjects and so interpretation depends on how these systems are conceptualised. There seem to be two main possibilities. One view is that semantic memories grow through episodic experiences where this knowledge is not 'tied' to the episodes where it was acquired, perhaps reflecting a cumulative process resulting from episodic experiences (Parkin; 1990, Cermak 1984). This view is supported by studies which show deficits in acquiring new semantic knowledge after the onset of amnesia. Another view is that the reverse is true and semantic knowledge is necessary for proper encoding of episodic memory. Support for this comes from (1) experiments showing preserved ability to acquire new semantic knowledge after the

onset of amnesia independent of remembering episodes where this was learned, and (2) experiments showing the importance of contextual information to remembering specific episodes (e.g. Tulving and Thomson 1973).

Whichever is the case, it seems that the two systems interact in some way, and that it is possible to have a deficit in one but not the other. This may indicate that to some extent different processes are involved. In Korsakoff's patients, the actual clinical manifestation is that episodic memory is strikingly impaired and much semantic knowledge (particularly that known well before the onset of the illness) is preserved.

1.4.6. *Implicit memory*

Implicit memory is what is learned while not being consciously aware (Tulving and Schacter 1990). Priming abilities, which have been described as 'the facilitation of a particular response to a cue by an earlier stimulus' (Kopelman 1995), have frequently been cited as an index of implicit memory . This can be measured in a number of ways using various tasks such as stem completion, fragment completion and perceptual identification (Lewandasky et al 1989). A number of studies have shown that amnesics can perform relatively well on these tests. A good example is Graf et al's study (1984) where subjects were exposed to a list of words, which included the word 'garage'. Later subjects were either asked to say the first word they could think of beginning with the letters 'gar' (a wordstem completion test) , or they were asked to think of a word beginning with 'gar' which was on the previously presented list (a cued recall test). Amnesics' performance on the cued recall test (explicit memory test) was found to be significantly poorer compared with normal subjects, whereas the performance on the word stem completion task (implicit memory test) was at the same level as normals. Other researchers have reported similar findings, with a range of priming tasks (e.g. Tulving and Schacter 1990, Shimamura 1986, Schacter and Graf 1986).

Some have therefore concluded that these findings show a distinction between implicit and explicit memory systems because although amnesic subjects perform very poorly on explicit memory tests, they perform within the normal range on implicit memory tasks. However Dunn and Kisner (1989) point out that the type of processing involved in carrying out these tasks is not 'knowable'. They say that it is conceivable that an implicit memory task such as a word completion could be carried out by consciously remembering the previous stimuli, and an explicit recognition memory task may be solved implicitly without either the intention to remember or the awareness of the original presentation. Nevertheless the striking difference between performance by Korsakoff's patients on implicit memory tasks as compared with explicit memory tasks cannot be denied and the working hypothesis that these tasks tap separate memory systems has yet to be disproved.

1.4.7 *Remote memory*

Korsakoff's subjects have been found to have poor remote memory by their performance on a number of different measures. These include memory for remote public (i.e. semantic) facts, (Butters,1984; Kopelman 1989), and remote autobiographical memory (memory for personal events), (Kopelman 1989). Lack of memory for events which happened following the onset of illness maybe expected because of the severity of anterograde amnesia. However as Korsakoff himself described, Korsakoff's patients also have retrograde amnesia, where their memory for events prior to onset of the illness is disrupted. There is good evidence to suggest that there is a temporal gradient in retention of remote memories where very distant memories show the least disruption and may be entirely intact, but the more recent the memories, the greater the impairment, (Selzer and Benson 1974; Cohen and Squire,1981). Kopelman (1989) carried out a number of remote memory tests which confirmed this. It included a news events test, a famous personalities test, a personal semantic schedule (knowledge for facts about individual subjects past) and an autobiographical incidents schedule. On all tests Korsakoff's patients displayed a

temporal gradient. Alzheimer's patients also showed a temporal gradient in their remote memory, however it was not as steep as in the Korsakoff's patients. Kopelman concludes that this steep gradient maybe due to a 'superimposed' progressive anterograde deficit during the heavy drinking period before the more acute symptoms of the illness.

Other studies of remote memory have attempted to assess people's memory for personal events that have happened to them during their life. The most common way of doing this has been to use tests derived from the Galton cueing technique, which involves giving subjects cue words and asking them what they are reminded of. Crovitz and Schiffman (1974), adapted this technique and used it as a study of personal memories (subjects were asked to think of specific personal events which the cue words reminded them of). Findings in patients with Korsakoff's subjects have been variable. Wood et al (1982), found that although amnesic subjects could describe categorical information about the words, they found it more difficult than normal subjects to produce specific memories. It was theorised that this is because they were using context free retrieval strategies. However Zola Morgan et al (1983) found that although there was a tendency for their group of Korsakoff's patients to produce more generic memories in response to the cue words than normal, if the subjects were further prompted to be more specific there was not a significant difference to performance by normal subjects.

More studies of autobiographical memory have been carried out on clinical populations with emotional disorders than populations with memory disorders. The most recent test which has been used is the Autobiographical Memory Test (AMT), Williams and Broadbent (1986). This consists of six positive words, six negative words and six neutral words. Memories are coded as specific , generic or extended. A specific memory is defined as the recall of an event which took place at a certain time over a period lasting less than a day. Therefore in response to the cue word 'sunny', an example of a specific memory response would be ' sunbathing on the

beach last Saturday'. A generic response is a summary of many events, so an example would be 'sunbathing on beaches'. An extended memory is a single event which took place over a period of time lasting more than a day 'e.g. 'sunbathing on the Beach on my holiday in Florida two years ago'.

Differences in styles, features and deficits in autobiographical memory recall have been demonstrated. For example, people with depression have been found to generally retrieve generic rather than specific memories (e.g. Williams and Scott 1988). It has also been suggested that depressed people are more able to recall specific negative memories more than positive memories, however studies have failed to provide conclusive evidence (e.g. Kuken and Dalgliesh 1995)

A study by Whitely (unpublished dissertation 1998), used the AMT with alcoholic subjects. It was found that alcoholic subjects were more likely to remember generic memories compared with a control group, and that the latency time for recall of memories was longer in the alcoholic group. In both the alcoholic group and the control group there was a tendency to recall more generic memories in response to negative words than positive words.

Although there has been no research to date on this version of the AMT on people with Korsakoff's syndrome, Daum et al (1996) investigated emotionally valenced experiences in 10 amnesics (including 4 subjects with Korsakoff's syndrome) using a series of interviews. They explored memories associated with pain, happiness and fear. It was found that despite remote memory difficulties, the amnesics were able to recount a similar number of emotionally significant personal memories as the control group. The authors concluded that there maybe a relative sparing of autobiographical memories with a strong emotional association.

1.5 Other cognitive impairment

1.5.1 *Global intellectual functioning*

Impairment in other areas of cognitive function has been found various degrees in Korsakoff's subjects. In terms of general intelligence, findings have been

variable. Jacobson and Lishman (1987) found different degrees of impairment where transition of pure memory loss to global intellectual decline appeared gradual. It seems therefore the degree of global cognitive impairment varies greatly between individual cases.

1.4.2. *Executive functioning (frontal lobe functioning)*

Frontal lobe function has been the subject of much research. Some authors have suggested that impairment in this area of cognitive functioning could be due to memory impairment (Jacobson et al 1990), with poor contextual memory resulting in a poor performance on temporal and ordering tasks, embedded figure tasks and confabulation. Others argue that there is independent frontal lobe damage in some patients including problems with skills such as planning and strategising. Examples of where poor performance has been noted are on verbal fluency tasks (Kopelman 1989, Jacobson et al 1989), cognitive estimate tasks (Kopelman 1989) and the Wisconsin Sorting test (Janowsky et al 1990). Again the evidence suggests that there are differences between individual Korsakoff patients in the degree of impairment of executive functioning.

1.5.3 *Visuospatial and visuoperceptive abilities*

A number of studies have shown that Korsakoff's patients have deficits in visuospatial and visuoperceptual abilities. Tasks on which there has been poor performance include digit symbol substitution test, concept formation tasks which require the manipulation of complex visual information and embedded figures tasks (e.g. Glosser et al, 1977; Kapur and Butters, 1977; Oscar-Berman, 1973; Butters, 1977).

In summary the pattern of cognitive impairment in people with Korsakoff syndrome is not uniform. However severe memory difficulties resulting in severe anterograde amnesia are seen in all cases, as is, to some degree, retrograde amnesia.

Other cognitive impairment is variable, although visuo spatial, perceptual skills and frontal lobe functioning have been found to be affected in a significant number of cases.

2. Emotional Memory

Emotional memory can be considered a very important aspect of remembering, playing a huge part in the survival and development of animal and humans. The most fundamental aspect of the concept of emotional memory is the ability to learn very quickly about harmful situations. Bower (1992) describes emotions as 'evolution's way of giving meaning to our lives [whereby] our lives are organised by our needs, motives and concerns'. Therefore emotion depends heavily on remembering past experiences and their meaning. Markowitsch (1994) highlighted the notion that cognitive and affective components are closely interlinked and perhaps there is considerable overlap in the brain systems which are involved in memory processing.

Considerable evidence exists to suggest that events which have a strong emotional association are better learned and therefore better remembered. For example, Cahill et al, (1996) carried out an experiment where subjects were either shown neutral film clips or emotionally arousing film clips. Three weeks later, in a free recall test, subjects remembered more emotionally arousing clips. Another example is Dutta and Kanungo's (1967) study, where students read some made up statements about personality traits of their ethnic group. They were asked to rate these statements for liking and not liking. Later, when they were given a memory test on the personality trait statements it was found that they were more likely to remember those which they had rated highly on either liking or not liking. Therefore it was concluded that the strength of the affective reaction determined the likelihood that the statement was remembered regardless of the affect being positive or negative.

There have been differing opinions as to how emotion and memory interact, both in terms of how the information is processed and which structures of the brain are involved.

2.1 Effect of high levels of arousal on memory

In a model put forward by Christianson and Nilson (1984), they postulated that high levels of arousal accompanying an emotional response is detrimental to memory. They suggested that very high levels of arousal take up a high level of attentional capacity and therefore there is a subsequent lack of attentional capacity left to be able to encode specific details. They predicted amnesic affects from highly emotional material. For example, they showed some subjects pictures of very disfigured faces in a series of normal faces. Compared with subjects who were just presented with normal faces, these subjects showed significantly poorer memories for verbal descriptions which were given accompanying, and after presentation of the disfigured faces. However there is more evidence to suggest that high levels of arousal actually facilitate memory of emotional material. A criticism of the Christianson and Nilson experiment is that the visual stimulus may have been well remembered because of the emotional valence, but if the descriptions of the characters were not emotionally valent then memory for emotional material was not being tested. It would be remembering the content of the pictures themselves which would be the emotional material. Indeed their results could indicate that emotional memory supersedes neutral memory, i.e. the neutral information is more poorly remembered when accompanied by emotional material.

A more substantiated notion, therefore, is that levels of arousal can improve memory. It has been suggested that the main function of high levels of emotion and therefore high levels of arousal is to enhance memory (e.g. Cahill et al, 1996). This has gained some support from research on 'flashbulb' memories. These are memories for personal circumstances in moments when personal or shocking information is received (Brown and Kulik 1977). It is postulated that these memories are more

resistant to disintegration and decay. Thus affect and arousal are seen as leading to a series of physiological processes which lead to superior retention (Bohannon 1988). Experiments which support this hypothesis include a series carried out by Goodman et al (1990). It was found that when pre-school children were exposed to a stressful experience, this facilitated memory. The children either received a painful invasive procedure (venepuncture) or a painless tattoo rubbed on their arm(control group). Those who had the painful procedure remembered more details about the nurse and the setting than the control group. However these findings have not always been replicated (e.g. Peters 1991). Revelle and Loftus (1992) suggest that high levels of arousal facilitate the sustained detection of, and quick responding to stimuli. Burke et al (1992) found that emotional arousal enhanced memory for gist and basic level information around a central theme, but impoverished memory for information not associated with the central theme. From the studies reviewed, it can clearly be seen that there is not yet a consensus about the role of emotional arousal in memory

2.2 Stress hormones

As arousal seems to have an effect on memory, some studies have examined the effects of the stress hormone adrenaline. In animal studies it has been found that there does seem to be an enhancing effect, for example Gold and van Buskirk (1978) found that on an inhibitory avoidance task in rats, retention was enhanced when they were injected with low doses of adrenaline. These findings have been replicated in a number of other learning tasks in animals (e.g.Introini-Collinson and McGaugh 1986, Borrell et al 1983). This evidence suggests that adrenaline influences retention by acting on the arousal system which in turn act on the processes underlying memory storage (McGaugh 1992).

Adrenergic function has also been examined in experiments using human subjects. Cahill et al (1994) looked at the effects of propranolol on long term memory for emotional compared with neutral events. Propranolol is a beta adrenergic antagonist and therefore blocks the effects of adrenaline. Subjects received either

propranolol or a placebo before seeing a series of slides which were accompanied by either a neutral or an emotional narrative (the Cahill Test). It was found that placebo subjects who viewed the emotional story did significantly better in a recall test one week later than those who had taken the propranolol. This difference was not found in the group who viewed the neutral story. They therefore concluded, that the impairing effect of the propranolol on memory for the emotional story, supported the hypothesis that enhanced memory associated with emotional experience involves activation of the beta adrenergic system (i.e. adrenaline being released).

2.3 Neural mechanisms in the brain

Fear conditioning (aversive classical conditioning) has been most widely used in looking at the neural mechanisms which underlie memories, in particular of painful and dangerous situations. Ledoux (1992) explains that this fear conditioning can be studied in different ways. One of the most frequent ways has been to look at 'simple fear conditioning' in rats whereby a conditioned stimulus (CS) is paired with an Unconditioned Stimulus. (UC), for example a neutral auditory stimulus with a footshock. The next day the conditioned stimulus is presented. Changes in autonomic activity (arterial pressure) are measured as well as emotional behaviour (freezing) produced by the conditioned stimulus. These are used to measure the efficacy of the conditioning. In order to determine which systems of the brain are involved in this process, rats' brains can be lesioned in different places and put through this procedure. Experiments so far have indicated that neural pathways underlying simple fear conditioning with an auditory conditional stimulus connect to the lateral nucleus of the amygdala and the central nucleus of the amygdala (Ledoux 1992). It has also been demonstrated that the lateral amygdala is interconnected with sensory, perceptual and higher cognitive processing areas suggesting it may have a role in integrating information transferred through each of these regions. (see Ledoux 1992 for an overview of these studies).

The amygdala therefore seems highly implicated, and further studies in animals have indicated that adrenaline appears to influence the amygdala's responses and sensitivity (Cahill and McGaugh, 1991). Therefore this suggests an interaction between stress hormones and the amygdala which form an integral part of the process of remembering emotional material.

There have been a few case studies with human subjects which have looked at the effects of lesions to the amygdala. For example, Cahill et al, (1995) described subject BP who suffered from Urbach Weithe disease which is a condition involving nearly complete damage of the amygdala, whilst other brain structures are spared. It was found that when the subject was presented with a series of slides and an emotional narrative (the Cahill Test), BP did not show the usual effect of enhanced memory for emotional aspects of the story, as compared with neutral aspects as had been demonstrated in normal subjects. There was no difference in how BP rated the emotionality the story compared with controls indicating that the emotional impact of the story was recognised. However the emotional impact did not enhance BP's memory as it did in normal subjects, suggesting that the damage to the amygdala had resulted in a detrimental effect on this process. Markowitsch et al (1994), in their study of 2 people with Urbach Weithe disease also found a lack of enhancement of memory for emotional material. They cited this as evidence that the amygdaloid region may add to the 'affective flavour' of memories which made them more likely to be stored in long term memory. Another case study involving a subject suffering from the same disease found impaired recognition memory for emotional faces, particularly those with fearful expressions (Adolphs et al 1994), again adding strength to the hypothesis that the amygdala is involved in memory for emotional information.

Amygdaloid lesions are very difficult to study in humans as the condition is so rare, and due to its location in the brain it is seldom damaged in head injuries. Therefore most of the evidence supporting the involvement of this structure in the processes involving emotional memory come from animal studies. There needs to be

considerably more research to establish more about the exact role of the amygdala in these processes.

2.4 Emotional memory in people with Korsakoff's Syndrome

One of the earliest descriptions of memory for emotional events in a Korsakoff's subject was by Claperede (1911) cited by Parkin (1990). He reports how he shook hands with the patient with a pin concealed in his hand. This obviously caused the person pain. He then returned a few minutes later and tried to shake hands with her again, but she refused. She did not remember who he was and could not give an explanation as to why she was avoiding him. This avoidance continued over time. This indicates that there was some learning of a fearful situation, without explicit memory for the event.

Since that time relatively few experiments have looked specifically at emotional memory in amnesics. One very interesting study was carried out by Johnson et al (1985). They used two experiments to investigate whether Korsakoff's syndrome patients had the ability to acquire affective reactions. In the first experiment the exposure effect paradigm was utilised. This is the phenomenon that repeated exposure increases people's preference for objects (Zajonc 1980). It might be expected that this is not the case in amnesics if they fail to remember the previous exposures. Unfamiliar melodies were played to Korsakoff's subjects, alcoholic control subjects and non-alcoholic control subjects. After a short interval, some of these melodies were repeated and some new melodies were played. Korsakoff's subjects, as would be expected showed a significantly impaired effect in recognising the melodies, but showed the same preference for the old melodies as did control subjects. This indicates that although not explicitly recognising the melodies, Korsakoff's subjects may have retained some information implicitly to conform to the exposure effect paradigm.

The second experiment involved subjects being shown pictures of two men. They were asked to rate the two faces on twenty characteristics such as honesty and

politeness. Subjects then heard a few sentences describing the two men, one being described as a 'good guy' (e.g.was helpful, was brave etc.) and the other as a 'bad guy' (e.g. he stole, was violent etc.). After about two hours subjects were shown each picture again. They were asked for their impressions of each man and asked which one they preferred. They were then given a free recall and cued recall test about the biographical information of each of the men. Another preference test was administered a few days later and following this the biographical information was presented again. There was then a recognition test which included distractor faces and the two men were once again rated on the same characteristics as previously. About two weeks later subjects were given the same tasks again. Results showed, that although Korsakoff subjects had significantly poorer recognition and recall memory scores, in the final preference test 78% said they preferred the good guy , and the ratings on the characteristics were more favourable for the good guy than for the bad guy. This was despite having no explicit memory for the information on which the impressions were formed. The impression evaluations (i.e.ratings) however were less extreme than those of normal control subjects. These experiments therefore indicate that Korsakoff's patients maybe able to acquire affective reactions, without explicit access to the information on which this is based. As the ratings were higher in normal subjects this suggests that explicit memory does affect the acquisition of affective reactions to some extent, but is not the only factor involved. This further supports the notion that there maybe different processes involved in acquisition of affective components of information from those involved in explicit memory for other components of the information.

Other studies which have shown enhanced memory for emotional material include that by Markowitsch et al(1986). They found that on a test of recognition memory Korsakoff's patients performed better on emotionally arousing slides than on neutral items. Douglas and Wilkinson(1993) carried out an experiment with five Korsakoff's subjects, examining memory for faces accompanied by either neutral or negative emotional descriptors. Although Korsakoff's subjects performed at chance

levels on a recognition test, a few minutes later when asked to rate the faces for likability it was found that they expressed a preference for faces accompanied by a neutral distractor rather than a negative distracter. The authors therefore concluded that Korsakoff's subjects are not impaired on emotional responsiveness. Hamman et al(1997) administered the Cahill Test to a group of 9 amnesics of different aetiologies. The test examined memory of a story consisting of three phases, where the middle phase contained emotional information and the other two phases contained neutral information. It was found that the amnesic subjects had enhanced memory for the emotional phase relative to the neutral phases. These studies also add to evidence supporting the hypothesis that emotional valence may facilitate learning in individuals with Korsakoff's syndrome.

