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EMOTIONAL RESPONSIVENESS AND ITS RELATION TO MEMORY IN ALCOHOL-RELATED KORSAKOFF'S SYNDROME

BY

© JACQUELINE DOUGLAS

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

IN

COUNSELLING PSYCHOLOGY

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EDMONTON, ALBERTA

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for acceptance, a thesis entitled Emotional Responsiveness and Its Relation to Memory in Alcohol-Related Korsakoff's Syndrome submitted by Jacqueline J. Douglas in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Counselling Psychology.

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ABSTRACT

Retrieval of emotion-laden and neutral stimuli was measured in five Korsakoff's patients without concurrent dementia, 16 Former Heavy Drinkers and 15 Light Drinkers using self-generated paired-associates with two different sets of retrieval instructions, experimenter-generated pairings of faces with descriptors and familiar versus unfamiliar faces. Response latencies were monitored for the self-generated paired-associates task, and likeability ratings were taken for familiar and unfamiliar faces. The Profile of Mood States, the Geriatric Depression Scale, WAIS Verbal Subtests, WAIS Block Design, and Halstead-Reitan Trail Making Test Part B were also used. No group differences were identified for emotional responsiveness on self-report measures, likeability ratings or memory for emotion-laden material. Others' suggestion that sexual material is more memorable for Korsakoff's patients was not upheld. The pattern of memory impairment for Korsakoff's Syndrome was consistent with literature reporting severe deficits in direct recall of events and near normal retrieval using indirect methods of accessing information about the episode. Earlier reports of longer response latencies to words following emotion-laden stimuli were corroborated.

Earlier reports that self-generated associates to neutral words are remembered better than associates to emotion-laden words were upheld when recall instructions were given but not when associative, priming instructions were used. Faces previously paired with neutral descriptors were judged more likeable than those paired with negative descriptors. Findings are discussed in relation to existing theories of memory, priming, and the emotion-memory interaction in Korsakoff's Syndrome and in the general case.

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CHAPTER 1

INTRODUCTION

Korsakoff's Syndrome is a relatively uncommon, debilitating disorder that usually occurs in conjunction with long term alcohol abuse. The cause of alcohol-related Korsakoff's Syndrome is generally thought to be severe thiamine deficiency (Tuck, Brew, Britten, & Loewy, 1984) or deficits in the ability of certain neuronal tissue to make use of available thiamine (Greenberg & Diamond, 1985), resulting from overuse of alcohol together with poor nutrition. The most distinctive and most frequently studied characteristic of Korsakoff's Syndrome is profound impairment of long term memory for specific types of information.

As early as 1889 when Korsakoff first described the constellation of symptoms subsequently given his name, disruption of normal emotional responsiveness was noted as a frequent adjunct to the memory dysfunction seen in Korsakoff's Syndrome. Clinical descriptions state that the memory deficit is often accompanied by disorientation of time and place,

apathy, emotional blandness, irritability or euphoria (Korsakoff, 1889/1955; Lezak, 1985; Mesulam, 1985). Rappaport (1942) suggested that the memory deficit is at least partly due to repression of emotionally salient material. Other writers (Kral, 1959; Talland, 1965) have proposed that the memory deficit is due, in part, to a deficit in emotional arousal or to lack of involvement with the stimulus situation. However, treatment for Korsakoff patients does not appear to take this aspect of Korsakoff's Syndrome into account.

Despite the fact that both researchers and clinicians have suggested that Korsakoff patients' memory disorder results from their lack of emotional responsiveness, research addressing this relationship in Korsakoff's Syndrome is scant. The available literature does not offer a comprehensive view of both affective and memory function in Korsakoff's Syndrome upon which to base either interventions or predictions about their relationship. While there is a great deal of published work examining the memory disorder, alone, little research attention has been paid to whether the deficit is actually due to emotional dysfunction. Furthermore, the belief that

Korsakoff patients are abnormal in emotional responsiveness persists, despite there being even less published research on this topic than on the interaction of emotion and memory in this clinical group. It seems important, therefore, to examine emotional responsiveness and its relation to memory in Korsakoff's Syndrome. If the relationship between emotion and memory is central to the disorder as Talland (1965) and others have suggested, this relationship may be more fruitful as a locus of investigation than one of the components in isolation.

Practical and Theoretical Implications

Although infrequent, Korsakoff's Syndrome merits study from both theoretical and clinical perspectives. Theoretical understanding of memory and of alcoholic brain damage have greatly increased in recent years as a result of investigations of this disorder (Butters, 1985; Butters & Cermak, 1980; Squire & Cohen, 1984; Wilkinson, 1982; Poulos & Wilkinson, 1984). A similarly comprehensive body of research into the memory-emotion relationship in Korsakoff's Syndrome is now needed, in order to

provide a broader knowledge-base upon which to build even better theories. The relationship between emotion and alcohol-related brain damage requires clarification both in Korsakoff's Syndrome and in the general case, as does the relationship between heavy alcohol consumption and functional brain damage.

One undecided question concerning the relationship between alcohol and brain damage that should be taken into account when designing studies in this area is the continuum-of-impairment issue (Ryan, & Butters, 1980; Ryback, 1971). Wilkinson and Poulos (1987) have proposed that Korsakoff's Syndrome is the endpoint in a continuum of impairment within a distinct memory system. Inclusion of former heavy drinkers as a comparison group allows consideration of this assertion as it applies to the relationship between emotional responsiveness and the memory deficit, and it could also broaden the applicability of the current study. To the extent that the Wilkinson-Poulos (1987) suggestion is supported, the knowledge gained about Korsakoff's Syndrome and former heavy drinkers can be both theoretically and practically applied to a much larger group of people

who suffer from varying degrees of alcoholic memory impairment.

The central question addressed in this research is the relationship between emotional responsiveness and memory in Korsakoff's Syndrome. In testing the validity of the suggestion made by Talland (1965) and others that Korsakoff patients' memory deficit is due to a lack of emotional responsiveness to stimulus material, this study represents not only an opportunity to understand memory better, but also another step toward accurate description of Korsakoff's Syndrome, itself. Research on emotional responsiveness in this group is greatly needed.

Given the number of unanswered questions in this area, it seems useful to study emotional responsiveness and its relation to memory in Korsakoff's Syndrome from a theoretical/descriptive perspective. Moreover, it can also be helpful on a practical, clinical level. The clinical utility of studying Korsakoff's Syndrome, and of the current study in particular, lies in the possibility of designing effective treatment for all or some of the symptoms associated with the disorder. Such treatment will not only benefit persons with

fullblown Korsakoff's Syndrome, but it might also be useful in treating the rather large subgroup of pre-Korsakoffian alcoholics identified by Ryan and Butters (1980).

As has been the case in the theoretical literature, the abnormality in emotional responsiveness frequently seen by clinicians is the one feature of Korsakoff's Syndrome that has been largely overlooked in designing treatments. Although abnormal emotional responsiveness is accepted as a frequent adjunct to the memory disorder (Biemond, 1969; Butters & Cermak, 1980; Grossman & Butters, 1986; Kral, 1959; Lezak, 1985; Mesulam, 1985; Signoret, 1985; Talland, 1965), this characteristic of Korsakoff's Syndrome is poorly understood, and it is all but ignored in treating the disorder.

Theory-based interventions (Godfrey and Knight, 1985; 1987; Schacter, 1987) have been directed toward the memory deficit, alone. These attempts to ameliorate the memory problems experienced by Korsakoff patients have not addressed the possibility that other symptoms may also need to be considered in planning the intervention. The poor results seen in these studies may be due, at least in part, to this

too narrow view of Korsakoff's Syndrome.

An Australian study (Lennane, 1986) did not proceed from a theoretical base at all, but applied a very broad regimen of lifestyle reorganization to treating Korsakoff patients. Lennane's work was an attempt to monitor how Korsakoff patients would manage if they were returned home rather than being kept in long term institutional care. In preparation for their release from hospital some general efforts were made toward reteaching the Korsakoff patients lifeskills they had, apparently, forgotten. A broader understanding of the disorder than is presently available in the literature might provide a stronger basis upon which to plan treatment strategies.

Purpose and Limitations of this Research

This research represents an attempt to help fill the gap in knowledge by increasing the available data on emotional responsiveness and its relationship to the memory disorder found in Korsakoff's Syndrome. The study is limited to behavioural measures rather than physiological indices of emotional response. Further limitations are that only those Korsakoff

patients without concurrent dementia or other psychiatric diagnosis are studied. More explicitly, retrieval of emotion-laden material is compared with retrieval of neutral material in Korsakoff patients, former heavy drinkers and light drinkers. Self-report measures are also used, to monitor emotional functioning more directly.

Former heavy drinkers are included as a comparison group in this study both because of suggestions that prolonged heavy drinking results in abnormal affective responsiveness (Knott & Bulmer, 1985; Markowitsch, Kessler, & Denzler, 1986; Rubin, Gottheil, Alterman, & Holstine, 1977), and to monitor whether any differences between Korsakoff patients and light drinkers should best be described as manifesting along a continuum of drinking severity or whether they are more likely discontinuous and absolute.