Another study of individuals with Alzheimer's disease looked at memories for events arousing strong emotions (Ikeda et al 1998). This was based on people who had experienced the Kobe earthquake. Soon after the earthquake, subjects were given a MRI scan and 6-10 weeks later subjects were asked about their memories about the earthquake and memories about being given the MRI scan. 86% of subjects remembered the earthquake where as only 31% remembered the more neutral episode of the MRI scan. However factual information about the earthquake was poorly recalled. It was concluded that in these patients, fear did enhance memory retention, although not for the contextual detail information. A criticism of this study is that an MRI scan could potentially be quite frightening for people and therefore is not a neutral episode. Also it is likely that subjects had been repeatedly exposed to images of the earthquake , (television, newspapers, people talking about it etc.) in contrast to the MRI scan. Therefore a direct comparison between the two episodes was not really made in this study.

Apart from the studies reviewed above, there has been very little research on emotional memory in this population. The only other research on emotional memory in amnesics seems to be in autobiographical memory where Daum et al (1996) found that pain related memories in amnesiacs were less impaired than memories associated

with happiness or fear (as described earlier). Zola Morgan and Oberg (1980) also found evidence in a case study that there was some preserved memory for emotionally significant episodes in autobiographical memory for up to two years after they had happened.

It appears that much of the evidence for memory for emotional material being preserved in people with Korsakoff's syndrome comes from case studies, anecdotal evidence and very few experimental studies. Much more research in this area needs to be carried out, to establish detailed information about the preservation of emotional memories in this group of people. The studies reviewed here seem to pose two important questions. Firstly, is some emotional information remembered implicitly, as was found in Claperede's patient in the pin experience and Johnson's melody and good guy bad guy experiments? Secondly, is an episodic memory more likely to remembered if it is emotionally flavoured (as suggested by the studies mentioned on autobiographical memory) as compared with being neutral? If the answers to both or either of these questions is 'yes' then this would provide further evidence for different processes in the brain being involved in emotional memory compared with other types of memory. It would also have important clinical implications for memory therapy in Korsakoff patients.

3. Rationale for the study

As already noted there is little research on memory for emotional material in people with Korsakoff's syndrome. Tentative evidence suggests that this maybe more intact than memory for neutral material. If this is the case, it is not clear what mechanisms maybe involved in this process. There are also no studies looking at whether memory for emotional material is affected by the way in which memory is assessed.

The present study aims to examine in detail memory for emotional material versus neutral material in people with Korsakoff's syndrome as compared with normal control subjects. The central hypothesis is that memory for emotional material

is better than memory for neutral material in this subject group. The study therefore aims to extend knowledge about memory for emotionally valent material in people with Korsakoff Syndrome, by replicating some tasks which have been used previously with this subject group, but also by introducing some novel tasks designed to measure the effect of emotional material on different types of memory.

This is an important area of research for two main reasons. Firstly it can inform theories and models of memory. By establishing what types of memory are left intact in Korsakoff's subjects, different processes can be suggested as being involved in different types of memory. This then may also inform which structures of the brain and neuro-chemical systems are involved in this type of memory. The finding that performance on implicit tasks is preserved in amnesics despite profound impairments on explicit tasks had very important implications for current theories of memory. Similarly if emotional memory, assessed implicitly or explicitly, is also relatively intact in people with Korsakoff's Syndrome, this would inform current theories of cognition and emotion.

The second and more clinically relevant reason is that it may help to inform specific rehabilitation strategies for amnesic patients. Traditionally most treatments for brain injured patients were provided by other health professionals, but more recently Clinical Psychologist's specialist knowledge about models of memory has been used to develop rehabilitation strategies (Wilson and Powell 1995). At present strategies for memory difficulties include mnemonics, increasing depth of processing of material to be remembered (e.g. reading for meaning), recoding of information into patterns which can be more easily stored and retrieved (e.g. verbal to visual encoding or vice versa) and dual encoding, using the visual and verbal memory systems, (e.g. picture illustrations of passages of prose). For a more detailed overview see Powell (1983).

All these strategies have been informed by theories of memory which have been developed and further substantiated by research both on normal subjects and brain damaged subjects. If it were found that memory for emotional material

supersedes memory for neutral material, rehabilitation strategies for Korsakoff patients could be developed that utilise emotional material similar in principle from those described above. For example, information to be remembered could be presented in a form which was more emotionally valent, emotional mnemonics could be used or emotional information could be 'tagged' to what is needed to be remembered.

3.1 Research Questions

The main research questions are therefore:

1. Is memory for emotional material better preserved than memory for neutral material in people with Korsakoff's syndrome?
2. Does memory for emotional material in people with Korsakoff's syndrome depend on how memory is assessed?

3.2 Hypotheses

It is hypothesised that memory for emotional material will be preserved in subjects with Korsakoff's syndrome.

Explicit memory tasks

The prediction is that when memory is assessed on explicit memory tasks, subjects with Korsakoff's syndrome will remember less than normal controls but the superiority of memory for emotional material in the two groups will be similar.

Implicit memory tasks

Organic brain damage has been found to generally affect performance on explicit but not implicit memory tasks. Whether this is the case for emotional material in an incomplete word stem completion task is not known as no previous research has assessed this in subjects with Korsakoff's Syndrome. Therefore a specific hypotheses regarding emotional valence and performance of this task is precluded.

It is predicted that Korsakoff's subjects will remember less explicitly assessed information but will retain implicitly the emotional nature of the material.

These questions and hypotheses are addressed by carrying out four main memory tests on Korsakoff's subjects and normal subjects. These are the Goodguy/Badguy test, the Cahill Test, the Autobiographical Memory Test and an Emotional Priming Test.

The Goodguy /Badguy test

This is an adapted version of the Goodguy/Badguy test used by Johnson et al (1985) when looking at whether Korsakoff's subjects acquired affective reactions. One of the main rationales for using this task is that it assesses memory for emotional material in several different ways.

In the version used in the present study, it firstly assesses recognition memory. To examine whether emotionally valent material has any effect on recognition memory, recognition of faces which are accompanied by a 'good' or a 'bad' descriptor are compared with recognition of those not accompanied by a descriptor. Secondly this test provides measures of free recall and cued recall on 'good' and 'bad' information. It was hoped that inferences could be made about whether the emotional information about good and bad characters allows for better recall in Korsakoff's subjects. Finally, rating people on characteristics and doing a preference test before the explicit memory recall test allows examination of whether the emotional flavour of the information has been retained independent of remembering any content of the descriptors.

This test therefore provides measure of memory for emotional material on explicit memory tasks (recognition and recall) and a measure on more implicit memory tasks (preference and character ratings).

The Cahill test

This test compares memory for neutral events versus emotional events in episodic memory. It has been used in normal subjects and on a patient with an amygdalectomy lesion (Cahill et al 1994, 1995). It has been used in only one study on a small number of amnesic subjects of different aetiology (Hamman et al 1997), therefore it was hoped that in this study of Korsakoff's subjects, it would yield important results.

Autobiographical Memory test

As described earlier, the Autobiographical Memory Test (AMT), (Williams and Broadbent 1986) examines the specificity of memory for autobiographical events with positive, negative and neutral words given as cues. It has been used on many clinical populations particularly in groups with emotional disorders. Although autobiographical memory has been assessed in amnesics using other tests (e.g. Daum et al 1996, MacKinnon and Squire 1989), this particular test has not been used.

It allows examination of whether emotionally valent cue words affect ease of recall of a specific memory, by measuring latency time and specificity of the memory. This test is therefore included in the present study because it is an explicit memory task examining the effect of emotion on memory for autobiographical events, (i.e. memories personal to the subject). This differs from other tests used which are all based on novel information given to the subject so are specifically looking at anterograde memory.

Emotional priming test.

This test allows implicit memory to be examined. It is an incomplete word stem priming task utilising pairs of words beginning with the same word stem, one being a 'neutral' word and one being an 'emotional' word. Although word stem completion priming tasks have been used with people with amnesia (e.g.Graf et al 1984), a priming task with an emotional component has not been used. The purpose

of this test is to enable comparison of neutral versus emotional material on a classic implicit memory task.

The tests outlined above will provide information about explicit memory tasks looking at the effects of emotional material on recognition memory, free and cued recall, and autobiographical memory. Information will also be gained about the effect of emotional material on the implicit memory tasks of incomplete word stem completion and the preference and rating tasks in the Goodguy/Badguy experiment.

CHAPTER 2 METHODS

1. Design

The methodology used was a case control design where memory for emotional material in people with Korsakoff's syndrome was compared with control subjects.

2. Participants

There were therefore 2 groups of participants, a sample of people with Korsakoff's Syndrome and a sample of control subjects.

Korsakoff's Group

The 6 male patients with Korsakoff's Syndrome were recruited through a neuropsychiatry department at a hospital. They were approached by the investigator in person who asked them whether they would be willing to take part. The inclusion criteria were that they had to have had a firm diagnosis of Korsakoff syndrome, and they must not be drinking at the time of data collection.

Control Group

The control sample consisted of 12 males similar in age and predicted pre morbid intellectual functioning to the Korsakoff's syndrome participants. These were recruited by placing an advert in various locations including hospitals and universities. The control subjects were offered a payment for their participation.

All participants were asked to read an information sheet outlining what they would be required to do (see Appendices 1 and 2). They were then asked to sign a consent form before taking part in the study (see appendices 2 and 3). Ethical approval for this study was granted by Joint UCL/UCLH Committees on Ethics and Human Research and St Thomas' Hospital Research Ethics Committee (see Appendices 4 and 5).

3. Emotional memory measures

3.1. Good guy/Bad guy Test

This test is based on an experiment designed by Johnson (1985) to examine whether people with Korsakoff's syndrome were able to acquire affective reactions. In this study recognition memory, free recall and cued recall were assessed.

Participants are told that they are going to be asked to look at some pictures of some faces. They are shown some rating sheets (Appendix 6). They are told to rate each face according to the three characteristics: honesty, kindness and likability on these rating sheets. There is a separate rating sheet for each face. They are also told that they will only be shown the faces for a short period of time, but to make a judgement for each characteristic for each face. The participant is then asked to look at the rating sheet and is given an opportunity to ask any questions about the procedure. The form consists of a 5 point rating scale for each of the characteristics (e.g. for kindness, the categories which can be ticked are: more kind than most people; more kind than many people; average; less kind than many people; less kind than most people). This 5 point scale is the same as the one Johnson used (1985). However faces are rated on only 3 characteristics, whereas in her original study 20 characteristics were used. For this study ratings on less characteristics were used as there were more faces to rate, so inclusion of 20 characteristics would make administration extremely lengthy. Piloting this procedure revealed that ratings were likely to be similar for each characteristic on individual faces. Therefore if a face was rated as 'less kind than many people' then it was likely that the two other characteristics would be rated similarly. Honesty and kindness were picked from the original characteristics as they appeared to be more general, as compared with some of the other characteristics used in the original study (e.g. popular, mature). The characteristic 'likeable' was added as this was thought to be a characteristic which may encompass some of the more specific characteristics Johnson used.

Eighteen faces are then presented one at a time for 5 seconds and the participants rate these as described (rating at time 1). Subjects are then immediately

presented with the 18 faces again, this time for a minute each. For 3 of the faces there is some biographical information describing the characters as good people (good guys) and for another 3 faces the information describe the characters as bad and unpleasant (bad guys). (See the appendix 7 for character descriptors used). Subjects are asked to rate characters immediately after hearing the information (rating at time 2). For three other characters subjects are asked to rate again in the absence of any information (neutral characters) and for the remaining 9 faces they are asked to attend to them without rating. These faces are presented in a random pre-determined order. All subjects are asked to rate the same faces in the same order to control for primacy and recency affects. For all 18 faces there is the same total exposure time.

Two days following the procedure described above subjects are then asked to do 4 tasks:

a. *Recognition memory*

Subjects are shown 50 faces, 18 being the 'target' faces which they saw in the first session and the remaining 32 being 'distractor' faces which have not previously seen. Participants are asked to identify the faces they have seen before. These faces are also presented in a random pre-determined order.

b. *Rating at time 3*

Subjects are then shown the 9 faces which they had rated for a second time in the previous session(the 3 good guys, 3 bad guys and 3 neutral characters), and asked to rate them for a third time using the same method as previously. This is in order to determine whether the ratings remained in the direction indicated by the biographical information (i.e. higher for good guys or lower for bad guys) .

c. *Preference test*

Subjects are again presented with three pairs of faces, each pair consisting of 1 'good guy' and 1 'bad guy'. For each pair they are asked which they think is the nicer person. Their answer is recorded.

d. *Recall test*

Subjects are then presented with the 9 faces in turn in a random pre determined order (3 good guys, 3 bad guys and 3 neutral guys). For each face they are asked what they can remember about the character (a free recall test). For each of the 6 faces which were accompanied by a descriptor, they are also asked 3 cued recall questions and finally 3 forced choice recall questions (where the choice of answer is Yes or No), see Appendix 7.

3.2 Cahill test.

This test was designed to compare memory for an emotionally arousing story with a more neutral story. A set of a slides is shown accompanied with a narrative. The slides are the same for each condition but the narrative is different for each story. This test was first used with normal subjects in a study by Cahill and McGough (1995). For the purpose of this study, only the emotionally arousing narrative was used as several studies have now found clear differences between emotional and neutral versions and the patient sample was too small to make within sample group comparisons. Furthermore, the emotionally arousing story consists of three phases where the first phase is neutral (about a mother and son leaving home planning a trip to the fathers workplace), the second phase is emotionally arousing (the child is hit by a car, taken to hospital and surgeons have to re-attach his severed feet) and the final phase is neutral (the mother goes to pick up her other child). Thus comparisons can be made between memory for emotional and neutral phases within subjects.

In the first session, participants are shown a set of 11 slides, each slide being displayed for 20 seconds. Accompanying each slide is a piece of narrative (see Appendix 8). After seeing the set of slides and hearing the narrative, participants are asked to rate the story as to how 'emotional' they felt it was on a scale of 0-10 where 0 is not emotional at all and 10 is extremely emotional.

Participants with Korsakoff's Syndrome are asked to answer some multiple choice questions about the story half an hour after the exposure. Control participants are asked the same questions 2 days after exposure. The time before recall differs for the 2 groups so that participants with Korsakoff's syndrome will not score at floor level, and therefore types of information better retained can be discriminated. Similarly it is not desirable that control subjects perform at ceiling levels for the same reason, so they are given a longer delay.

There are a number of questions (ranging from 5-9) about the story for each slide. They include both questions about the narrative and the visual aspects of the story. Each question is a multiple choice with four possible answers (see Appendix 9 for examples). Participants are given the following instructions before being asked the questions.

"*You should answer each question even if you are forced to guess. You will have to guess on many of them because we have designed the questions to be difficult.*" (This is said in an attempt to allay fears about not knowing all the answers). "*There will be 5-9 questions per slide and I will tell you at what point the questions will refer to the next slide. Sometimes a question will tell you that you were right or wrong on the previous question, if you were right, great, if you were wrong just keep going on.*"

Participants answers are recorded. The percentage of correct answers to each slide is calculated.

3.3 Autobiographical Memory Test

This test assesses memory for past personal events. It has been fairly widely used with normal population samples (Williams et al 1996) and depressed people (e.g. Puffet et al 1991). It aims to measure the specificity of memories for personal events and the time that these memories take to be retrieved.

It consists of 18 cuewords in three cueword valence categories: 6 positive words (such as proud, happy), 6 negative words (such as guilty, helpless) and 6 neutral words (such as bread, pottery), see Appendix 10. The subject is asked to recount a memory that each cue word reminds them of. The amount of time taken to recall the memory is recorded as well as when the event took place. Participants are given the following instructions:

"*I am interested in your memory for events that have happened to you in your life. I am going to read you some words. For each word I want you to think of an event that happened to you which that word reminds you of. The event could have been an important event or a trivial event. Just one more thing, the memory you recall should be a specific event. So if I said the word 'good' it would not be okay to say 'I always enjoy a good party' because that doesn't mention a specific event. It would be okay to say ' I had a good time at Jane's party on Friday'.*"

The investigator reads each word aloud and participants' responses are recorded verbatim. There are three practice words and participants can be prompted on these cue words until they produce a memory of a specific event. The test words are then read aloud by the investigator. If the participant's response is not specific they can be prompted by the investigator saying "*Can you think of a particular time?*" This prompt can be used a maximum of twice for the test words. Participants have 30 seconds in which to remember an event from each cueword. The time taken to respond with a specific memory is recorded, even if their first response is not specific. The timing starts when the investigator has finished speaking the cueword. This time is called the 'latency to first specific memory score'. If the participant is not able to think of a specific memory within the time limit, a latency of 30 seconds

is recorded. After the responses to the cuewords have been recorded the participant is asked how long ago each memory took place, which is also recorded. The participant is then asked if the memory is pleasant or unpleasant. They are asked to rate the memory on pleasantness or unpleasantness (depending on what their answer was to the previous question) on a scale of 0-10 where 10 is at the extreme end of the scale. For unpleasant memories scores are recorded on a negative scale (e.g. -10 = very unpleasant) and pleasant memories are recorded on a positive scale (e.g. +10 = very pleasant). If the subject says the memory is neither pleasant or unpleasant a score of 0 is recorded.

The first response to each cueword is then coded as either Omission, Generic, Extended or Specific as suggested by Phillips and Williams (1997). The general rules for coding are that if the event took place over a period of time lasting less than one day it is coded as specific (e.g. 'Last Sunday when I went for a walk'); if it does not specify a particular time it is coded as generic (e.g. 'when I go for walks'); if it specifies a time period lasting a day it is coded as extended (e.g. 'My two week holiday in Spain last year') and if no answer is given then this is coded as an omission. Previous research has indicated that this coding system does distinguish between specific and generic memories reliably, as inter rater reliability scores have been between 0.87 and 0.93 (Williams and Scott 1988)

3.4. Emotional priming test

This test is a novel wordstem completion priming test which assesses implicit memory for 'emotional threat' and 'neutral' material. Participants are shown 55 words, 32 of which are real words and the other 23 are non-words. The 32 real words consist of 16 pairs of words. Each pair starts with the same 3 letter wordstem and has the same total number of letters. One word in the pair is a 'neutral' word, for example ASHTRAY and one an 'emotional threat word' for example ASHAMED. The 55 words are presented to participants in a pre-determined random order. To ensure participants attend to each word they are asked

to indicate whether they think the word is: definitely an English word, probably an English word, unsure, probably not an English word or definitely not an English word. These options are listed on a card and participants are asked to point to an option for each word. 20 minutes later participants are presented with 24 word stems and asked to think of a word to complete them. 16 of the word stems are the beginning of the pairs of emotional and neutral words and the remaining 8 are new wordstems (see Appendix 11). Stems are presented in a random order. Following each wordstem there is a series of dots indicating how many more letters should complete the word, (e.g. for ashamed and ashtray ASH . . . .). Participants are unaware that the earlier task, (when asked to identify whether words were English words), and this task are related. The purpose of the 8 new word stems is so that participants do not recognise a connection between the two tasks.

Participants responses are coded as 'E' if they completed the word stem as the emotional word, 'N' if completed with the neutral word and 'O' if completed with another word.

4. Other Assessments

In addition to these four measures of memory for emotional information, other assessments were used to assess demographic information, mood and different areas of cognitive functioning. This was so that any inferences made from results could be placed in the context of strengths and weaknesses in other areas of functioning. Frontal lobe function was assessed by administration of the FAS test and trails Test. Explicit verbal and visual short term memory was assessed by a story recall test and a visual reproduction test. Pre morbid intellectual functioning was estimated by the National Adult Reading Test (NART), and current reasoning ability was assessed using Raven's Standard Progressive Matrices. Levels of anxiety and depression were also assessed using the Hospital Anxiety and Depression Scale (HADS).

4.1. Story Recall (immediate) from the Adult Memory and Information Processing Battery

The Story recall subtest from the Adult Memory and Information Processing Battery (AIMPB)(Coughlan and Hollows, 1985), assesses current verbal episodic memory function. Participants are required to listen to a passage of prose which contains 28 'ideas'. Immediately after listening to the prose participants are asked to recall as much as they can about the story. Responses are scored by giving 2 points to every idea correctly recalled and 1 point for ideas partially recalled. Therefore there is a maximum score of 56 and a minimum score of 0. The subtest has been standardised and from scores obtained, the percentile range for a normal population can be calculated.

4.2 Visual Reproduction (immediate) from the Wecshler Memory Scale (WMS-R)

The Visual Reproduction is a subtest of the WMS-R (Wecshler 1983). It is a test of short term visual memory. The test requires participants to look at 4 geometric designs one at a time for 10 seconds. Immediately after the presentation of each design, they are asked to draw what they can remember of the design. The drawings are scored for accuracy following detailed criteria. There is a maximum total score of 41. This test has been widely standardised and from scores the percentile range can be calculated.

4. 3 F A S Verbal Fluency Test

The FAS test (Benton and Hamsher 1989) is a test of verbal fluency. In this test participants are required to think of many words as they can beginning with the letters F, A and S respectively. One minute is allowed for each letter and the investigator records the participants' answers. Before the test commences subjects are told that proper nouns and words which are the same but have a different endings such as (eat and eating) will not be counted.

4.4 Trail Making Test

The Trail Making test (Reitan 1958) is a test of executive functioning and planning. It consists of 2 parts, A and B. In part A participants are required to join a series of 25 numbered circles in order. The time it takes for participants to complete this task is recorded. In the part B participants are required to join up numbers and letters in order starting off from 1 to A, A to 2, 2 to B, B to 3 , 3 to C until finishing on 12 to L. Again time to completion of this task is recorded. There are shorter practice items for both parts which participants complete before attempting the timed tasks.

4.5 Hospital Anxiety and Depression Scale (HADS)

The Hospital Anxiety Scale (Snaith and Zigmond 1983) consists of a 14 item self report form. It is designed to assess levels of anxiety and depression and therefore half of the items relate to symptoms of anxiety and the other half to symptoms of depression. This scale produces scores between 0 and 21 for both anxiety and depression. A score of above 9 is considered to be outside normal range and therefore indicates higher levels of either anxiety and depression than would be expected of the normal, non-psychiatric population.

4.6 National Adult Reading Test (NART)

The NART (Nelson 1982) provides an estimate of pre-morbid intellectual functioning. It consists of a list of 50 non phonetical words which participants are required to read aloud. It has been extensively standardised and is commonly used to obtain an estimated pre-morbid IQ.

4.7 Raven's standard Progressive Matrices

Raven's standard progressive Matrices (Raven, Court and Raven 1985) provides a measure of non verbal reasoning ability and gives an index of intellectual capacity. It consists of 60 pictorial puzzles divided into 5 sets (A, B, C, D and E).

Each puzzle has a piece missing and the participant is required to find the piece which fits among options provided. Control participants were required to tackle all items whereas Korsakoff participants were required to complete only sets B and D. This was to reduce testing time for patients. Also as intellectual functioning has been found to decline in some people with Korsakoff's Syndrome, these participants were more likely to have difficulties solving the problems so only 2 sets were administered to make the experience less stressful. Scores are then pro rated.

4.8 Demographics

Participants were asked for some demographic information which included their age at present, what age they left school and what qualifications they gained. They were also asked to list any further qualifications they gained after leaving school. Finally they were asked to give a brief career history.

5. Procedure

These tests were carried out over 2 sessions. They were conducted individually and in a quiet and confidential setting. For each participant the 2 sessions took place in the same setting.

Participants from both groups (Controls and Korsakoff's) were offered an appointment after agreeing to participate. Where possible participants were given the information sheet at least a day before data collection took place. However this was not the case for all participants. Each participant was interviewed alone. At the beginning of the first appointment, the investigator made sure the participant had read the information sheet. If they had not, they were given time to do so. The investigator then gave the participants time to ask any questions about the research. They were reminded that participating meant attending 2 appointments, the second appointment being 2 days after the first. They were then asked to sign the consent form.

The data collection then began with demographic information. It was hoped that gaining this information enabled the investigator to learn a little about the participant and therefore help a rapport to develop. It was the aim that this may encourage participants to have as low anxiety levels as possible when completing the tests.

The tests were then administered in the following order:

Session 1

1. First presentation of 18 Good guy/Bad guy faces, rating at time 1 by participants
2. Second presentation of good guy/ bad guy faces, accompanied by information. rating at time 2 by participants
3. Presentation of slides from Cahill test and accompanying pre recorded narrative Participants rate story on emotionality
4. Presentation of words and non words from the emotional priming test
5. Autobiographical Memory Test.
6. Wordstem completion of emotional priming test
7. NART
8. Participants fill in HADS questionnaire
9. KORSAKOFF'S SUBJECTS ONLY - multiple choice recall tests of slides and narrative from Cahill Test.

At the end of the session participants were allowed time for any comments and were thanked for their time. The next appointment was then confirmed.

Session 2

1. Recognition test from Good guy/bad guy test which includes 50 faces, 18 being the 'target faces'
2. Rating at time 3 of faces by participants
3. Recall test including free recall, cued recall and forced choice recall subtests.

4. CONTROL SUBJECTS ONLY- multiple choice recall tests of slides and narrative from Cahill Test.
5. FAS test of verbal fluency
6. Story recall test (immediate) from AMIPB
7. Visual Reproduction test (immediate recall) from WMS-R
8. Ravens Standard Progressive Matrices (sets A,B,C, D and E for control subjects and sets B and D for Korsakoff's subjects).
9. Trail making test

Again all participants were given time to comment or ask any questions at the end of the session. Control subjects were then given a payment for their participation. Korsakoff's subjects could not be offered payment as this was against the policy of the organisations involved but were refunded any travelling expenses.

CHAPTER 3 RESULTS

1. Participants

18 subjects participated in this study, 6 (33%) had Korsakoff's Syndrome and 12 (67%) were normal controls. 5 of the Korsakoff's group were outpatients at the Neuropsychiatry department of a large hospital and 1 Korsakoff subject was an inpatient on a ward at the same hospital. 3 of the Korsakoff's subjects were living in supported accommodation and 2 were being cared for by their partners. (The remaining Korsakoff's subject was the afore mentioned inpatient)

2.Demographic details.

The age range was 43-63 (mean 54.8 $\pm$ 7.7) years in the Korsakoff group and 42-62 (mean 48.1 $\pm$ 6.7) years in controls. There was no significant age difference (t=1.92, df=16, ns). All participants in both groups were male.

All of the control group were in current employment, whereas none of the Korsakoff group were in current employment. However all the Korsakoff's group had been in employment in the past.

3. Premorbid Intellectual functioning

The average age for leaving school for the Korsakoff group was 15.5 years (sd 0.24, range 15-16) and for the control group was 16.0 (sd 0.55 range 15-18). There was no significant group difference in age that subjects left school. (t=1.46, df=16 ns).

In the Korsakoff group 4 subjects (67%) reported leaving school with no qualifications and in the control group there were also 4 subjects (33%) who reported leaving school with no qualifications. 1 of the Korsakoff group had 4 'O'levels and the remaining Korsakoff subject had 2 'A' levels. In the control group, 4 subjects (33%) had 2-5 'O' levels and 4 subjects (33%) had one or more 'A' levels

The average estimated pre morbid IQ (scores obtained on the NART) for the Korsakoff's group was 109 (sd 5.88, range 101-118) and for the control group was

113 (sd 7.596, range 91-120). This difference in estimated IQ scores between the two groups was not significant (t= 0.94, df=16, ns).

4. Current cognitive functioning

Verbal Memory: On measures of immediate verbal recall (Story recall from the Adult Memory and Information Processing Battery), out of a possible total of a score of 56 the average score for the Korsakoff group was 12.00 (sd 6.03, range 2-19). For the control group the average score for this test was 32.08 (sd 11.63, range 3-47). The higher average score of the control group was significant (t= 3.93, df=16, p=0.001).

Visual memory: In the Visual Reproduction subtest from the Wecshler Memory Scale (WMS-R), percentiles for performance were calculated. The average percentile for the Korsakoff group was 35.6 (sd 28.48, range 2-79), whereas for the control group the average was 78.08 (sd 25.49, range 19-98). Again controls were performing significantly better on this task than the Korsakoff group (t= 3.03, df=15, p<0.01).

Verbal Fluency: The average scores the F A S test of verbal fluency for the Korsakoff group was 24.00 (sd 7.32, range 15 - 37) and for the control group was 43.58 (sd 10.49, range 22 - 58). The control group were found to be performing significantly better (t=4.07, df=16, p=0.001). When scores were converted into percentiles, the average percentile for the Korsakoff's group was 17.83 (sd 22.26, range 2-62) and the average percentile for the control group was 74.92 (sd 18.21, range 27-90).

Executive functioning: Performance on part A and part B sections on the trail making test were measured by the number of seconds it took to complete the tasks. Scores were then converted into percentiles. The average percentile for the Korsakoff group on part A was 15.83 (sd 12.46, range <5-50) and for controls 39.5 (sd 30.90 range <5 -90) Controls were performing significantly better than the Korsakoff group (unequal t= 2.31, df=15.66, p<0.05).

On Part B the average percentile for the Korsakoff group was 15.83 (sd 19.85, range 0-50) and for the control group was 50.00 (sd 30.97 range 0-90). Again the control group were performing significantly better than the Korsakoff group ($t=2.44$, $df=16$, $p<0.05$).

Current intellectual functioning: The average score for the standard progressive matrices in the control group was 46 (sd 5.09, range 28-58). This average score fell at the 25th percentile, which converts to a full scale IQ of 90 (converting percentile to IQ scores based on the WAIS-R). For Korsakoff subjects only items B and D were administered and the average score was 13, (sd 5.91, range 5-19). Average score on items B and D for the control group was 20 (sd 2.52, range 15 -24). A non parametric Mann whitney test revealed that there was a significant difference in scores between the two groups ($Z= -2.78$, $p<0.01$). However, although 2 of the Korsakoff's subjects' scores on items B and D were low (5 and 6), the other 4 Korsakoff's scores fell within the range of 14-19 indicating that they were performing in a similar range to the control subjects. It was not possible on the basis of these scores to predict IQ scores or percentile equivalents accurately for Korsakoff subjects.

5. Mood

For the Hospital Anxiety and Depression Scale (HADS), on the anxiety subscale the average score for the Korsakoff group was 9.67 (sd 3.78, range 5-14) and for the control group was 5.25 (sd 2.96, range 3-11). It was found that Korsakoff subjects were scoring significantly higher on this scale than controls ($t=-2.73$, $df=16$, $p<0.05$). A score of above 9 is considered to be outside the range of the normal population. 3 of the 6 Korsakoff's subjects and 1 of the 12 control subjects had scores of above 9.

On the depression subscale the average score for Korsakoff subjects was 5.17 (sd 4.12, range 2-13) and for control subjects this score was 3.58 (sd 2.94 range 1-10). There was no significant difference between groups on the depression scale (t=-

0.94, df=16, ns). Only 1 Korsakoff's subject and 1 control subject scored above 9 (outside the range of the normal population).

6. Research questions

The main research questions were:

1. Is memory for emotional material better preserved than memory for neutral material in people with Korsakoff's syndrome?
2. Does memory for emotional material in people with Korsakoff's syndrome depend on how memory is assessed?

7. The Good guy/Bad guy test

It was hypothesised that the Korsakoff group would remember less explicitly assessed information than control subjects, but that the superiority of memory for emotional information in the two groups would be similar. It was also hypothesised that the Korsakoff group would retain the emotional nature of the material. Therefore in the Good Guy/Bad Guy test, it was predicted that Korsakoff's subjects would remember less information about the characters than the control group, but that they would be able to distinguish between good and bad characters and this would be reflected in ratings of characters over time and preference tasks. On explicit tasks of recognition and recall the Korsakoff's scores would be lower than the control group.

7.1 Ratings

In order to explore the above predictions, firstly the rating scores were analysed. The subjects had rated 3 characters accompanied by 'good' information (good guys), 3 characters accompanied by 'bad' information (bad guys) and 3 'neutral' characters accompanied by no information. Each character was rated on three different characteristics (honesty, kindness and likability), each consisting of a 5 point rating scale (described in the methods chapter). Scores of 0,1,2,3 and 4 were

assigned to each of these points, with 0 being at the most negative end of the scale (e.g. less kind than most people) and 4 being at the most positive end of the scale (e.g. more kind than most people). Therefore, for each rating for each character there was a maximum score of 12 (if 4 was scored on each characteristic) and a minimum of 0 (if 0 was scored on each characteristic). For the purpose of analyses these ratings for each type of character were added together at each time point. This produced an overall rating score for each type of character at each of the three time points (e.g. for the good guys: Overall Good Rating at time 1, Overall Good Rating at time 2, Overall Good Rating at time 3). Rating at time 1 was in the first session before any information was given about a character, rating at time 2 was also in the first session and took place immediately after information about the characters was given and rating at time 3 took place 2 days later in session 2.

Table 1 shows the means of ratings for the Good and the Bad guys at each time point for each group. This information is also represented in a graph (figure 1). The graph indicates that for the control group, although ratings do differ somewhat at 'time 3' from 'time 2', they still remain either higher or lower than the baseline rating at 'time 1' according to the type of character (i.e. higher for good guys and lower for bad guys). However this was not the case for the Korsakoff group, where although ratings at 'time 2' changed according to the type of character, 2 days later at 'time 3' ratings were similar to that of the baseline rating at 'time 1'.

A 2 X 2 X 2 mixed analysis of variance was carried out to find out if these differences in profiles of ratings were significant. 'Type of information' (good and bad) and 'time' (time 2 and 3) were entered as within subject factors and 'group' as a between subjects factor. T tests were carried out to ensure that ratings at time 1 did not differ significantly between groups and therefore differences in rating based on a judgment in absence of any information would not confound results. There was no significant difference of ratings at time 1 between groups for either the good or the bad characters ($t=-1.35$, $df=16$, ns for Good rating 1 and $t=.69$, $df=16$, ns for Bad rating 1), therefore analysing ratings at times 2 and 3 was considered to be valid.

The Analysis of Variance revealed that group was a significant between subjects factor ($F_{(1,16)} = 8.41$, $p=0.01$) and, as would be expected, there was a significant main effect of type of information (i.e. good or bad) on ratings ($F_{(1,16)}=74.33$, $p<0.001$) . There was also a trend towards a three way interaction between group, type of information and time ($F_{(1,16)}=3.66$, $p=0.07$).

Subsequent t tests then indicated that at time 2 (immediately after information had been presented) there was a trend for Korsakoff's ratings of the bad guys to be higher than controls ($t=-1.96$, $df=16$ $p=0.07$), but this was not the case for the good guys ($t=-0.12$, $df=16$, ns). There was a significant difference between ratings of the Bad guys at time 3 (2 days after information was presented) ($t=-2.95$, $df=16$, $p<0.01$). By inspection of the means it can be seen that it is the ratings of controls which are lower than the Korsakoff group at time 3. For the good characters there was no significant difference in ratings at time 3 ($t=1.17$, $df=16$ ns).

Table 2 reports the mean ratings and standard deviations for the neutral characters at different time points and figure 2 shows this information in graph form. At time 1 the Korsakoff group rated the neutral characters significantly higher than the control group ($t=-2.51$, $df=16$, $p<0.05$). At time 2 there was a trend for Korsakoff subjects to rate these characters higher ($t=-1.95$, $df=16$, $p=0.69$) and at time 3 there is no significant difference between the two groups ($t=-0.85$, $df=16$ ns).

Table 1

Comparison of mean characteristic ratings of Korsakoff (K) and control groups (C) over the three time periods for Good and Bad guys.

Group	T I M E 1				T I M E 2				T I M E 3			
	good		bad		good		bad		good		bad	
	m	sd	m	sd	m	sd	m	sd	m	sd	m	sd
K	24.33	5.57	23.00	7.38	29.00	5.57	7.50	3.02	22.83	5.04	21.33	7.03
C	21.33	3.85	21.25	3.55	28.75	3.85	3.92	3.91	25.75	4.98	11.58	6.42
t	1.35ns		0.69 ns		1.35ns		1.96 ns (trend)		1.17ns		2.95 **	

df =16 in all cases. *=p<0.05 **=p<0.01 ***=p<0.001

Table 2

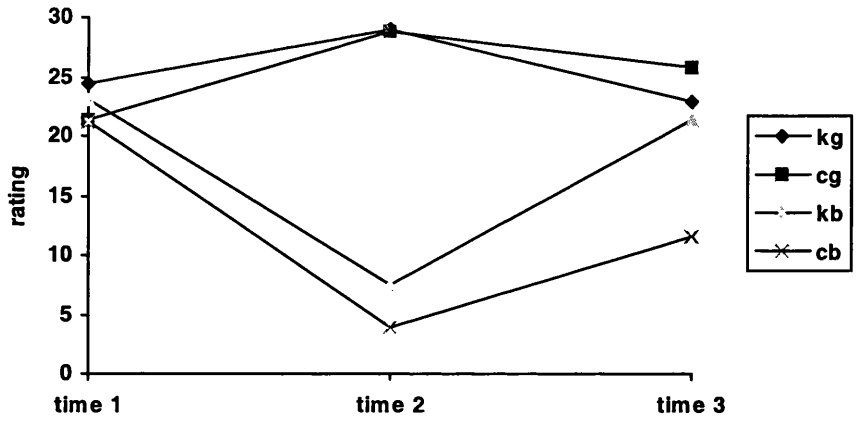
Comparison of mean characteristic ratings of Korsakoff and control groups over the three time periods for neutral characters

Group	TIME 1		TIME 2		TIME 3	
	m	sd	m	sd	m	sd
Korsakoff	20.83	7.73	20.83	9.85	18.33	7.87
Control	13.91	4.14	14.42	4.36	15.58	5.78
t	-2.51 *		-1.95 (trend)		-0.85 ns	

df =16 in all cases. *=p<0.05 **=p<0.01 ***=p<0.001

Figure 1

Graph to show mean ratings at times 1,2 and 3 for the Korsakoff and control group

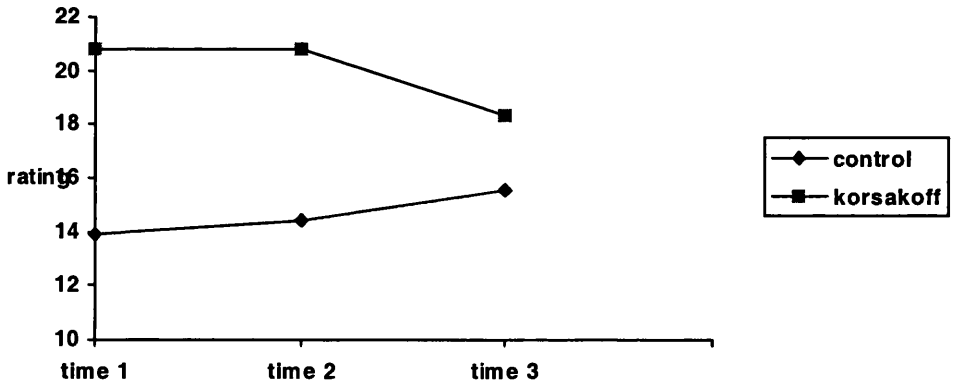


Kg= Korsakoff ratings for 'good guys'
Cg= control ratings for 'good guys'
Kb= Korsakoff ratings for 'bad guys'
Cb= control ratings for 'bad guys

Time 1- rating 1 in session 1 before any information given
Time 2- rating 2 in session 1 immediately after character information presented.
Time 3-rating 3 in session 2, 2 days later.

Figure 2

Graph to show mean ratings of neutral characters at times 1, 2 and 3 for the Korsakoff group and the control group.