In addition to examining emotional responsiveness and its relation to memory in Korsakoff's Syndrome, this research looks at the relationship between emotional content and the concept of multiple memory systems postulated by Wilkinson and Poulos (1987) and others. The study does not attempt to confirm or

refute the Wilkinson/Poulos theory but only to shed some light on how emotional stimuli relate to retrieval in a dual memory system.

Similarly, this study does not attempt to chose among the rather large number of multiple memory system theories published to date. However, the experimental design is based on the assumption that memory is not a unitary phenomenon - that there are at least two memory systems. More specifically, this study does not examine retrieval of emotional versus neutral material in isolation. Within each category (emotional or neutral) it also employs retrieval instructions that bias toward the use of either the Experiential or the Abstractive memory system (Wilkinson & Poulos, 1987). Implications for multiple and unitary memory theories are discussed in light of the results, as is the relationship between emotion and memory, generally.

CHAPTER 2

REVIEW OF THE LITERATURE

In order to provide a basis for further discussion, there follows a brief review of memory performance in Korsakoff's Syndrome and in other clinical groups, followed by a discussion of the few studies that have looked at affective functioning in either Korsakoff patients or in alcoholics who are functionally impaired but do not have clinically apparent Korsakoff's Syndrome. Similarities and differences between Korsakoff patients and those with certain other organic brain syndromes are then considered for both memory and affective functioning. Finally, possible interactions between memory and emotion are discussed using literature from both Korsakoff patients and normal subjects as a basis.

MEMORY PERFORMANCE IN KORSAKOFF'S SYNDROME

Korsakoff patients have consistently been shown to be severely impaired in their ability to recall recent events (Butters & Cermak, 1980; Korsakoff, 1889/1955; Mair, Warrington, & Weiskrantz, 1979;

Talland, 1965). Clinically, this deficit is revealed as an inability to remember conversations and other events occurring after the onset of their illness. Korsakoff patients do not recognize medical personnel who leave the room and reappear 10 or 15 minutes later, and they often cannot remember why they are in hospital or even that they are, in fact, in a hospital (Butters & Cermak, 1980). Furthermore, they typically have marked retrograde amnesia for events occurring in the relatively recent past that predate the appearance of clinical symptoms of Korsakoff's Syndrome (Albert, et al., 1980; Butters & Cermak, 1980; Sanders & Warrington, 1971; Seltzer & Benson, 1974). Another interesting characteristic of this group is that they are reported to be generally disinterested in alcohol (Butters & Cermak, 1980).

In formal tests of memory, this impairment manifests itself as abysmal performance on recall of unrelated paired-associates (Ryan, et al., 1980), relatively better performance on stronger associates than on weaker associates (Warrington & Weiskrantz, 1982) and very poor performance on tests that require the subject to recall verbal material (Butters, 1984; Talland, 1965). This is particularly evident when

Korsakoff patients are tested after a delay (Butters, 1984). Findings for recognition performance are less consistent (Biber, Butters, Rosen, Gerstman, & Mattis, 1981; Butters, 1984; Brooks & Baddeley, 1976; Cohen & Squire, 1980; Hirst & Volpe, 1982; Huppert & Piercy, 1976; Johnson & Kim, 1985). The poor performance of Korsakoff patients on certain types of memory tasks has been characterized in a variety of ways, for example as impaired "experiential memory" (Poulos & Wilkinson, 1984; Wilkinson & Poulos, 1987), an "explicit memory" deficit (Schacter, 1987), an "episodic memory" impairment (Tulving, 1983), deficits in "declarative memory" (Cohen & Squire, 1980), impaired "contextual memory" (Kinsbourne & Wood, 1982), and a "reflective memory" deficit (Johnson, 1983).

Although it is abundantly apparent that Korsakoff patients have severe memory deficits, some functions that most theorists include as part of memory are spared. Their knowledge of language and other everyday skills appears normal (Cohen & Squire, 1980). They are also normal in their ability to learn some new skills. Examples of skills that appear to be acquired normally are motor skills such

as the pursuit rotor (Brooks & Baddeley, 1976; Cermak, Lewis, Butters, & Goodglass, 1973) and cognitive skills such as reading inverted text (Cohen & Squire, 1980). Korsakoff patients' performance on some priming tasks is relatively intact, as well. That is, if a Korsakoff patient is asked to directly recall a recent learning episode (eg., presentation of unrelated paired-associates) he/she will not be able to remember this event. However, if a primer such as a strongly related word from a previously paired association (Talland, 1965; Winocur & Weiskrantz, 1976) or a degraded word fragment (Graf et al., 1984; Warrington & Weiskrantz, 1970) is presented to the patient in such a way that he/she is not asked to remember a specific event but only to make an appropriate association, performance is normal or near normal.