7.2 Preference test

Preference tests in the second session were administered where subjects were shown Good guys paired with Bad guys and asked which one they preferred. There were three pairings and for each pairing subjects were given a score of 1 for choosing the good guy and 0 for choosing the bad guy. Therefore there was a maximum score of 3. For Korsakoff's subjects the mean number of preferences for good guys was 1.33 (sd 0.52) and controls had a mean score of 1.92 (sd 0.79). It can be seen that controls are scoring higher than the Korsakoff group on this test. However this difference was not found to be significant ($t= 1.62$, $df=16$, ns).

7.3 Recognition test

Subjects were given a recognition test in the second session. It consisted of the 18 'target faces' which they had been exposed to in the previous session and 32 distractors which had not previously been seen. The 18 target faces included the Good guys , the Bad guys and the neutral characters. Subjects could score a maximum of 18 'true positives' and 32 'true negatives'. Incorrect answers consisted of 'false negatives' and 'false positives'. (See table 3 for means and standard deviations of recognition scores). For the purpose of analysis, the total number of items answered correctly was calculated (true positives + true negatives), therefore the maximum score was 50. As the scores were not normally distributed, nonparametric Mann Whitney tests were performed. It was found that the control group had significantly higher scores than the Korsakoff group ($Z=-3.37$, $p<0.001$). Using the same type of analysis it was found that the control group had a significantly higher number of true negatives ($Z=-3.21$, $p<0.01$) but not a significantly different number of true positives ($Z=-0.58$, ns).

To investigate whether there was any difference in percentage of recognition of the 6 good and bad characters as compared with the 12 faces which had not been accompanied by emotionally valent information, a repeated measures 2 X 2 ANOVA was performed. 'Group' was entered as a between subject factor and 'characters

category' as a within subject factor with 2 levels (valent characters, *i.e. good and bad characters* and non valent characters *i.e. characters not accompanied by any information.*). It was found that although group effect was significant ($F_{(1,16)}=12.63$, $P<0.01$), there was no significant main effect of character category ($F_{(1,16)}= 0.35$ ns) or interaction between character category and group ($F_{(1,16)}=0.04$ ns).

Table 3

Mean and standard deviations of scores on recognition for the Korsakoff and control groups.

	KORSAKOFF		CONTROL	
Type of answer	**m**	**sd**	**m**	**sd**
True positives	13.33	4.55	15.25	1.42
True negatives	25.33	5.85	31.17	1.03
False positives	4.67	4.55	2.75	1.42
False negatives	6.67	5.85	0.83	1.03
total correct	38.00	4.73	46.42	1.56

7.4 Recall tests

In session 2 subjects were given free, cued and forced choice recall tests. Each piece of information about the characters consisted of 22 'ideas'. In the free recall test a point was scored for each idea correctly recalled and half a point was awarded for getting the gist of an idea rather than remembering specifics (for example half a point would be received for saying that the person came from the north rather than remembering that they came from Scarborough).

The number of ideas remembered by Korsakoff's subjects was extremely low (from the whole Korsakoff group a total of only 2 ideas were remembered), and therefore negligible. The control group remembered a mean of 11.13 ideas (sd 7.6, range 0-26). As there were 6 stories, this resulted in an average of approximately 2 ideas per character, although as can be seen from the large range of scores and standard deviation, performance between control subjects varied greatly.

There were 3 cued recall questions for each character, and 1 point was scored for each question answered correctly. As there were 6 characters there was a maximum potential score of 18. The Korsakoff's group scored a mean of 2.42 (sd 1.49, range 1-5) and the control group scored a mean of 9.8 (sd 3.07, range 4-13). A non parametric Mann Whitney test revealed that there was a significant difference between the two groups ($Z= -3.03$, $p<0.01$).

There were 3 forced choice recall questions for each character, therefore again a potential maximum score of 18. As the answer to the questions were either 'yes' or 'no' it was possible to get a high proportion of these questions right by chance and so as Johnson et al(1985) points out in her experiment, this measure is likely to provide an over estimation of the Korsakoff group's ability. The Korsakoff group had a mean score of 11.33 (sd 1.371, range 7-15) and the control group had a mean score of 15.33 (sd 2.73, range 14-18). It was found that the control group scores were significantly higher than the Korsakoff group ($t=4.20$, $df=16$, $p=0.01$).

7.5 Valence of information

A 2 X 2 repeated measures ANOVA was performed to investigate the interaction of valence of information on recall and group. Free recall, cued recall and forced choice recall scores were added together for the good and bad characters respectively. 'Group' was entered as a between subjects factor and 'valence of information' as a within subject factor with two levels (good and bad). This interaction was not found to be significant ($F_{(1,16)} = 4.01$, ns). However there was a significant main effect of 'valence of information' ($F_{(1,16)} = 5.20$ $p<0.05$) where both groups scored higher on recall for the information about the Good guys as compared with the Bad guys. Mean scores for the Korsakoff group on total recall of information about the Good guys was 8.17 (sd 1.72) and for the Bad guys was 5.92 (sd 1.80). A paired sample t test confirmed that this difference was significant in the Korsakoff group ($t=3.00$, $df = 5$, $p<0.05$).

Summary of Results of Good guy/Bad guy test

- There was a significant group difference in overall ratings. For the Bad guys ratings were similar at 'time 1'. At 'time 2'(immediately after the information had been presented) there was a trend for ratings in Bad guys to be higher in Korsakoff's subjects, however ratings had still gone down in response to the negative information in both groups. At 'time 3' the Korsakoff group's ratings were significantly higher than the control group, where the control group were still rating towards the negative end of the rating scale and the Korsakoff subjects were not. As can be seen from figure 1, for the Good guys, mean ratings were similar at 'time 1' and then ratings in both groups went up to similar scores at 'time 2' in response to the positive information. At 'time 3', however ratings had gone back down in Korsakoff's subjects whereas the control group's mean ratings had remained higher (this difference, however was not found to be significant). These

findings indicate that Korsakoff's subjects had not retained the emotional nature of the material as predicted.

- On ratings of neutral characters, Korsakoff subjects rated significantly higher than controls at 'time 1', this was still a trend at 'time 2' and at 'time 3' there was not a significant difference between the two groups.

- On preference tests it was found that the control group reported preferring a higher number of Good guys than Bad guys compared with the Korsakoff group. However this difference was not found to be significant.

- On all explicit memory tasks (recognition, free recall, cued recall and forced choice recall), as was predicted control subjects were performing significantly better than the Korsakoff group.

- There was not a difference in the number of false negatives for good and bad characters as compared with characters not accompanied by valent information, indicating valence of character had little effect on recognition in either group.

- Type of valence of the information was found to be a significant overall main effect for total recall scores. Both groups scored higher on recall tests for the Good guys.

8. The Cahill Test

It was hypothesised that although Korsakoff's subjects may remember less than the control group, both groups would get more questions right on phase 2 of the story (the emotional phase) as compared with phase 1 and 3 (neutral phases of the story).

8.1 Scores on different phases of the test

Mean percentages of questions answered correctly for each of the three phases of the story were calculated. (see Table 4 and Figure 3).

A repeated measures 2 X 3 ANOVA was carried out in order to examine the interaction between group and phase. It was found that there was no significant interaction between group and phase, ($F_{(2, 32)} = 0.42$, ns), but there was a significant overall main effect of phase ($F_{(2, 32)} = 3.51$ $p<0.05$). As was expected, there was a significant overall main effect of group, ($F_{(2, 32)} = 24.22$, $p<0.0001$) where the control group scored higher than the Korsakoff group for all phases.

The same type of analysis was carried out where phase 1 and 3 (both neutral information) were added together and a mean taken to allow the two types of information to be compared directly. The pattern of effects was unchanged with a significant main effect of type of information (i.e. emotional phase v neutral phases) ($F_{(1,16)} = 7.22$, $p<0.05$) and a significant group effect ($F_{(1,16)} = 28.04$, $p<0.0001$) but no significant interaction between type of information and group ($F_{(1,16)} = 0.88$, ns).

Table 4

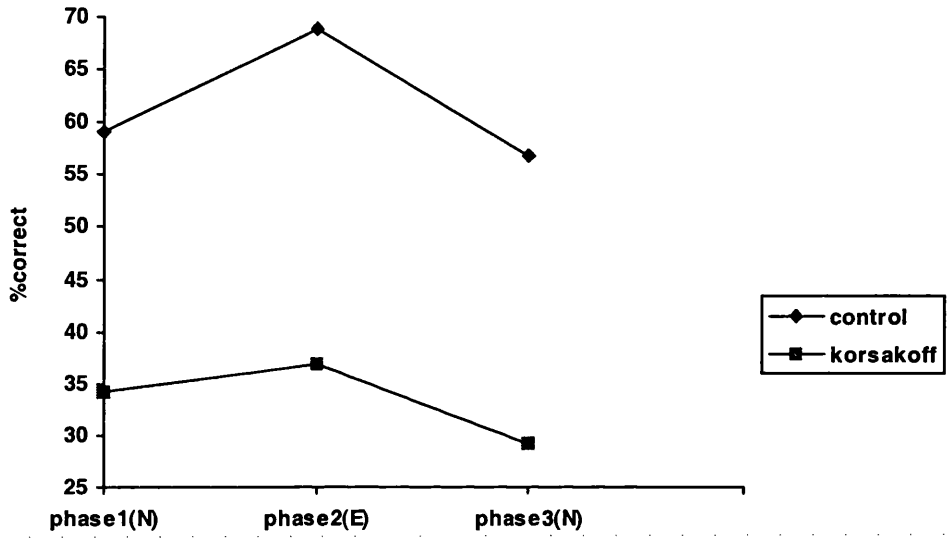
Summary of results of the Cahill test: mean percentage of questions answered correctly for each phase of the story, mean of story valence ratings and results of independent sample t tests.

GROUP	Neutral (phase 1)		Emotional (phase 2)		Neutral (phase 3)		VALENCE RATINGS	
	M	SD	M	SD	M	SD	M	SD
Korsakoff	34.1	12.7	36.9	17.8	29.3	16.6	6.5	3.3
Control	59.1	11.7	68.9	7.6	56.8	18.7	8.0	0.8
t	4.05***		4.21**		3.03**		1.09 ns	

The df for phase one and three was 16
The df for phase two and valence ratings was 5.94 as levenes test for equality of variance was significant so an unequal variance tests were performed.
*=p<0.05 **=p<0.01 ***=p<0.001

Figure 3

Graph to show mean percentage of questions answered correctly for each phase of the story for each group.



Phase 1= neutral phase Phase 2= emotional phase Phase 3 = neutral phase

As there were significant main effects but no significant interaction between group and type of information, post hoc t tests were carried out. It was found in a paired sample t test of control subjects only, they scored significantly higher on the emotional phase ($t=3.01$, $df=11$, $p<0.05$), as compared with their scores on the neutral phases. However the same analysis for the Korsakoff group revealed that there was no significant difference between their scores on the emotional phases and the neutral phase ($t=1.19$, $df=5$, ns). This can be seen in figure 3 where there is clearly a peak for the emotional phase in the control group, but scores over the 3 phases remain flatter for the Korsakoff group.

Results of independent sample t tests for each phase are summarised in the table 4, where it can be seen that there are significant differences between groups on all phases where control subjects were scoring higher. From inspection of table 4, it can be seen that in the emotional phase the standard deviation for the control group was smaller than the standard deviation for the Korsakoff group at the same phase (mean 68.9, sd 7.6; mean 36.9, sd 17.8 respectively). This indicates that subjects in the control group were performing similarly on the emotional phase, whereas the Korsakoff group had a high degree of variability in their performance.

8.2 Valence rating of story

Subjects gave a valence rating of how emotional they thought the story was on a scale of 0 -10, where 0 was extremely unemotional and 10 was extremely emotional. An independent sample t test was carried out in order to investigate differences in ratings of emotionality of the story between the two groups (see table 4). It was found

that the differences in ratings of the two groups was not significant; (unequal t=1.09, df=5.54 ns).

Summary of results of the Cahill test

- There was no significant interaction of group and type of information (emotional or neutral) on performance.

- There was a significant overall effect of group where the control group were performing better than the Korsakoff group across all phases.

- There was a significant main effect of type of information (scores were higher on the emotional phase). Post hoc analysis revealed that for the control group, scores were significantly higher on the emotional phase than the neutral phases, but this was not the case for the Korsakoff group where there was no significant difference in scores according to phase.

- The standard deviation for the control group on the emotional phase of the story was smaller than for the Korsakoff group on the same phase.

- There was no significant difference in the emotional valence rating of the story between the Korsakoff group and the control group.

9. Emotional Priming Test

Organic brain damage has been found to generally affect performance on explicit but not implicit memory tasks. Whether this would be the case for emotional material in an incomplete word stem completion task was not known as no previous research has assessed this in subjects with Korsakoff's Syndrome. Therefore a specific hypotheses regarding emotional valence and performance of this task was precluded.

9.1 Type of wordstem completion frequencies

Wordstem completions were coded into 'emotional', 'neutral' or 'other' where 'emotional' was a primed emotional word, 'neutral' was a primed neutral word and 'other' was a word not previously presented. If the subject failed to give a response 'none' was coded. The frequency of each wordstem completion was calculated for each subject. The maximum frequency for any one type of wordstem completion was 16, however in practice no subject answered with the same type of response to the 16 wordstems. There was a negligible number of 'none' responses (4 altogether), so these were not included in the analysis. The mean frequencies for each response for each group is summarised in table 5.

A repeated measures 2 X 3 ANOVA ('group' X 'type of wordstem' completion) was carried out. There was no significant interaction between group and type of wordstem completion ($F_{(2,15)} = 0.02$ ns). There was also no significant effect of group ($F_{(1,16)}$=, 0, ns). As can be seen from inspections of the means (Table 5), the two groups had a very similar profile of results.

A paired sample t test revealed that there was no significant difference overall between the number of neutral and emotional wordstem completions (t=-1.44, df=17 ns).

Table 5

Mean frequencies and standard deviations of types of wordstem completion in the Korsakoff and Control group.

	type of wordstem completion					
GROUP	**Emotional**		**Neutral**		**Other**	
	M	**SD**	**M**	**SD**	**M**	**SD**
Korsakoff	2.50	1.98	4.00	2.76	9.00	2.83
control	2.67	2.02	3.75	2.42	9.08	2.43

9.2 Effect of anxiety

As half of the Korsakoff group had scored above the cut off point for anxiety, it was investigated whether this had any effect on the frequency of emotional wordstem completions. Mean emotional type of wordstem for anxious Korsakoff subjects was 1 (sd 1.73) and for non anxious Korsakoff's subjects was 4 (sd 0). A non parametric Mann Whitney test revealed that non anxious Korsakoff subjects responded with a significantly higher amount of emotional wordstem completions than anxious Korsakoff subjects ($Z=-2.12$, $p<0.05$).

Summary of results of Emotional Priming test

- There was no significant interaction between type of wordstem completion and group and the profile of results for the two groups were very similar.

- There was not a significant difference between overall frequency of neutral and emotional wordstem completions.

- Non anxious Korsakoff subjects responded with a higher number of emotional wordstem completions as compared with anxious Korsakoff subjects.

10. Autobiographical memory test

It was hypothesised that superiority for emotional memory would be the similar between the Korsakoff and Control groups. Therefore it was predicted that for both groups there would be a relative ease of recall in response to emotional cueword valence categories (positive and negative), as compared to the neutral cueword valence category.

All participants from both groups were able to produce a memory (generic, extended or specific) for the majority of cuewords in the AMT. For the purpose of analysis the frequency of the type of first memory response (specific, generic, extended or omission) were calculated. As there were 18 cuewords, the maximum potential score of each participant for each type of memory response was 18. None of the subjects in either group in practice responded with the same first memory response for all 18 cuewords. The frequencies of each type of memory response for the three cueword valence categories (positive, negative and neutral) were also calculated, there were 6 words in each category. In the extended memory category the total number of extended memories for both groups was at floor level (control: mean=0.33, sd=0.42; Korsakoff: mean =0.17, sd = 0.41). Therefore for the purpose of analysis, this type of response was considered negligible. There was no significant difference in the number of omissions between groups (t=-1.20, df =16, ns), and therefore it was concluded that an analysis of specific and generic memory responses only would be valid

10.1 Types of first memory response

Table 6 shows the mean frequency and standard deviations of specific or generic memories of each group for each cueword valence category. Figure 3 shows the mean frequency of specific memories for each cueword valence category.

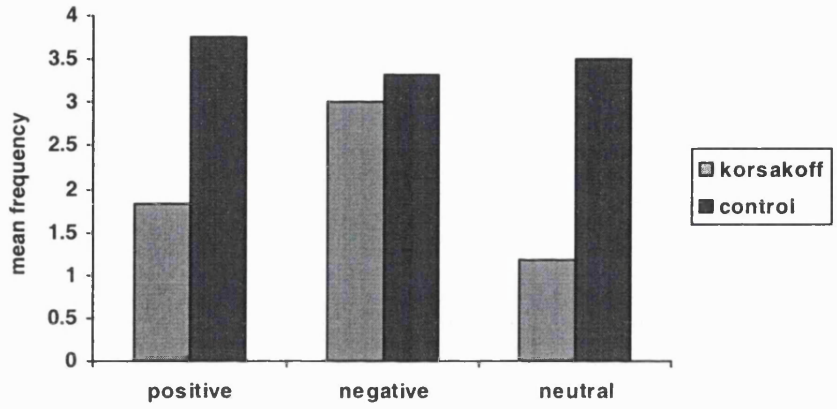
Table 6

Mean number of specific and generic memories for each group in each cueword valence category.

Group	**KORSAKOFF**				**CONTROL**			
memory type	specific		generic		specific		generic	
	M	SD	M	SD	M	SD	M	SD
positive	1.83	1.72	3.0	1.27	3.75	1.42	1.42	1.38
negative	3.00	2.28	2.0	1.55	3.33	1.67	1.17	1.12
neutral	1.17	0.75	3.50	0.64	3.50	1.17	1.92	1.56
TOTAL	6.00	4.34	8.50	3.56	10.58	3.63	4.58	3.28

Figure 4

Graph to show mean frequencies of specific memory responses of each group for each cueword valence category.



A repeated measures 2 X 2 X 3 ANOVA was performed to investigate 'group', 'type of memory response' (specific or generic) and 'cueword valence category' (positive, negative or neutral) interactions. It was found that there was no significant three way interaction between the three factors ($F_{(2,32)}=2.23$ ns). There was also no significant overall effect of group ($F_{(1,16)}=0.24$ ns) and no significant overall main effects of type of memory response ($F_{(1,16)}=1.08$ ns) or cueword valence ($F_{(2,32)}= 0.46$ ns). However there was a significant group and type of memory response interaction ($F_{(1,16)} = 6.20$ $p<0.05$) and a significant type of memory response and cue word valence interaction ($F_{(2,32)}=3.90$, $p<0.05$).

To investigate further these interactions, post hoc t tests revealed that control subjects produced a significantly higher number of specific memories overall than the Korsakoff group ($t=2.37$, $df=16$, $p<0.05$). Also for positive and neutral cuewords, the control group produced significantly more first specific memories than the Korsakoff group ($t=2.52$, $df=1,16$, $p<0.05$; $t=3.42$, $df= 1,16$, $p<0.01$). However for negative cuewords there was no significant difference between the two groups ($t=0.35$, $df=1.16$ ns). The profile of mean frequencies for each cueword category for each group can be seen in figure 4.

The Korsakoff group had a significantly higher number of generic memories overall than the control group ($t= -2.32$, $df=16$, $p<0.05$). This was the case for positive words and a trend for neutral words ($t=-2.36$, $df=16$, $p<0.05$; $t=-1.99$, $p=0.06$). However for negative words there was no significant differences between groups in the number of generic memories produced ($t=-1.32$, $df=16$, ns).

The mean number of total memories produced (specific + generic) for the Korsakoff's group was 14.50 (sd 2.07) and for the control group was 15.67 (sd 2.37). A t test revealed that there was no significant difference on this score between the two groups ($t=0.58$, $df=16$, ns).