Obviously, some Korsakoff patients are unimpaired, or only slightly so, in certain aspects of memory. The proposals for dual or multiple memory systems rest on attempts to conceptually separate Korsakoff patients' intact abilities from those on which their performance is very poor. It has been suggested that this spared learning capacity reflects

an intact "abstractive memory" system (Poulos & Wilkinson, 1984; Wilkinson & Poulos, 1987), spared "implicit memory" (Graf, et al., 1984), normal "semantic memory" with an additional sparing of the priming function (Tulving 1983), intact "context-free" learning (Kinsbourne & Wood, 1982), normal "procedural memory" (Cohen & Squire, 1980), and intact "sensory and perceptual memory" systems (Johnson, 1983).

Korsakoff's Syndrome can be differentiated from other disorders involving lesions or toxic damage to the nervous system by the character and specificity of its memory deficit, coupled with the fact that general intelligence and most other cognitive abilities are intact (Butters, 1984). For example, demented patients of various origins show a relatively global cognitive deterioration with memory deficit being only a part of that overall decrease in mental abilities. Alzheimer's Disease, which is a cortical dementia, often presents as difficulty in remembering everyday events in its early stages, due to the association areas of the brain being affected first. However, more global cognitive deterioration soon appears as well (Joynt & Shoulson, 1985).

The progressive deterioration seen in Alzheimer's Disease and in some other amnesias does not seem to occur for Korsakoff patients who quit drinking. Whereas Korsakoff's Syndrome usually appears after an acute Wernicke's episode and does not worsen over time, other disorders such as Alzheimer's Disease, Pick's Disease, Multiple Sclerosis, Huntingdon's Disease and Parkinson's Disease progress from mild to severe over a number of months or years (Butters, Tarlow, Cermak, & Sax, 1976; Heilman, Bowers, & Valenstein, 1985; Morris, & Kopelman, 1986; Weingartner, Grafman, Boutelle, Kaye, & Martin, 1983).

Memory disorders due to brain injury do have a sudden onset but the character of the amnestic syndrome can differ from that of Korsakoff patients. In frontal, parietal and reticular lesions there are marked disorders of attention which will often affect memory and other cognitive performance in these patients (Mesulam, 1985; Signoret, 1985). However, memory is not usually affected to the exclusion of other cognitive abilities as it is in Korsakoff's Syndrome, nor is the memory deficit occurring in patients with attentional disorders usually specific

to certain memory tasks. Memory deficit specificity does not usually occur when the memory problems are secondary to an attentional disorder, whereas this specificity is one of the defining characteristics of Korsakoff's Syndrome.

Some brain lesions, particularly those involving the limbic system, do show a pattern of memory disorder similar to that of Korsakoff patients (Heilman et al., 1985). In the case of HM, for example (Scoville & Milner, 1957 quoted in Signoret, 1985), bilateral medial temporal lobectomy resulted in a memory disorder somewhat similar to that of Korsakoff's Syndrome but without the accompanying symptoms of confabulation and motor problems. Herpes Simplex Encephalitis can also result in a similar pattern of memory loss to that found in Korsakoff's Syndrome (Signoret, 1985), especially when the resulting lesion is limited to medial temporal regions. It has been suggested that similarities between Korsakoff's Syndrome and some other amnesias may be due to damage occurring in the same neural systems.

EMOTIONAL RESPONSE IN KORSAKOFF'S SYNDROME

The literature on emotional responding in Korsakoff patients offers few clues to the possible relationship with memory performance. Clinically, Korsakoff patients have usually been described as apathetic, bland, and detached (Biemond, 1969; Cermak, 1982; Fisher & Adams, 1964; Korsakoff, 1955/1889; Talland, 1965). Less frequent are clinical reports of Korsakoff patients who show inappropriate emotional responding, rigid responding, and euphoric responding (Biemond, 1969). It has also been reported that some Korsakoff patients show normal emotional response (Biemond, 1969).

Few attempts have been made to measure the affective aspect of Korsakoff patients' functioning, and most studies attempting to describe emotional response in Korsakoff patients have involved physiological responses to a variety of arousal-inducing stimuli. Whether physiological responses are good indicators of emotional functioning is, at present, moot. Some researchers have concluded that autonomic measures do reflect emotional activity (Kagan, 1981; Lang, Rice, & Sternbach, 1972; Schwartz, 1981), but these measures

may also reflect other events and some theorists do not consider them, in isolation, good indicators of emotional functioning (Obrist, Light, & Hastrup, 1981). While psychophysiological studies of emotional responsiveness are few for Korsakoff's Syndrome, behavioural studies are even fewer. The following section reviews psychophysiological studies first, followed by those using behavioural measures of emotional response.