10.2 Latency to specific memory response.

Time (in seconds) taken to respond to the cue words with a specific memory response was measured (latency score). This was regardless of whether this was the first memory recalled or whether a prompt was given. Therefore it was possible that a subject could have produced 2 generic memories before producing a specific memory (as 2 prompts are allowed). Means and standard deviations of latency according to cueword valence category are reported in table 7.

To investigate whether there was any interaction between group and cuewords on latency, a 2 X 3 ANOVA was performed. It was found that there was a trend towards an interaction between group and cueword valence category ($F_{(2,28)}=3.24$, $p=0.05$), but there was no significant main effect of cueword valence category ($F_{(2,28)}=2.20$, ns). Post hoc t tests revealed that there was a significant group difference in latency of remembering specific memories for positive cuewords and neutral cue words ($t=-2.84$, $df=15$, $p<0.05$; $t=-2.04$, $df=15$, $p<0.05$). However this was not the case for negative cue words ($t=-0.80$, $df=16$, ns), where there was no significant difference in latency between the two groups.

Table 7

Means and standard deviations of latency until specific memory responses in each group for each cueword valence category.

Group	POSITIVE		NEGATIVE		NEUTRAL		**TOTAL**	
	m	**sd**	**m**	**sd**	**m**	**sd**	**m**	**sd**
Korsakoff	18.81	6.57	13.81	6.24	14.73	1.94	15.05	4.48
Control	11.05	4.49	11.70	4.82	10.90	3.33	11.21	3.43

10.3 Subjective Valence

Table 8 shows the mean subjective ratings across cueword valence category. The scale ranged from -10 (very unpleasant) to +10 (very pleasant). A 2 X 3 ANOVA (group X cueword valence category) was performed. It was found that there was a significant interaction between these two factors ($F_{(2,15)} = 4.37$, $p<0.05$). Ratings were similar in both groups for the positive and negative words, but Korsakoff subjects rated neutral words as more positive than the control group. As would be expected there was significant main effect of cueword valence category ($F_{(2,15)} = 47.97$ $p<0.0001$). However there was no significant overall effect of group ($F_{(1,16)} = 0.37$, ns).

Table 8

Mean subjective valence and standard deviations of each group for each cueword valence category.

Group	POSITIVE		NEGATIVE		NEUTRAL	
	m	**sd**	**m**	**sd**	**m**	**sd**
Korsakoff	6.45	7.36	-4.35	4.30	3.51	3.57
control	7.66	1.17	-5.67	2.45	1.31	0.95

10.4 Time ago of remembered events

The mean number of years ago that events recalled took place was calculated for each subject. Events which had happened less than a year ago were given a score of 0. The same calculation was also carried out for each cueword valence category. Table 9 reports the mean number of years ago that events were reported to have happened for each group in each cue word valence category .

A 2 X 3 ('group' X 'cueword type valence' category) repeated measures ANOVA was performed. It was found that there was a significant interaction between group and cueword valence category ($F_{(2,28)}= 3.61$ $p<0.05$). There was also a significant effect of group ($F_{(1,14)} =19.09$, $p=0.001$) and a significant main effect of wordtype ($F_{2,28)} = 4.18$, $p<0.05$). It can clearly be seen from inspecting the means that events remembered in the Korsakoff group happened much longer ago than events remembered by the control group. For each cueword valence category in control subjects, mean number of years ago were similar, whilst for the Korsakoff group, positive memories were more recent than negative and neutral memories.

Table 9

Mean number and standard deviations of years ago that events remembered were reported to have happened for each group in each cueword valence category.

Group	POSITIVE		NEGATIVE		NEUTRAL		**TOTAL**	
	m	**sd**	**m**	**sd**	**m**	**sd**	**m**	**sd**
Korsakoff	23.00	14.63	28.5	11.38	31.33	10.56	28.19	10.91
control	4.92	5.30	5.36	7.65	5.36	6.65	5.03	6.13

Summary of results of Autobiographical Memory Test

- There was no significant difference in the number of memory responses produced (specific +generic) between the Korsakoff group and the control group.

- There was a higher frequency of specific first memories produced overall in the control group as compared with the Korsakoff group. The Korsakoff group produced a higher frequency of generic first memories. This was found to be the case for positive and neutral cueword categories.

- There was no significant difference in frequency of specific first memories produced between the groups for negative cuewords.

- Korsakoff's subjects had a significantly longer latency time to specific memories overall. This was found to be the case for positive cuewords and for neutral cuewords.

- There was no significant difference in latency for specific memories between the two groups for negative cuewords.

- There was not an overall group effect on subjective valence of memories produced.

- Events recalled had happened significantly longer ago for the Korsakoff group as compared with the control group across all cueword valence categories.

CHAPTER 4 DISCUSSION

The results of each of the four main tests (Good guy/Bad guy test, Cahill test, Emotional Priming test and the Autobiographical Memory Test) will firstly be discussed in turn. The main themes of the findings in the four tests will then be discussed in relation to the research questions and in the context of the literature on memory and emotion in normal and amnesic subjects. Methodological issues of the study will also be considered, as well as areas for further research and the clinical implications of these findings.

1.Good guy/Bad guy test

This test involved recognition and recall subtests and character ratings and a preference test. It was hypothesised that Korsakoff's subjects would remember less explicitly assessed information, but would retain the emotional nature of the material.

1.1 Explicitly assessed memory

As had been predicted, on all explicit memory tests Korsakoff subjects performed significantly worse than the control group. Although Korsakoff subjects did extremely poorly on free recall, cued questions seemed to aid recall to some extent as they were able to answer some questions. However, they were still performing significantly below the level of the controls. This is similar to the findings of Johnson et al (1985) where Korsakoff subjects performed better on cued than free recall.

In the recognition memory test, again Korsakoff's performance was below that of the control group. However although this difference was significant for the number of true negatives (i.e. number of previously unseen faces which subjects correctly identified as such), it was not significant for the number of true positives. It may have been expected that due to poor memory Korsakoff subjects would score

a lower number of true positives. The higher number of true positives among the group indicates a similar 'hit' rate (correctly identifying previously seen faces) as the control subjects. Therefore it seems as if the Korsakoff subjects did have some recognition ability scoring higher on true positives than at chance level. It is likely that this was due to the high level of exposure of the faces in session 1. In Johnson et al's (1985) much simpler recognition test (recognising 2 'target' faces from two previously unseen faces), performance of the Korsakoff group was also good.

In the present study, faces which had been accompanied by emotionally valent information were no more likely to be recognised than the faces which had not been accompanied by information. This was the case for both the control and Korsakoff group. This finding does not fit the hypothesis of superiority of memory for emotional material for either group: in the present study emotional valence did not significantly affect recognition memory. A study by Douglas and Wilkinson (1993) involved a recognition test where some faces had previously been paired with negative descriptors and some had been paired with neutral descriptors. The recognition test took place only 5 minutes after the initial presentation. There was no difference in recognition according to which type of descriptor the faces had been paired with for amnesic or control groups. The results were therefore similar to the present study, indicating that descriptive emotional material does not affect face recognition memory.

On overall recall scores (free + cued), however there was a significant main effect of type of valence of information with both groups remembering more information about the 'Good guys' than the 'Bad guys'. This effect remained significant on an analysis of scores of the Korsakoff group only. (In practice, as the Korsakoff scores on free recall were negligible, the overall recall scores were almost entirely made up of cued recall scores). In Johnson et al's experiment slightly more information was remembered about the good guy than the bad guy, but a statistical analysis of this effect was not reported. These results suggest a possible normal implicit influence of affective content of information on recall in the Korsakoff

group (as the same bias to remember more about the good guys was found in controls). This is a potentially important finding in terms of identifying preserved memory processes in Korsakoff patients. Neutral descriptors were not used, so on recall, the effect of neutral versus good and bad emotional material could not be compared.

One possible explanation for the differences in apparent ease of recall of the good guy descriptors in both groups could be the concept of mood congruity in cognition. This is the idea that people in a particular mood state will attend more to stimuli which are similar to their mental state (Bower, 1992). Experiments supporting this theory have concentrated on manipulating people's mood states and then asking them to attend to happy and sad information(e.g. Forgas and Bower, 1987). It has been found that happy subjects attend more to happy aspects of information and sad subjects to the sad aspects of the information. Therefore if there are higher levels of attendance to stimuli, this may facilitate better learning. In the present study neither the Korsaskoff group nor the control group were depressed, and therefore may have been biased towards attending more to the positive descriptors (good guys). Cognitive avoidance of negative descriptors may also have played a role.

1.2 Ratings and preference tests

It was hypothesised that if the emotional nature of the material (i.e. bad and good) was retained by the Korsakoff subjects then this would be reflected in the ratings of characteristics of characters over time, despite poor recall of the information. As expected, at time 1 before any information had been presented, ratings of characteristics did not differ significantly between the two groups.

At time 2, immediately after the information about the characters had been heard, it was predicted that ratings for both groups would increase for the 'Good guys' and reduce for the 'Bad guys'. Again this was found to be the case.

At time 3, two days after the character information was presented, it was predicted that the Korsakoff Group's ratings and control ratings would remain higher for the Good guys and lower for the Bad guys. Results indicated that although the ratings did not remain as extreme as the ratings at time 2, this was true for the control subjects. This however was not found to be the case for the Korsakoff's subjects where ratings at time 3 did not reflect any retention of the emotional material. This was confirmed in the significant difference in ratings at time 3 between the Korsakoff group and the control group for the Bad guys. The difference was not significant for the Good guys, however this may have been because of a tendency of both groups to rate all characters at the higher end of the scale before information was heard (perhaps another result of mood congruence effects).

These findings do not replicate Johnson et al (1985) where, although character ratings of Korsakoff's subjects after a delay of 2-6 days were not as extreme as the control group, their ratings did not go back to the base lines. This difference remained when subjects were tested over 10 days later. There maybe several reasons for this. Firstly, subjects heard the character information three times (as opposed to once in the present study). Ratings became more extreme the more times the information was presented. There was also much less information. i.e. one good guy and one bad guy, where as in the present experiment there were three of each. It is also worthy of note that mean ratings of the bad guys by Korsakoff subjects always remained above 3 out of a maximum of 5 at the 'good' end of the scale. Therefore it seems that there was limited evidence from this task to suggest that the emotional nature of material is remembered and that if this was the case it depended on a very high level of exposure.

In the present study there was also some neutral ratings for faces which had not been accompanied by any information with the purpose of being a control measure. It was predicted that these ratings would stay the same at the three time points for both groups. This was found to be the case for the Korsakoff subjects for times 1 and 2, yet at time 3 the rating went down. For control subjects ratings went

up at time 2 and up again at time 3. This result seems rather anomalous in the context of the other results and is difficult to interpret. However it does seem that there may have been some factors affecting ratings over time other than information about characters being given. One possibility for the control group is the exposure effect paradigm (Zajonc, 1980), where preference for objects is increased by exposure. Therefore, with repeated exposure of faces, ratings on pleasant characteristics went up. This effect was not however shown in Korsakoff subjects. This is also opposite to what Johnson et al (1985) found in an experiment which looked at preferences for unfamiliar Korean melodies. It was found that with repeated exposure Korsakoff subjects showed similar preference effects to control subjects, despite being unable to recognise the melodies (i.e., not explicitly 'knowing' that they had heard the melody before). Findings in this study would indicate that the exposure effect paradigm was not evident in the Korsakoff group in repeated exposure to faces.

In the preference tests, when subjects were shown a good guy and a bad guy and asked who they preferred, the Korsakoff group performed at chance level. This again indicated a lack of retention of the emotional nature of the material.

Overall, the results of the Good guy/Bad guy task indicate that with the levels of exposure to the material given in this experiment, Korsakoff's subjects were not able to retain the emotional flavour of the information. However they were able to form appropriate affective judgements immediately after the information was given indicating that they were not impaired on emotional responsiveness. The experiment also suggests that retention of the emotional nature of the material could depend on recall of specific details, because the Korsakoff's recall was so poor compared to the control group. Whether recall of specific information is necessary for control subjects to remember the nature of the material cannot be inferred from this experiment as this group were all able to recall some specific details. A more positive finding was that Korsakoff subjects appeared to show a normal bias to

remember more positive information reflected in their relatively higher scores on recall of information about the good guys relative to the bad guys.

2. Cahill Test

This test involved a story with three phases, phase 1 being neutral, phase 2 being emotional and phase 3 being neutral. It was predicted that the Korsakoff group would perform less well than the control group overall, but that the superiority of memory in both groups would be for the emotional phase as compared with the two neutral phases. Korsakoff subjects were tested on recall half an hour after presentation of the material and control subjects were tested at a delay of two days.

There was no difference between the two groups on ratings of the emotionality immediately after hearing the story. Therefore it appeared that the Korsakoff subjects did not differ from controls on emotional responsiveness.

As predicted it was found that on all phases of the story the control group remembered significantly more than the Korsakoff group. Also as predicted and found previously, (Cahill et al, 1994; Hamann et al 1997), the control group performed better on the emotional phase than the other two phases (69% of questions on the emotional phase answered correctly as compared to 59% and 56% on neutral phase 1 and 3 respectively). However this profile of results was not seen for the Korsakoff group, where although they scored highest on the emotional phase, the difference was slight and they performed similarly on each neutral phase (37% of questions answered correctly for the emotional phase and 34% and 29% for neutral phases 1 and 3 respectively). There was a significant main effect of type of information (i.e. emotional versus neutral), when analysis was carried out. However, it was found that this was only a significant effect in the control group and not in the Korsakoff group, indicating that Korsakoff subjects had not retained more information about the emotional phase of the story.

One interesting result was that the standard deviation for the emotional phase in the control group was small, indicating that there was less variation in scores for

this phase in the control group as compared with the neutral phases. This further supports the hypothesis that the emotional content was contributing to the control group performing at similar levels. However this commonality of scores was not seen in the Korsakoff group, where the standard deviation was much larger for the emotional phase indicating that emotionality had a diverse effect for this group.

Hamann et al (1997) used the same task with 9 amnesic subjects and a control group. Both groups were tested on recall two minutes after the seeing the slides and hearing the story. A second control group were tested on recall at a delay of a week. The amnesic group showed a superior memory for emotional material where recall performance on this phase was higher than the neutral phases. Although recall across all phases was poorer than the time delayed control group, this difference was not significant. The results of the present study have not replicated these findings for amnesic subjects, and performance differed between the two groups across all 3 phases. This could in part have been due to a longer time delay for the Korsakoff subjects (half an hour) as compared with the amnesic subjects in the Hamann et al study (2 minutes), and the shorter time delay for the controls (2 days, this study versus 1 week, Hamann et al). Therefore it maybe that memory for emotional material is superior in amnesics over very short periods of time, but that a time delay sees a rapid decaying of this effect.

In summary, results on the Cahill task produced no strong evidence for superior emotional memory in the Korsakoff subjects. This is opposed to the predictions made based on previous research. Performance of Korsakoff subjects was very poor across all phases, compared with the control group, despite being given the recall task after a much shorter time delay than the control group. There was no difference in ratings of emotionality of the story immediately after it had been presented between groups. This indicates that failure to have an emotional response to the story was not a factor in the Korsakoff group's poor memory for the emotional phase of the story.

3. Emotional priming test

In this experiment subjects were required to carry out a wordstem completion task, where there was a possibility of completing the word stem with either an 'emotional threat' word, a 'neutral' word or an 'other' word There were no specific hypotheses for this task because a literature search failed to find similar investigations on the effect of emotion in an implicit priming task in amnesics.

It was found that performance of the two groups on this task was extremely similar. Both groups produced the most 'other ' responses. Rounded up to the nearest whole number both groups produced a mean of 3 'emotional threat' wordstem completions and 4 'neutral' wordstem completions. This result indicates that as in previous experiments, the Korsakoff patients have shown preserved priming benefits (Graf et al 1985, Shimumara 1986).

Interestingly the number of 'neutral' and 'emotional threat' completed wordstems were the same in both groups. This indicates that implicit memory for emotional material was the same for the Korsakoff subjects and control subjects. In this priming task, memory for the emotional material did not supersede memory for neutral material in either group. Although there were slightly more neutral completed wordstems in each group, these differences were small and insignificant. In an experiment by Matthews et al, (1989), performance of anxious subjects in a similar wordstem completion task was examined. It was found that the anxious subjects were biased to completion of the wordstem with the 'emotional threat' word rather than the 'neutral' word. When this was compared with a memory task assessed explicitly, the same bias was still present to some extent, however it was not as pronounced as in the implicit condition. It was concluded that this was because of pronounced mood congruence effects in an implicit memory task. As half of the Korsakoff subjects in the present study were classified as anxious according to their score on the anxiety subscale of the HADS, it may have been expected that given priming ability to be normal, they may have had a similar bias towards the threat words. Results and analysis indicated that this was not the case. However this sample

was small and the scores on the anxiety subscales fell into mild rather than severe anxiety, therefore a thorough investigation of the effects of anxiety states on performance of the task was not possible. Matthews et al 's study is yet to be replicated. Indeed Tobias et al (1989) [cited in Tobias et al, 1992], found that when they manipulated mood by musical mood induction, happy and sad music states had no effect on the type of word stem completion in this task, so this area of research is still in its infancy.

In summary this study has yielded some important preliminary results where the similarity in performance between the control group and the Korsakoff group on this priming task indicated they were functioning normally. This was not only on primed ability but also on showing the same proportion of neutral and emotional threat words as the control group.

4. Autobiographical Memory Test

This test examined memory for events that had happened in the person's life. As it was hypothesised that the superiority for emotional memory would be similar for the Korsakoff group and the control group, it was predicted that there would be relative ease of memory recall in response to the negative and positive cuewords as compared with the neutral cuewords. Ease of retrieval was assumed to be indicated by the specificity of first memory response and the latency to retrieve specific memories.

4.1 Specificity

The control group responded with more specific first memories than the Korsakoff group and their first response to a cueword was more likely to be specific than generic. The reverse was true for the Korsakoff group where they were more likely to first respond with a generic memory. This finding is similar to that of Wood et al, (1982) who found amnesics produced more generic memories than

controls. Zola Morgan et al (1983) also found that there was a tendency among amnesics to produce more generic memories than normal subjects, although if the subject was prompted to be more specific, they performed at the same level as control subjects. In their study different methodology was used where in some cases they would use a high degree of probing, even suggesting concrete examples for specific memories from generic memories. Mackinnon and Squire (1989), also found performance improved if single word cues were accompanied by probes or more structured questions. In the AMT there was a time limit of 30 seconds and only a maximum of two simple probes ("*can you think of a specific time*?") were used, so this may account for these differences. Wood et al's suggestion was that more generic memories were being produced because amnesic subjects were using context free retrieval strategies. Williams (1992), suggests that over general memory maybe due to over general encoding strategies whereby specific episodes are encoded into generic categories of experiences. Zola Morgan et al (1993) on the other hand suggests that the initial generic memory retrieval was due to loss of initiative and apathy and that the probing 'counteracted' this. Williams (1992) criticises such cognitive effort theories as they still leave unspecified which part of the encoding or retrieval process requires the most effort, and therefore explain little about the mechanisms which are involved in these processes. Also in the present study there was nothing in the presentation of the subjects in the Korsakoff group to suggest lack of initiative, and given the pattern of normal emotional responsiveness in this group, this seems unlikely.

Therefore it may be more likely that the Korsakoff group were impaired on being able to generate appropriate strategies to retrieve specific memories. As they produced a similar number of first memories (i.e. specific plus generic) as control subjects, this suggests that the Korsakoff group were using some sort of retrieval strategy in order to come up with a memory at all. However as they produced more generic memories this could be interpreted as a dependence on semantic more than episodic memory, making it more difficult to access specific episodes (i.e. they

remember facts which are not related to a particular context). This tendency to produce more first generic memories has also been found in clinical populations. For example this has been found in depressed people (Williams and Scott 1988) and alcoholics (Whitely, unpublished dissertation 1988).

In terms of cueword valence, the pattern of significantly more specific memories in control subjects was true for both positive and neutral words. However this was not the case for negatively valent cuewords where there was no significant difference between the two groups in the number of first specific memories they produced. This was due to Korsakoff subjects producing more specific memories in response to negative words than neutral or positive words, whereas the control subjects produced similar frequencies of specific memories regardless of cueword valence category. This can be seen as a bias in Korsakoff subjects to be more likely to respond with more specific memories to negative cuewords.

4.2 Latency

It was found that retrieval latency for specific memories was significantly longer overall in Korsakoff subjects than control subjects. If latency is assumed to be an indication of ease of retrieval of specific memory, then this finding indicates that control subjects could retrieve specific memories with more ease than the Korsakoff subjects. This fits well with the finding that control subjects were able to produce more first specific memories overall. Latency has not been analysed in the afore mentioned studies on autobiographical memory in amnesics, so comparisons in this area could not be made.

Although latency to specific memory was significantly longer in the Korsakoff subjects for positive cue words and neutral cuewords there was no significant difference in latency for negative cuewords. This again concurs with the findings of equivalent levels of specific memories in the two groups for negative cuewords. The qualitive nature of the answers of the Korsakoff group also indicated

that these negative memories were well remembered as they were able to give clear details of the events. For example one response to the cueword 'grave' was:

"*Losing friends in the desert, two lads I played squash with drove over a landmine and were killed, it was horrific*". A response to the cueword 'ugly' was: " *When I smashed up my vehicle in the 60's. I was at the tail end of a pile up in the mist, it was a horrible scene*"

This superiority of memories for negative events is similar to findings in an experiment by William and Broadbent (1986), who were investigating autobiographical memory in overdose patients. They found that the patients had a longer latency time than controls for a specific memory in response to positive cuewords, but the same latency period for negative cue words. They suggested that this was a 'mood congruent' effect, whereby the depressed subjects were more able to recall negative memories.

4.3 Possible explanations for negative cueword bias in the Korsakoff group.

The negative cueword bias found in Korsakoff subjects is not explicable in terms of depressed mood (as suggested by Williams and Broadbent, 1986), because on the HADS depression subscale, the group showed no significant levels of depression. Daum et al (1996) carried out a study specifically investigating autobiographical memory for emotional events in amnesia. They found that amnesics were able to remember a similar number of emotionally significant personal experiences in a free recall test. The three categories examined were pain related, fear related and happiness related memories. Amnesics showed significantly more ability to describe imagery of personal experiences related to pain and fear than to happiness. This indicates that memory for negative events was more spared than for positive events. Amnesics were also able to give more elaborative detail of memories associated with pain as compared with fear and happiness. Daum et al suggest that this could be due to the sensory component of the memory and richer encoding. In the present study, a possible explanation for relative sparing of

specific memories in response to negative cuewords, could be that richer encoding may take place for negative personal experiences as compared with positive personal experiences.

There is no obvious explanation for why this maybe the case. As it was found the time ago that memories were retrieved from was shorter for positive words rather than negative words in the Korsakoff group, this contradicts somewhat with the notion that negative memories are easier to retrieve.

4.4 Subjective valence

There was found to be no significant group differences in subjective valence ratings of experiences recalled. Both groups rated memories in response to positive memories as pleasant, and memories in response to negative words as unpleasant. Memories in response to neutral words were rated as more positive in the Korsakoff group than the control group. This indicates that relative ease of specific memory was not affected by the Korsakoff group rating life events as more negative. In fact, overall they had a tendency to rate experiences as more positive than the control group. As valence ratings varied accordingly to negative and positive cue words, this again provides evidence for unimpaired emotional responsiveness in Korsakoff subjects.

4.5 Time ago of memories

It was found that Korsakoff subjects tended to retrieve memories from many more years ago, and that on average, memories from the Korsakoff group were occurring 23 years before memories of the control group. Given the severe anterograde amnesia of the Korsakoff group, this is not a surprising finding. It also fits with the notion that there is a temporal gradient in the retention of remote memories, where memories from the distant past show the least disruption and maybe completely intact (Cohen and Squire 1981). However, the fact that there were more generic memories shown for positive and neutral words suggests that

specific memories were difficult to access even from a long time ago. This could be a consequence of a more limited number of memories to access, because of being constrained to a limited time period.

These results therefore provide evidence to support the existence of retrograde amnesia of events which happened before the onset of the illness. The mean number of years ago of events recalled taking place for the Korsakoff group was more than 28 years ago as compared with 5 years ago for the control group. Mean years ago of events remembered for the Korsakoff group was therefore well before the onset of their illness. This is similar to the findings of Zola Morgan et al (1983) where the average time ago of events remembered for their amnesic group was thirty years ago. Studies which have looked at autobiographical memory for particular time periods have confirmed that it is less impaired in amnesics for childhood and early adulthood periods (Daum et al 1996, Tulving et al 1988, Kopelman 1989).

There was little difference in the mean number of years ago of when events remembered happened according to cueword valence in the control group. However for the Korsakoff group, memories in response to positive cuewords happened most recently (mean=23 years ago), than those to negative words (mean =28 years ago) and events that happened the longest ago were responses to neutral words (mean=31 years ago). These results could suggest that in Korsakoff subjects there is more retrograde amnesia for neutral events, and therefore memories are retrieved from longer ago. However, all three types of cueword valence categories produced memories of the distant past, and therefore hypotheses made about these differences are probably not very meaningful.

4.6 Effects of confabulation

One methodological problem which has been highlighted in examining autobiographical memory in people with Korsakoff syndrome is the effect that confabulation may have on results. Dalla Barba et al (1990) in a case report noted

confabulatory responses in a Korsakoff patient. However in Daum et al's study, (1996), they were able to check many of the responses with relatives of the subjects and there was no evidence for confabulatory material. Also they suggest that patients well beyond the acute stage of their illness are less likely to confabulate and in the present study this was the case for all subjects. Korsakoff subjects generally seemed to indicate that they could not think of a memory in response to some cuewords, rather than attempting to give answers to all. In addition the qualitative aspect of the responses were very plausible and not markedly bizarre as some of the confabulations reported by Dalla Barba et al (1990). However it should be noted that the method used in this experiment did not enable the possibility of some confabulation to be ruled out completely.

Dalla Barba et al also reported temporal errors in the dating of events. It is quite possible that this was the case for the Korsakoff group in the present study. However, as the memories were generally from the distant past, even errors of some years would have still resulted in significant differences in the time ago that events recalled happened between the two groups. It was also often obvious that the memories were from a long time ago due to the qualitative nature of the responses for example, "*when I failed my eleven plus*" or "*...when I was a child during the war*"

Overall in this task, as has been found in previous studies, there was a general tendency for the Korsakoff group to respond with a lower number of first specific memories than control subjects. The exception to this was on negative cuewords where there was no significant difference between the two groups. This was consistent with the results for latency where generally Korsakoff subjects had a longer latency time to specific memories, but this was not the case for negative cuewords. This apparent more relative ease of accessing specific memories in response to negative cuewords rather than positive and neutral cuewords in the Korsakoff group could not be explained by mood congruent factors, as the Korsakoff

subjects were not depressed. As the profile of subjective valence ratings of experiences remembered did not differ significantly between the two groups, this was not a variable which affected ease of recall either. As these results support the finding that negative autobiographical memories were more elaborate in amnesics (Daum et al 1996), this is clearly an area of interesting further research.

The finding that events recalled by the Korsakoff group took place longer ago as compared with the control group, concur with existing research where there seems to be more preservation of remote memory from the distant past. However, as the Korsakoff subjects were impaired generally on specificity of memory, this may imply some overall difficulty in retrieving specific memories, even from the distant past.

5.Effects of Method of assessment of memory

5.1 Implicitly assessed memory

Emotional memory was assessed implicitly in the Good guy / Bad guy experiment and the emotional priming experiment. In the Good guy /Bad guy experiment results of ratings over time and preference tests indicated that the emotional nature of the material was not retained in the Korsakoff group. However in the emotional priming task, performance was extremely similar in both the Korsakoff subjects and the control subjects, indicating no difference between groups in memory for emotional material in this implicit memory task. One possible explanation for the incongruity of the results on these tasks could be the difference in time delay. In the Good guy /Bad guy test, there was a delay of two days between study and final ratings and preference tests, whereas for the priming task there was a delay of about twenty minutes from study to test. Priming effects have been found to be generally short lived in amnesics (Graf et al 1984; Kinoshita 1989), lasting for hours rather than days. If this is the case and the implicit effects measured in the Good guy /Bad guy test tap similar processes as in the word stem completion task, it maybe that the implicit effects would have been lost at a two day time delay.

However it should be noted that in the Good guy / Bad guy test there was a lot more exposure to the target material than in the wordstem completion task.

An alternative explanation is that the tasks involved different memory processes. The wordstem completion task did not depend on memory for the episode of initial presentation of the target material, whereas results indicated that ratings and preference in the Good guy/ Bad guy test did rely on remembering specific details from when the character information was presented. This therefore suggests that ratings and preference tasks, perhaps relied more on explicit memory processes than the wordstem completion task.

The results from the Good guy / bad guy test in this experiment do not support anecdotal descriptions of the implicit nature of personal experiences being remembered in amnesics without having memory for the episode. The most famous example is when Claperade (1911), describes concealing a pin in his hand and pricking a Korsakoff patient when shaking her hand. The Korsakoff subject later refused to shake his hand despite not remembering meeting him before. This exposure was very brief, yet the unpleasant nature of the material seemed to be retained. Differences here could be due to the fact that this was a very personal experience rather than information about a character completely unrelated to the patient (as in the Good guy /Bad guy test). Most anecdotal evidence of such emotional reactions in the absence of remembering the particular event, in addition to that of Claperade, are also based on unpleasant autobiographical experiences (e.g. Bagby, 1928; Janet, 1904, cited by Tobias et al 1993). As the Autobiographical Memory Test (explicitly assessed) in the present study also found that personal memories for unpleasant negative events are superior in the Korsakoff group, it is possible that in terms of autobiographical events, memories for unpleasant events are superior for explicitly and implicitly assessed information. This suggestion, although based on very limited studies and anecdotal evidence may provide an interesting basis for further research.

5.2 Explicitly assessed memory

Neither the Good guy/Bad guy test or the Cahill test produced evidence suggesting a high degree of superiority of memory for emotional material in the Korsakoff subjects. Although in the Good guy/Bad guy test, valent information about characters was not compared directly with neutral information (neutral characters had no accompanying information), the fact that so few ideas were remembered in a free recall test point towards the notion that free recall was not aided substancially by the valency of information. Recognition was also not found to be aided by valency of information. However there was better total recall (free + cued recall) for the Good guys relative to the Bad guys in the Korsakoff group which was the same effect as seen in the controls. It could be that this increased performance on an explicit task was due to a preserved implicit influence of affective content of material on recall (as described earlier). On the Cahill test, Korsakoff performance for the emotional phase did not differ significantly from the neutral phases, suggesting that the emotional valence of the information did not enhance recall. This is a somewhat mixed finding in terms of preservation of memory for emotional material in explicitly assessed tasks of novel information. There is evidence to suggest a limited effect of positively valent information on recall (particularly cued recall) in the Korsakoff group, but no apparent effect of other types of valent material on recall. This supports Johnson et al's (1985) finding in recall tests, but not the findings of Hamann et al (1997) who did find superiority of memory of amnesics for the emotionally arousing phase of the story in the Cahill test. Therefore although in the present study there is more evidence to suggest that there is a limited effect of emotional material on explicitly assessed memory tests, in the context of the literature this is not conclusive. It maybe that with careful manipulations of exposure conditions, there could be more enhanced effects of emotional material on the memory of Korsakoff subjects. However results from the present study do suggest that if such a superiority exists it is not as simple as the initial hypothesis and may depend on many other factors not examined in detail here

(some examples might include exposure time, time delay to recall, nature of material (visual, verbal), type of valence of information (e.g. happy, sad, frightening, exciting) and aetiology and type of amnesia) .

As the Cahill test has also been carried out on subjects with bilateral amygdala lesions, (Adolphs et al, 1997; Cahill, 1995), and these subjects do not show enhanced memory for the emotional phase of the story, one conclusion has been that the amygdala plays a central role in the process of remembering emotional information. However findings from the present study suggest that emotional and neutral material may have a greater overlap in the way they are processed than has been suggested in previous studies (such as Hamann et al, 1997 ; Cahill et al, 1995).

The results in the Autobiographical Memory Test showed a superiority of autobiographical memory for negative as compared with neutral and positive events. Results on this test maybe different from the other explicitly assessed memory tests for two main reasons. Firstly, personally relevant autobiographical memory is being assessed rather than memory for information connected with artificial stimuli. Second, this test allowed subjects to access memories from times before the onset of their illness, rather than recent episodes. As Daum et al (1996) point out, talking and thinking about autobiographical experiences may help in sparing qualities of experiences and distinguishing them from more abstract memories. Significant events in the person's life may have been repeatedly talked about and may therefore have been subject to more exposure. It maybe that negative events have been talked about more, therefore resulting in more exposure and therefore appearing more spared, or that the Korsakoff subjects may have had more negative life events. Another alternative is to put this negative bias into the context of an evolutionary framework where it is important to adapt to unpleasant 'dangerous' situations, so they can be avoided in the future (Bower 1992). Therefore it is of benefit for negative memories to be better remembered than positive memories. This, however still does not explain why the same bias was not seen in the control subjects.

The pattern of results from this study therefore indicates that superiority of memory for emotional information in the Korsakoff group, very much depends on the way memory is assessed. There is little evidence to suggest superiority of emotional memory in explicitly assessed tasks of novel information, however the exception to this is the indication that positive valence of material may aid cued recall. In contrast, in an explicitly assessed autobiographical memory test, there seemed to be a superiority of recall of negative memories. On an implicit priming task, results suggested that emotional memory is not impaired. It was also hypothesised that implicit memory processes could have played a role in the enhanced performance on cued recall of the Good guys. However on a test examining retention of the emotional nature of information, Korsakoff subjects performed poorly, as reflected in rating and preference scores in the Good guy/Bad Guy test.

6. Emotional responsiveness in the Korsakoff subjects

In all four experiments there was nothing to indicate that there was any impairment in immediate emotional responsiveness of the Korsakoff subjects. In both the Good guy/Bad guy test and the Cahill test, ratings on emotionality of the stimulus materials did not differ between the two groups. Further, in the autobiographical memory test, valence rating of personal events were also similar in the Korsakoff and control groups. In the wordstem completion task there was no difference in the profile of results to the control group, again suggesting normal emotional responsiveness. This challenges some of the pre existing ideas about a deficit in emotional responsiveness in people with Korsakoff syndrome. For example Rappoport (1961) suggested that there is an emotional disturbance underlying the syndrome and cites Krauss (1930), who described Korsakoff's patients as having 'a lack of pregnance of feeling ... the stream of feeling is characterised by a dull flow and lack of differentiation'. Abnormalities in emotional responsiveness in Korsakoff syndrome have also been described by Talland (1965) and Fisher and Adams (1964).

There have even been suggestions that memory impairment maybe partly due to a lack of emotional response (Talland, 1965; Kral 1959). However more recent studies (Hamann et al, 1997, Douglas and Wilkinson 1993), have found that Korsakoff subjects exhibited normal emotional responsiveness to different stimuli. Therefore the present study and most other recent empirical evidence supports the argument that emotional response is unimpaired in the Korsakoff syndrome. It can therefore be concluded that the results indicating no superior memory for emotional material versus neutral material, are not due to Korsakoff subjects failing to respond to the nature of the material at the encoding stage.

7. Methodological issues

The small sample size was obviously the biggest methodological limitation and therefore any inferences drawn need to be done so with caution. However in justification of the small sample size, as noted by Douglas and Wilkinson (1993), much research on Korsakoff syndrome has been carried out on populations of similar size and has still made a significant contribution to the area of study. Also by not including amnesias of other aetiologies, it was hoped that this would allow specific patterns in this particular disorder to be examined.

Subjects from the Korsakoff group were well matched with the control group for age and pre morbid IQ giving validity to the comparisons made between the two groups. For current intellectual functioning, most of the Korsakoff group were performing within a similar range as the control group, however two of the group were performing at a lower level. This may have had some implications on their performance on the four memory tests, but it was hoped that this effect would be minimal as tests were designed to look specifically at memory functioning, and not involve a high level of reasoning skills. It should also be noted that this was also the case for tests of executive functioning where Korsakoff subjects were performing more poorly than control subjects.

8. Areas for further research

Clearly the results from the present study which are based on a small sample size are preliminary. Therefore there are several possible areas for further research. Firstly the opposing findings in the Good guy /Bad guy test to Johnson et al (1985) need to be explained. There needs to be more manipulations of exposure times to discover whether this affects the retention of the nature of material. Based on results of the present study, the working hypothesis of such research would be that retention of the emotional nature of the material in Korsakoff subjects would depend on level of exposure, repetition and the type of valence of material. The Cahill test also produced differing findings to Hamann et al, 1997 who used a much briefer test to study delay. A working hypothesis would be that effects of emotional valence on memory depends on brief study to test delay. It may also be interesting to see if repeated exposure to the stimulus material effects retention.

With regard to the emotional priming test, it would of interest to look at the effect of words with other emotional valences (e.g. sad and happy). Other types of priming tasks could also be looked at with regard to emotional information such as non verbal, repetition priming, and semantic priming to see if the preservation of this memory in Korsakoff's syndrome is more generalised .

With respect to the autobiographical memory test, the preliminary results that there is preserved memory for specific negative events as compared with other valenced events clearly needs to be replicated and experiments designed to shed light on why this maybe the case. It would be interesting to look more closely at the time periods of the superiority of negative personal memories in a more constrained design to examine whether this maybe the case for more recent negative events.

9. Clinical implications of findings

Within a clinical context these results can be seen to have several implications. Firstly the evidence that emotional responsiveness is normal in people with Korsakoff's syndrome is an important factor in the care of such patients. They

do have affective reactions to environmental cues and whilst these may not be remembered, better quality of life is going to depend on living in an environment which allows them to have positive affective reactions. They are a vulnerable group of people who although may not retain affective reactions are clearly able to 'feel' and therefore like all client groups benefit from a sensitive approach where their feelings are taken into account.

Ease of retrieval of more unpleasant personal events is also an important clinical finding. Although the present sample of Korsakoff subjects were not depressed, this finding indicates that the negative memory bias may leave these patients susceptible to depression. It has not generally been found that Korsakoff patients are more depressed than normal subjects (e.g. Daum et al 1996), but within a holistic treatment framework, it is important to properly and thoroughly assess for signs of depression, and if such symptoms are found they should be treated (for example with medication, or practical strategies such as making the environment more pleasant, limited use of talking therapies).

As there was intact priming ability, rehabilitation strategies which make use of these skills could be implemented. Glisky (1992) describes a rehabilitation package that uses a micro computer to teach traumatic head injury patients domain specific knowledge and skills. They are taught procedures which allow them to perform daily life skills by utilising the implicit memory ability to use partial cues. Such principles could be used with Korsakoff subjects as their preserved priming ability has clearly been demonstrated.

The fact that the Korsakoff group were able to think of a memory in relation to a cueword even if was more likely to be generic provides evidence that some internal memory strategies were intact in this group. Rehabilitation treatments could potentially make use of these strategies. Mnemonics, increasing depth of processing and recoding of information into patterns which can be more easily stored or retrieved are examples of concepts used in memory rehabilitation (Wilson and Powell 1995). Given the finding of more intact memory for events which happened

a long time ago and personal generic memories, these could be incorporated into cognitive memory strategies such as mnemonics. The potential of such strategies, however is perhaps limited given the severe deficits in episodic memory, but cues using well remembered information from remote memory may enhance strategies utilising implicit memory.

The present findings suggest that retention of memory for emotional material in Korsakoff subjects is limited, and therefore not a sufficient basis on which to develop tailored rehabilitation strategies. However there is some exploratory evidence that Korsakoff's subjects may remember more good information about other people (as opposed to themselves where they tend to remember negative events). If further research replicates this, then this could also be a potential useful basis from which to design memory rehabilitation strategies.

CONCLUSION

This study had two main research questions.

Firstly: Is memory for emotional material better preserved than memory for neutral material in people with Korsakoff's syndrome?

It was predicted that the answer to this question would be 'yes', however results showed that in some circumstances this hypothesis was not substantiated. Recall scores in remembering good and bad information about characters was very poor in the Korsakoff group as compared with normal controls. There was however a tendency for both groups to remember more information about characters accompanied by good descriptors rather than bad descriptors in cued recall tests. In the Cahill test, there was no effect of emotive material on recall of information in the Korsakoff group, although this effect was seen in the control group.

The prediction that Korsakoff subjects would remember the emotional nature of the material in absence of remembering specific details of information was also not substantiated. This was reflected by the Korsakoff group's scores in the rating of characters over time, and scores in the preference test on the Good guy / Bad guy test.

It was found that with regard to memory for autobiographical experiences, Korsakoff subjects were more likely to produce first generic memories rather than specific memories in response to cuewords as compared with the control group. It was also found that there was a longer latency period to specific memories in the Korsakoff group than the control group. Both these findings suggest it was more difficult for the Korsakoff group than the control group to produce specific memories. When looking at cueword valence category effects, it was found that there were similar patterns for positive and neutral cuewords. However for negative cuewords there were no significant differences in number of specific memories or latency periods between the Korsakoff group and control group. This suggests a superiority of memory for negative autobiographical events in the Korsakoff group. This was contrary to the initial prediction that there would be a relative superiority of

emotional cueword valence category as compared with neutral cueword category for both groups.

With regard to the emotional priming test, the exploratory results indicate that there is normal emotional memory effects in such priming tasks, as the proportion of emotional threat and neutral wordstem completions was the same in the Korsakoff group as in the control group.

The second research question was: Does memory for emotional material in people with Korsakoff's syndrome depend on how memory is assessed?

It can be seen that the answer to this question is clearly 'yes'. For tasks where there was requirement to learn novel information and recall is assessed explicitly, there was no superiority of memory for unpleasant emotional material, but a limited influence of positive material in Korsakoff subjects. However in an implicit word completion task, the effect of emotional material was normal. On memory for autobiographical events in a test which allows recall from the distant past, it appears there was a superiority for remembering negative events.

The limitations of this study have been identified, most notably the small Korsakoff sample making findings difficult to generalise. In response to these limitations several future areas of research has been suggested. The clinical implications of the findings have also been highlighted, particularly in relation to cognitive rehabilitation strategies for people with Korsakoff's syndrome.

REFERENCES

Adolphs, R., Tranel, D. and Damasio, A. (1994). Impaired recognition of emotion in facial expressions following bilateral damage to the amygdala. *Nature*, **372**, 669-672.

Adolphs, R., Cahill, L., Schul, R. and Babinsky R (1997). Impaired declaritive memory for emotional stimuli following bilateral amygdala damage in humans. *Learning and Memory,* **4**, 291-300.

Armstrong-James, M., Ross, D.T., Chen,F. and Ebner F.F.(1988). The effect of thiamine deficiency on on the structure and physiology of the rat's forebrain. *Metabolic Brain Disease*, **3**,91-124.

Atkinson, R.C and Schiffrin, R.M. (1968). Human memory, a proposed system and it's control processes. In K.W. Spence and J. T. Spence (eds), *The Psychology of Learning and Motivation*, vol 2, Academic Press.

Baddeley, A. D. (1990). *Human Memory, theory and practice*. London: Lawrence Erlbaum.

Baddeley, A. D. and Hitch, G. J. (1974) Working Memory. In G. A. Bower (ed) The *Psychology of Learning and Motivation*, vol 8, Academic Press.

Baddeley, A.D. and Warrington. E.K. (1970). Amnesia and the distinction between long and short term memory. *Journal of Verbal Learning and Verbal Behaviour*, **9**, 176-189.

Bagby, E. (1928). *The Psychology of Personality*. New York, Holt.

Barclay, L. L., Gibson, G. E. and Blass, J. P.(1981). Impairment of behaviour and acetylcholine in thiamine deficiency. *Journal of Pharmacology and Experimental Therapeutics,* **217**, 537-543.

Benton, A. L. and Hamscher, K. (1989). *Mulilingual aphasia examination.* Iowa City, AJA.

Bohannon, J. N. (1988). Flashbulb memories of the space shuttle disaster; a tale of two theories. *Cognition*, **29**, 179-196.

Borrell, J. de Kloet, E. R., Versteeg, D.H.G. and Bohus, B. (1983). Inhibitory avoidance deficit following short term adrenalectomy in the rat, the role of catecholamines. *Behavioural and Neural Biology*, **39**, 241-258.

Bower, G. H. (1992). How might emotions effect learning? In S. Christianson (ed) In *The Handbook of Emotion and Memory: research and theory*. Lawrence Erlbaum Associates, Hillsdale.

Brown, R and Kulik, J. (1977). Flashbulb memories. *Cognition*, **5** 73-99.

Burke, A., Heuer, F. and Reisburg, D (1992). Rememebering emotional events. *Memory and Cognition*, 20, **3**, 277-290

Butters, N. (1984). Alcoholic Korsakoff's syndrome, an update. *Seminars in Neurology*, **4**, 226-244.

Butters, N. and Cermak, L. S. (1986) A case study of the forgetiing of autobiographical knowledge: implications for the study of retrograde amnesia. In D.C. Rubin (ed), *Autobiographical Memory*. Cambridge University Press.

Butters, , N. and Cermak, L.S. (1980). *Alcoholic Korsakoff's Syndrome: An information processing approach to amnesia.* Academic Press.

Cahill, L., Babinsky, R., Markowitsch, H. J. and MacGaugh, J.L. (1995). The amygdala and emotional memory. *Nature*, **377**, 295-296.

Cahill, L., Haier, R., Fallon, J., Alkire, M., Tang, C., Keateor, D., Wu, J., and McGaugh, J.L. (1996). Amygdala activity at encoding correlated with longterm, free recall and emotional information. *Proceedings of the National Academy of Sciences*, **93**, 8016-8021.

Cahill, L. and McGaugh, J. L. (1991). NMDA induced lesions of the amygdaloid complex block the retention enhancing effect of posttraining epinephrine. *Psychobiology*, **19**, 206-210.

Cahill, L., Prins, B., Weber, M.,and McGaugh, J. G. (1994). Beta Adrenergic activation and memory for emotional events. *Nature,* **371**, 702-704.

Cermak, L.S. (1984). The episodic-semantic memory distinction in amnesia. In L. R. Squire and N. Butters (eds), *The Neuropsychology of Memory*. New York Guildford Press.

Cermak, L.S.(1982). *Human Memory and Amnesia.* New Jersey: Lawrence Erlbaum.

Cermak, L.S. and Butters, N. (1972). The role of interferance and encoding in short term memory deficits in Korsakoff's patients. *Neuropsychologia*, **10**, 89-96.

Claparede, E. (1911). Recognition et moiite. Archives de Psychologie, Geneve, 11, 79-90, cited in A. J. Parkin (ed.) *Memory and Amneaia, An introduction.* Blackwell, Oxford.

Cohen, N. J. and Squire, L. R. (1986). Retrograde amnesia and remote memory impairment. *Neuropsychologia*, **19**, 333-56.

Christianson, S.-A. and Nilsson, L.G. (1984). Functional amnesias induced by psychological trauma. *Memory and Cognition*, **12**, 142-155.

Coughlan, A. K. and Hollows, S. E. (1995). *Adult Memory and Information Procassing Battery.* St. James Hospital, Leeds.

Crovitz, , H.F., and Schiffman, H. (1974). Frequency of episodic memories as a function of their age. *Bulletin of the Psychonomic Society*, **4**, 517-518.

Cutting, J. (1978). the relationship between Korsakoff's syndrome and 'alcoholic dementia'. *British Journal of Psychiatry*, **132**, 240-251.

Dalla Barba, G., Ciplotti, L. and Denes, G. (1990). Autobiographical memory loss and confabulation in Korsakoff syndrome, a case study. *Cortex*, **26**, 525-534.

Daum, I., Flor, H., Brodbeck, S. and Birbaumer, N. (1996). Autobiographical memory for emotional events in amnesia. *Behavioural Neurology*, **9**, 57-67.

De Wardener, , H.E and Lennox, B. (1947). Cerebral beri beri (Wernicke's encephalopathy): Review of 52 cases in Singapore P o W Hospital. *Lancet*, **1**, 11-17.

Douglas, J. J. and Wilkinson, D. A. (1993). Evidence of normal emotional responsiveness in alcoholic Korsakoff's syndrome in the presence of profound memory impairment. *Addiction*, **88**, 1637-1645.

Dunn, J. C. and Kisner, K. (1989). Implicit memory, task or process? In S. Lewandowsky, J. Dunn and K. Kisner (Eds.) *Implicit Memory, Theoretical Issues.* Lawrence Erlbaum Associates.

Dutta, S., and Kanungo, R. (1967). Retention of affective material: a further verification of the intensity hypothesis. *Journal of Personality and Social Psychology*, **5**, 476-480.

Fisher, C. and Adams, R. (1964). Transient global amnesia syndrome. *Acta Neurologica Scandinavica,* **40**, 7-82.

Frith, C.D., Cahill, C., Ridley, R.M. and Baker, H.F. (1992). Memory for what it is and memory for what it means: a single case of Korsakoff's amnesia. *Cortex*, **28**, 53-67.

Forgas, J. P. and Bower, G. M. (1987). Mood effects on person perseption. *Journal of Personality and Social Psychology*, **53**, 53-60.

Glisky, E. L. , Schacter and Tulving, E. (1986). Learning and retention of computer-related vocabulary in memory impaired patients : Method of vanishing cues. *Journal of Clinical and Experimental Neuropsychology,* **8**, 292-312.

Glisky, E. L. (1992). Computer assisited instruction for patients with traumatic brain injury: teaching of domain specific knowledge. *Journal of Head Trauma Rehabilitation*, **7**, 3, 1-12.

Glosser, G., Butters, N. and Kaplan, E. (1977). Visuo perceptual processes in brain damaged patientson digit symbol substitution tests. *International Journal of Neuroscience,* **7**, 59-66.

Gold, P.E. and van Buskirk (1978). Posttraining brain norepinephrine concentrations: Correlation with retention performance on of avoidance training with peripheral epinephrine modulation of memory processing. *Behavioural Biology*, **23**, 509-520.

Goodman, GS. and Rudy, L., Bottoms, B. and Amon, C. (1990). Childrens concerns and memory. Issues of ecological validity in the in the study of children's eye whitness testimony. In R. Fivush and J. Hudson (eds.) *Knowing and Remembering in Young Children.* Cambridge University Press, New York.

Graf P., Squire, L.R. and Mandler, G. (1984). The information that amnesic patients do nor forget. *Journal of Experimental Psychology, Learning, Memory and Cognition,* **10**, 164-178.

Hamann, S.B., Cahill, L., McGaugh, J. L. and Squire, L. (1997). Intact enhancement of declarative memory for emotional material in amnesia. *Learning and Memory*, **4**, 301-309.

Hippert, F.A and Piercy, M. (1976). Recognition memory in amnesic patients: effect of temporal context and familiarity of material. *Cortex*, **12**, 3-20.

Holzburg, E. (1996). Thiamine absorption in alcoholic delerium patients. *Journal of Studies in Alcohol* , **57**, 6, 581-584.

Huppert, F.A. and Piercy, M. (1978). The role of trace strength in recency and frequency and judgements by by amnesic and and control subjects. *Quarterly Journal of Experimental psychology,* **30**, 347- 354.

Ikeda, M., Mori, M., E. Hirono, N., Imamura, T., Shimomura, T., Ikejiri, Y. and Yamashita, H. (1998). Amnesic people with Alzheimer's disease who remmebered the Kobe earthquake. *British Journal of Psychiatry*, **172**, 425-428.

Introini-Collinson , I, B., and McGough, J. L. (1986). Epinepherine modulates long term retention of an aversively motivated descrimination task. *Psychopharmocology*, **92**, 229-235.

Jacobson, R. R. and Lishman, W. (1987). Selective memory loss and and global intellectual deficits in alcoholic Korsakoff syndrome. *Psychological Medicine*, **17**, 649-655.

Jacobson, R. R., Acker, C.F. and Lishman, W.A. (1990). Patterns of neuropsychological deficit in alcoholic Korsakoff's syndrome, *Psychological Medicine*, **20**, 321-334.

Janowsky, J.S., Shimamura, A. P.,Kritchevsky, M. (1989). Cognitive impairment following frontal lobe damageand its relevence to human amnesia. *Behavioural Neuroscience*, **103**, 548-560.

Johnson, M. K., Kim, J. K. and Risse, G. (1985). Do alcoholic Korsakoff syndrome patients acquire affective reactions? *Journal of Experimental Psychology: Learning, Memory and Cognition*, **11**, 1, 22-36.

Kapur, N. and Butters, N. (1977). Visuo perceptive deficits in long term alcoholics and alcoholics with Korsakoff's psychosis. *Journal of Studies on Alcohol*, **38**, 2025-2035.

Kinoshita, S. (1989). Masked and unmasked repetition effects: activation of representation or procedure? In S. Lewandowsky, J. Dunn and K. Kisner (Eds.) *Implicit Memory, Theoretical Issues*. Lawrence Erlbaum Associates.

Kopelman, M.D. (1995). The Korsakoff Syndrome. *British Journal of Psychiatry*, **166**, 154-173.

Kopelman, M. D. (1991). Non verbal, short term forgetting in the alcoholic Korsakoff syndrome and Alzheimers type dementia. *Neuropsychologia*, **29**, 737-747.

Kopelman, M. D. (1989). Remote and autobiographical memory, temporal context memory, and frontal atrophy in Korsakoff and Alzheimer patients. *Neuropsychologia*, **27**, 437-460.

Korsakoff, S.S. (1887). Disturbance of psychic function in alcoholic paralysis and its relation to the disturbance of the psychic sphere in multiple neuritis of non alcoholic origin. Cited by Victor, M ., Adams, R. D. and Collins, G.H. (1971). *The Wernicke Korsakoff Syndrome*. Oxford Blackwell.

Korsakoff, S. S.(1889). Psychic disorder in conjunction with peripheral neurits (trans. Victor, M and Yakovlev, P. I. 1955). *Neurology* , **5**, 394-406.

Kral, V. (1959). Amnesia and the amnesic syndrome, *Canadian Psychiatric Association Journal,* **4**, 61-68.

Kuyken, W. and Dalgleish, T. (1995). Autobiographical memory functioning and depression. *British Journal of Clinical Psychology* , **34**, 89-92.

Langlais, P.J. (1992) Role of the Diencephalic lesions and Thiamine Deficiency in Korsakoff's Amnesia: Insights from animal models. In L. R. Squire and N. Butters (eds), *The Neuropsychology of Memory*. New York Guildford Press.

Lawson, R. (1878). On the symptomatology of alcoholic brain disorders. *Brain*, **1**, 182-194.

Ledoux, J. Emotional memories in the brain. (1992). In L. R. Squire and N. Butters (eds.), *The Neuropsychology of Memory*. New York Guildford Press.

Lewandowsky, S., Dunn, J. C. and Kirsner, K. (1989). *Implicit Memory, Theoretical Issues*. Lawrence Erlbaum Associates.

Makinnon, D. F. and Squire, L. (1989). Autobiographical memory in amnesia. *Psychobiology*, **17**, 3, 247-256.

Markowitsch, H.J. (1994). Effects of emotion and arousal on memory processing by the brain. In J. Delacour (ed.) *Memory, learning and the brain.*. World Scientific Publication Corporation.

Markowitsch, H., Kessler, J., Denzler, P. (1986). Recognition memory and psycho-physiological responses to stimuli with neutral or emotional content: A study of Korsakoff patients and recently detoxified and long term abstinent alcoholics. *International Journal of Neuroscience*, **29**, 1-35

Markowitsch, H. J., Calsbrase, P., Wurker, M., Durwen, H., Kessler, J., Babinsky, R., Brechtelsbauer, D., Heuser, L. and Gehlen, W. (1994). The Amygdala'a contribution to memory - a study on two patients with Urbach - Wiethe disease. *Neuroreport*, **5**, 1349-1352.

Martone, M., Butters, N. and Trauner, D.(1986). Some analyses of forgetting of pictorial material in amnesic and demented patients. *Journal of Clinical and Experimental Neuropsychology,* **8**, 161-178.

Matthews, A., Mogg, K., May, J. and Eysenck, M. (1989). *Implicit and explicit memory bias in anxiety.*

McEntee, , W.J., Mair, R.G. and Langlais, P. J. (1984). Neurochemical pathology in Korsakoff's psychosis: implications for other cognitive disorders. *Neurology*, **34**, 648-652.

Nelson, H. E. (1992). *National Adult Reading Test.* NFER-Nelson , Windsor.

Oscar-Burman, M. (1973). Hypothesis testing and focusing behaviour during concept formation for amnesic Korsakoff subjects. *Neuropsychologia*, **11**, 191-198.

Parker, A.J. (1990). *Memory and Amnesia: an introduction*, Blackwell.

Pentland, B and Mawdsley, C. (1982). Wernicke's encephalopathy following 'hunger strike' . *Postgraduate Medical Journal.* **58**. 427-428.

Peters, D. (1991). The influence of stress and arousal in child witness. In J. Doris (ed.), *The Suggestibility of children's recollections.* American Psychiatric Association, Washington D.C.

Philips, S. and Williams, J. M. G. (1997). Cognitive impairment, depression and the specificity of memory in the elderly. *British Journal of Clinical Psychology*, **36**, 341-348.

Powell, G. E. (1983). Psychological treatment strategies and rehabilitation of brain damaged patients. In S. Rachman (ed.) *Contribution to Medical Psychology*, vol 3. Pergamon press, Oxford.

Price, J. (1985) The Wernicke Korsakoff syndrome in Queensland, Australia: Antecedents and prevention. *Alcohol and Alcoholism*, **20**, 2, 233-242.

Rappoport, D. (1961). *Emotions and memory*. Science editions, New York.

Raven, J. C., Court, J . H. and Raven, J. (1985). *Raven's progressive matrices and vocabulary scales. Standard Progressive Matrices*. London, H. K. Lewis

Reitan, (1958). Validity of the trail making test as an indicator of organic brain damage. *Perceptual and Motor Skills*, **8**, 271-276.

Revelle, W. and Loftus, D. (1992). The implications of arousal effects for the study of affect and memory. In S.A. Christianson (ed.), *The Handbook of Emotional Memory, Research and Theory*. Lawrence Erlbaum Associates, Hilldale.

Riggs, H.E. and Boles, R.S. (1944). Wernicke's disease: a clinical and pathalogical study of 42 cases. *Quarterly Journal of Studies on Alcohol*, **5**, 361-370.

Riley, J.N. and Walker, D.W.(1978). Morophological alterations in hippicampus after long term alcohol consumption in mice. *Science*, **201**, 646-648.

Schacter, D. L. (1987). Implicit memory: history and current status. Journal of Experimental Psychology: *Learning, Memory, Cognition*, **13**, 501-518.

Schacter, D. L. and Graf, P. (1986). Preserved learning in amnesicspatients: perspectives from research on direct priming. *Journal of Clinical and Experimental Neuropsychology*, **8**, 727-743.

Seehra, H, McDemott, N. Lascelles, R. G. and Taylor, T. V. (1996). Wernicke's encephalopathy after vertical banded gastroplasty for morbid obesity. *British Medical Journal*, **17**, 312 (7028)

Selzer, B and Benson, F. (1974). The temporal pattern of retrograde amnesia in Korsakoff's disease. *Neurology*, **24**, 527-530.

Shimumara, A. P. (1986). Priming effects in amnesia: evidence for a dissociable memory function. *Quarterlty Journal of Experimental Psychology*, **38**, 619-644.

Shimamura, A.P. and Squire (1987). A neuropsychological study of fact memory and source amnesia. *Journal of Experimental Psychology: Learning, Memory and Cognition*, **13**, 464-473.

Snaith, R. P. and Zigmond, A. S. (1994). *Hospital Anxiety and Depression Scale.* NFER- Nelson, Windsor.

Talland, G. A. (1965). *Deranged memory.* New York Academic Press.

Tobias, B. A., Kihlstrom, J. F. and schacter, D. L. (1992). Emotion and implicit memory. In S. A. Christianson (ed.) *The Handbook of Emotional Memory, Research and Theory*. Lawrence Erlbaum Associates, Hilldale.

Tulving, E. (1972). Episodic and semantic memory. In E. Tulving and W. Donaldson (eds), *The Organisation of Memory*. New York Academic Press.

Tulving, E. and Schacter, D. L. (1990). Priming and human memory systems. *Science*, **247**, 301-306.

Tulving, E and Thompson, D. M. (1973). Encoding specificityand retrieval processes in episodic memory. *Psychological Review*, **80**, 352-373.

Tulving, E., Schacter, D. L., McLaughlan, D. R. and Moscovitch, M. (1988). Priming of semantic autobiographical knowledge. A case dtudy of retrograde amnesia. *Brain and Cognition*, **8**, 3-20.

Verfaellie, M. and Cermak, L.S (1994). Acquisition of generic memory in amnesia. *Cortex*, **30**, 293-303.

Victor, M.D. and Adams R.D. (1953). *The effect of alcohol on the nervous system. In Metabolic and Toxic Diseases of the Nervous System*. Association for Research in Nervous and Mental Disease, Vol 32. Baltimore.

Victor, M., Adams, R.D and Collins G.H (1971). *The Wernicke-Korsakoff Syndrome*. F.A. Davis.

Wallis, W.E., Willoughby, E. and Baker, P (1978). Coma in the Wernicke's Korsakoff syndrome. *Lancet*, **2**, 400-401.

Wechsler, P. (1983). *Wechsler Memory Scale Revised.* San Antonio, Psychological Corporation.

Whitely, C.(1998). *Alcohol consumption and bias in personal memory functioning.* Unpublished doctoral dissertation, University College London.

Williams, M. J. (1992). Autobiographical memory and emotional disorders. In S. A. Christianson (ed.) *The Handbook of Emotional Memory, Research and Theory.* Lawrence Erlbaum Associates, Hilldale.

Williams, J. M. G. (1996). Depression and the specificity of autobiographical memory. In D. C. Rubin (ed.) *Remembering Our Past, Studies in Autobiographical Memory,* CambridgeUniversity Press, New Yoek.

Williams, J.M.G. and Broadbent, K. (1986). Autobiographical memory in attempted suicide patients. *Journal of Abnormal Psychology*, **95**, 144-149.

Williams, J.M.G. and Scott, J. (1988). Autobiographical memory in depression. *Psychological Medicine*, **18**, 689-695.

Wilson, B. A, and Powell, G. E. (1995). Neurological problems: treatment and rehabilitation. In S.J.E. Lindsay and G. E. Powell (eds.) *Handbook of Clinical Adult Psychology*, Routledge, London.

Wood, F., Ebert, V. and Kinsbourne, M. (1982). The episodic-semantic memory distinction in memory and amnesia. In L.S. Cermak (ed) *Clinical and Experimental Observations in Human Memory and Amnesia,* Erlbaum Associates, Hillsdale, New Jersey.

Zajonc, R. B. (1980). Feeling and thinking: Preferences and no inferences. *American Psychologist*, **35**, 151-175.

Zola Morgan, S., Cohen, N.J. and Squire, L. R. (1983). Recall of remote episodic memory in amnesia. *Neuropsychologia*, **21**, 487-500.

Zola-Morgan, S. and Oberg, R.G.E. (1980). Recall of life experiences in an alcoholic Korsakoff patient: a naturalistic approach. *Neuropsychologia*, **18**, 549-557.

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CONFIDENTIAL

HEALTHY VOULUNTEER INFORMATION SHEET FOR PARTICIPATION IN:

'AN INVESTIGATION OF THE EFFECTS OF MOOD ON CONCENTRATION IN PEOPLE WITH AND WITHOUT KORSAKOFF'S SYNDROME'

You are invited to participate in a study looking at different aspects of people's concentration and mood. Its aim is to find out how different kinds of material affect people's concentration and therefore the results will help develop ways of helping people with concentration problems.

It will require you to attend two sessions one week apart. You will be paid £20 for your participation, and each session will last approximately two hours. In the sessions you will be asked to fill in some questionnaires and do a number of straight forward tasks involving both words and pictures.

All information gained from the study will be totally confidential. Only the person you see at the session will know your name and at no time will your name appear in any records. Please feel free to voice any concerns you may have to Ms. Sayra Shah.

You do not have to take part in this study if you do not want to. By taking part you will be helping us in our research, and therefore in developing better ways of helping people with concentration problems. If you do decide to take part you may withdraw at any time without having to give a reason.

Sayra Shah , Clinical Psychologist in training, UCL
Dr. Valerie Curran, Reader in Psychopharmacology, UCL
Dr. Mike Kopelman, Professor in Neuropsychiatry, St. Thomas's Hospital

All proposals for research using human subjects are reviewed by the ethics committee before they can proceed. This proposal was reviewed by the Joint UCL/UCLH Committees on Ethics and Human Research.

Thomas' Hospital Research Ethics Committee

NSENT FORM FOR PARTICIPATION IN RESEARCH PROJECTS & CLINICAL TRIALS

tle of Project: AN INVESTIGATION OF THE EFFECTS OF MOOD ON CONCENTRATION IN PEOPLE WITH AND WITHOUT KORSAKOFF'S SYNDROME

incipal Investigator: Dr. Mike Kopelman	**Ethics Committee**
her Investigator/s Sayra Shah, Dr. Valerie Curran	Code No: EC93/07
rolling patients:	

itline explanation:

You are invited to participate in a study looking at different aspects of people's concentration and mood. Its aim is to find out how different kinds of material affect people's concentration and therefore the results will help develop ways of helping people with concentration problems.

It will require you to attend two sessions one week apart and your travelling expenses will be reimbursed. Each session will last approximately two hours . In the sessions you will be asked to fill in some questionnaires and do a number of straight forward tasks involving both words and pictures.

All information gained from the study will be totally confidential. Only the person you see at the session will know your name and at no time will your name appear in any records .

You do not have to take part in this study if you do not want to. By taking part you will be helping us in our research, and in developing better ways of helping people with concentration problems. If you do decide to take part you may withdraw at any time without having to give a reason. This will in no way whatsoever affect your future medical care.

All proposals for research using human subjects are reviewed by the ethics committee before they can proceed. This proposal was reviewed by the Joint UCL/UCLH Committees on Ethics and Human Research.

(name) _____

(address) _____

_____

reby consent to take part in the above investigation, the nature and purpose of which have been plained to me. Any questions I wished to ask have been answered to my satisfaction. I derstand that I may withdraw from the investigation at any stage without necessarily giving a ason for doing so and that this will in no way affect the care I receive as a patient

NED (Volunteer) _____ **Date** _____

tor) _____ **Date** _____

ness, where appropriate) _____ **Date** _____

3 copies required:- one for researcher, one for patient volunteer, one for patient's notes

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CONFIDENTIAL

HEALTHY VOLUNTEER CONSENT FORM FOR PARTICIPATION IN:
'AN INVESTIGATION OF THE EFFECTS OF MOOD ON CONCENTRATION IN PEOPLE WITH AND WITHOUT KORSAKOFF'S SYNDROME'

	Delete as necessary
1. Have you read the information sheet about this study?	YES/NO
2. Have you had opportunities to ask questions and discuss the study?	YES/NO
3. Have you received satisfactory answers to all your questions?	YES/NO
4. Have you received enough information about the study?	YES/NO

5. Which person have you spoken to about this study?_____

6. Do you understand that you are free to withdraw from this study

*at any time	YES/NO
*without giving a reason for withdrawing	YES/NO

7. Do you agree to take part in this study? YES/NO

Signed:_____ Date_____

Name in block letters _____

Investigator_____

UCL
HOSPITALS

The University College London Hospitals

The Joint UCL/UCLH Committees on the Ethics of Human Research

Committee A Chairman: Dr F D Thompson

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Dr V Curran
Reader in Psychopharmacology
UCL
Sub-Department of Clinical Health Psychology
Gower Street

04 June 1998

Dear Dr Curran

Study No: 98/0081
Title: **An investigation of the effects of mood on concentration in people with and without Korsakoff's Syndrome**

Many thanks for your letter dated 13th May clarifying the points raised by the Committee. This study is now approved and you may proceed with your research.

Please note that it is important that you notify the Committee of any adverse events or changes (name of investigator etc) relating to this project. You should also notify the Committee on completion of the project, or indeed if the project is abandoned. **Please remember to quote the above number in any correspondence.**

Yours sincerely

Dr F D Thompson
Chairman

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ST THOMAS' HOSPITAL RESEARCH ETHICS COMMITTEE
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Chairman - Dr G du Mont
Administrator - Ms S Hirsch

25th June 1998

Sayra Shah
Clinical Psychologist in Training
Sub Department of Clinical Health Psychology
Gower STreet
London WC1E 6BT

Dear Ms Shah

EC93/077 **An investigation of the effects of mood and concentration in people with and without Korsakoff's Syndrome**

Thank you for your letter dated 16th June 1998 enclosing the revised consent form and the letter of appoval from UCL/UCLH. This is satisfactory and I am happy to approve this by Chairman's Action.

Please note that this project carries a reference number, noted above, which must be quoted in any future correspondence.

Yours sincerely

Dr G du Mont,
Chairman,
Research Ethics Committee,

APPENDIX 6

PLEASE PUT A TICK IN EACH BOX OF EVERY ROW TO INDICATE HOW EACH OF THE ADJECTIVES BELOW BEST DESCRIBES THE PERSON IN FRONT OF YOU.

more kind than most people ☐	more kind than many people ☐	average ☐	less kind than many people ☐	less kind than most people ☐
more honest than most people ☐	more honest than many people ☐	average ☐	less honest than many people ☐	less honest than most people ☐
more likable than most people ☐	more likable than many people ☐	average ☐	less likable than many people ☐	less likable than most people ☐

APPENDIX 7

Descrptors accompanying Good and Bad Guys from Good guy/Bad guy test

Good guy 1

This man is a pensioner. All his life he has worked locally, first as a milkman and then more lately as a lollipop man in front of the local primary school. He is liked and respected by all the locals. He has done voluntary work, helping the aged with their shopping and gardening and frequently driving them to hospital appointments on the bus on outings to the coast. On Fridays he goes to the local post office to collect his pension as well as the pensions of three elderly people who cannot get out of their houses. A day centre for the elderly is being opened locally by the Queen and all the locals want him to be the person who presents her with flowers, he has accepted.

1. What can you tell me about this man?
2. What is his job now?
3. Who will this man meet?
4. What happens on Fridays?
5. Was he a policeman
6. Did he used to work a long way away?
7. Does he drive elderly people to hospital?

Good guy 2

This man decided to go for a walk with his dog, Barnie on a cold but sunny January morning. It was Sunday and very few people were about in the park. As he approached the pond he saw that it was frozen. He looked to the other end of the pond and he saw a small boy aged eight or nine skating on the pond. This brought back memories of when he himself used to ice skate as a child in Holland. As he was watching, the boy slipped and landed on her bottom. The ice must have been very thin because it broke and the boy fell in. This man realised that he could not get out and there was no time to call others. He did not think of his own safety, but ran over and jumped in. To his surprise he found that his feet touched the bottom of the pond and he managed to lift the boy out of the water, slide him over the ice and then get out himself.

1. What can you tell me about this man?
2. What fond memories were brought back to this man by seeing a small boy on a frozen
   pond?
3. What happened to the small boy?
4. What did this man do?
5. Was the pond twenty foot deep?
6. Is the man's dog called Barnie?
7. Did his daughter come on the walk?

Good guy 3

This woman moved down from Scarborough and opened a hostel in Kings Cross, London. This area is full of drug dealers and unfortunately many young people end up there because of the railway station. Unless they can find cheap shelter and some kind of job quickly, they fall prey to the crooks. She looks after these young people. After they arrive, she asks others to let their parents know they are safe, but without revealing where they are. She has organised a scheme with social services whereby they quickly get work as care assistants working in day centres for the disabled, mentally ill and elderly. The youngsters enjoy this and are grateful to her as it gives them a sense of self worth, often for the first time.

1. What can you tell me about this woman?
2. Where did this woman move from?
3. Where is she now?
4. What has she opened?
5. Does she look after young people?
5. Does she ask them to work in the local fish shops?
7. Do the young people work with the elderly?

Bad guy 1

this woman ran two nursing homes in South West London. Although she had once been sacked by Merton Social Services because of alleged cruelty to residents when she was a care assistant, nobody discovered this when she made applications for Fairhaven and Marigold to be registered. Both Tooting social work department and St. Crispins hospital thought that her homes were rather good as she took on severely demented people, especially women who had no living relatives. However she stole all she could especially jewellery from these old people and on three occasions went on collecting the pensions of people who had been dead for months.

1. What can you tell me about this woman?
2. What was her job at Merton?
3. Why was she sacked?
4. What did she do with some pensions?
5. Did doctors at St, Crispins know of her?
6. Did she steal from young people?
7. Did she steal jewellery.

Bad guy 2

This man was expelled from the army for starting pub brawls. Once discharged, he worked as a plumber and drank eight pints of strong larger every evening in the Stag where fights were frequent. On one occasion his friend Bill was knifed and died. When questioned this man had showed little sorrow. Apparently he was sleeping with Bill's wife Gina, and thought that stabbing him during a brawl would be the perfect crime. He carried the knife with him in his back pocket behind his comb and while he thought no one was looking, he stabbed his friend and threw the knife away by running outside and hurling it over the garden fence, but he forgot to clean it and his finger prints were found on it.

1. What can you tell me about this man?
2. Why was this man expelled from the army?
3. Why did he kill his friend?
4. How was it discovered that he was the killer?
5. Was he sleeping with his friends wife?
6. Did he shoot his friend?
7. Did he throw the weapon over the fence?

Bad guy 3

This woman has always felt that people who are ill are weaklings who need to be killed. Her parents, who live in Canterbury recall how when she used to play doctors and nurses she would often get great pleasure in hurting other children or in pretending to kill the dolls. They thought it a passing phase. However, she grew into a studious adolescent. Her parents were told that because of her 12 grade A o levels she should try to get into medicine. Her ideas of murdering people came back when she was at medical school. She has been qualified for five years and recently was arrested on suspicion of having killed at least ten people in Derby, Bournemouth, Norwich and Folkestone. She worked as an anaesthetist so that she would have access to the greatest number of patients in a vulnerable situation.

1. What can you tell me about this woman?
2. Why does this woman want to kill people?
3. How did she do at school?
4. How many people did she kill?
5. Did she work as a surgeon?
6. Did her parents live in Canterbury?
7. Had she worked in Canterbury?

APPENDIX 8
Narration accompanying slides in the Cahill Test.

Slide 1: A mother and her son are leaving home in the morning

Slide 2: She is taking him to visit his father's workplace

Slide 3: The father is the chief laboratory technician at a nearby hospital

Slide 4: They check before crossing a busy road

Slide 5: While crossing the road, the car is struck by a runaway car which critically injures him.

Slide 6: At the hospital staff prepare the emergency room, to which the boy is rushed

Slide 7: All morning long surgeons struggle to save the boy's life

Slide 8: Specialised surgeons were able to successfully attach the boy's severed feet

Slide 9: After surgery, while the father stayed with the boy, the mother left to phone her other child's pre-school

Slide 10: Feeling distraught she phones the pre-school to tell her she will soon pick up her child

Slide 11: Heading to pick up her child, she hails a taxi at the number nine bus stop

Slides 1, 2, 3, 4 = phase 1 (neutral)
Slides 5, 6, 7, 8 = phase 2 (emotional)
Slides 9, 10, 11 = phase 3 (neutral)

APPENDIX 9

Examples of questions in the Cahill test.

Slide 1

1.1 Who is pictired in slide 1?
- a. a mother and her son
- b. a father and his son
- c. a mother and father
- d. no one is pictured

1.2 What are the mother and son doing?
- a. eating at a table
- b. leaving hime
- c. walking
- d. riding in a car

1.3 Where are the mother and son standing?
- a. in front of a school
- b. in front of their home
- c. at a bus stop
- d. next to their house

1.4 What is the mother doing?
- a. locking the house door
- b. tying her son's shoe
- c. getting into her car
- d. standing a doorway

1.5 What is the colour of the house door?
- a. green
- b. black
- c. red
- d. blue

1.6 What is visible in the foreground of the picture?
- a. lawn
- b. trees
- c. steps
- d. a driveway

1.7 What is the boy carrying?
- a. a soccar ball
- b. his lunch
- c. a backpack
- d. a teddybear

1.8 What time of day is it?
a. morning
b. afternoon
c. evening
d. It was not mentioned.

Slide 8

8.1 What is pictured next?
a. doctors talking to nurses
b. father and mother
c. the boy after surgery
d. the father and the boy

8.2 What had been donr to the boy?
a. skin graftes were put on his legs
b. his feet were reattached
c. his broken legs were in a cask
d. it was not mentioned

8.3 What part of the boy was shown?
a. head only
b. whole body
c. legs only
d. torso only

8.4 Where were the scars visible on his body?
a. on feet
b. near the ankles
c. on the knees
d.torso only

8.5 What else is pictured besides the boy?
a. a surgical tool
b. an IV drug linr
c. pillow
d. nothing

8.6 What is the position of the boy?
a. lying on his stomach
b. lying on his back
c. lying on his side
d. sitting

slide 10

10.1 a.Where is the mother?
b. on a curb
c. in a telephone booth
d. getting into a taxi

10.2 Who does the mother call?
a. her parenta
b. her boss
c. her child's school
d. the taxi company

10.3 What is she leaning on?
a. a soccar ball
b. her purse
c. a telephone book
d. the door

10.4 The phone is where relative to the mother?
a. on the right
b. on the left
c. behind the mother
d. is not visable at all

10.5 The mother was described as
a. feeling tired
b. feeling distraught
c. running late
d. feeling anxious.

APPENDIX 10 **AUTOBIOGRAPHICAL MEMORY TEST**

PRACTICE: enjoy
friendly
bold

cue	latency	response	t.ago	val.
HAPPY				
GUILTY				
POTTERY				
RELIEVED				
HOPELESS				
GIGANTIC				
PROUD				
FAILURE				

cue	latency	response	t.ago	val.
ABSENCE				
EAGER				
GRAVE				
WILDLIFE				
GLORIOUS				
UGLY				
BREAD				
SUNNY				
WORSE				
SEARCH				

APPENDIX 11 **Emotional Priming Test**

1. SAN .

2. OCT . . . .

3. SPI . . .

4. VIO . . . .

5. ASH . . . .

6. RIN .

7. COR . . . . .

8. CLU . . .

9. TAL .

10.BLA . . .

11.SUI . . . .

12.SCO . .

13. CAR .

14. ATT . . .

15. CAS . . . . .

16. WIL .

17. IGN . . . . .

18. TUM . . .

19. INQ . . . .

20. TIL .

21. TRA . . . .

22. DES . . . . .

23. CHA . .

24. CRIT . . . . .

wordstem alternatives

emotional	**neutral**
VIOLENT	VIOLINS
CASUALTY	CASSETTE
SUICIDAL	SUITCASE
IGNORANT	IGNITION
CRITICISM	CRITERION
TUMOUR	TUMBLE
SPITE	SPICE
TRAPPED	TRAWLER
DESPISED	DESCRIBE
INQUEST	INQUIRE
BLAME	BLAST
ATTACK	ATTEND
ASHAMED	ASHTRAY
CORONARY	CORDUROY
SCORN	SCOOP
CLUMSY	CLUTCH