There is evidence that Korsakoff patients and other individuals with alcohol-related impairments are hypoarousable on some physiological measures. Oscar-Berman and Gade (1979) compared the Skin Conductance Response (SCR) and pulse volume of eight Korsakoff patients with that of 18 normal controls, 15 Parkinsonians, 10 aphasics and seven patients with Huntingdon's Disease on response to an aversively loud, 100 db. tone. They found Korsakoff patients to have a significantly smaller SCR orienting response than all groups except those with Huntingdon's Disease. Korsakoff patients' pulse volume was also significantly less responsive to the tone than occurred in the other groups. Oscar-Berman and Gade suggest that the hypoarousability seen in

Korsakoff patients may be related to damaged connections between the thalamic-limbic areas and the hippocampus and frontal cortex.

In a more recent study of electrodermal response in this group, Markowitsch, Kessler, & Denzler (1986) compared Galvanic Skin Response (GSR) and chest expansion of nine Korsakoff patients, 10 recently detoxified young alcoholics, 10 young alcoholics who had been detoxified at least six months, and 10 older Alcoholics Anonymous (AA) members detoxified five years or more with controls matched on age and education. Markowitsch et al. included the four subgroups of alcohol abusers in order to determine whether response to emotion-laden stimuli relates to age and to recency of heavy alcohol consumption. In this study, Korsakoff patients' Galvanic Skin Response (GSR) to emotional and neutral pictures was most similar to that of the older group (AA) who had been abstinent for at least five years and whose duration of excessive alcohol consumption had been roughly 15 years. Both groups were significantly different in their GSR response from matched controls. Overall, Korsakoff patients and AA alcoholics were less reactive to both types of

stimuli than were other groups, but not differentially so. Younger alcoholics with no clinically apparent memory deficit who had been abstinent for at least six months also showed less GSR reactivity than did nonalcoholic controls, whereas recently detoxified alcoholics did not differ from controls.

Lack of clarity in reported results makes it impossible to evaluate the conclusions drawn in the Markowitsch et. al (1986) article. For example, Figure 8 in the Markowitsch et al. article is poorly labelled and, consequently, it becomes impossible to know precisely what is being graphed and what the findings are. The text refers to this and other, similarly confusing, tables and graphs both in reporting results and in drawing conclusions. The reader is left having to assume that the conclusions must be based on numbers, but the actual values remain unclear. Adding to the confusion is the absence of results for heart rate data which were, reportedly, gathered. These problems make the article of questionable use in understanding the issues at hand. However, the GSR data do suggest that Korsakoff patients and long term alcoholics are

hypoarousable on GSR responsivity to emotion-laden and to neutral verbal stimuli, suggesting some degree of relationship between hypoarousability of GSR response and alcohol abuse.

Studies of alcoholics without apparent Korsakoff's Syndrome show similar results, in that they have been shown to be hypoarousable on GSR response to an aversively loud noise. In a study of SCR responses to aversive stimuli, Knott and Bulmer (1985) compared 15 alcoholics who reported having had severe alcoholic withdrawal syndrome, blackouts, and amnesic episodes and who had been abstinent for at least two weeks with 15 male controls on SCR responses to a 100 db. tone. The alcoholic group showed a hyporeactive pattern of responsiveness relative to controls. Unlike controls, alcoholics exhibited no significant change in tonic Skin Conductance Level (SCL) with the onset of the tone, and they showed minimal change in the number of spontaneous fluctuations occurring throughout. They also took fewer trials to habituate. Based on SCR responding these researchers suggest that alcoholics have reduced sympathetic activity relative to nonalcoholics.

The indication that alcoholics are atypical in arousability is further demonstrated by studies of other physiological stressors. Rubin, Gottheil, Alterman, and Holstine (1977) studied the effect of cold pressor stress on pupillary contraction in 25 male alcoholics who had not consumed alcohol for at least six days. They found that, compared with normal controls, alcoholics' pupillary contractions and dilations occurred more slowly, and this slowness of reaction was seen in response to light as well as in recovery time to baseline. Overall, Rubin et al. concluded that the alcoholics had inadequate autonomic mechanisms that would, presumably, preclude effective optimal adjustment to stress and recovery from it.

In a study of the relationship between responsiveness to a cold pressor test and performance of a motor task on cutaneous vasomotor response, Lovallo, Parsons and Holloway (1973) monitored plethysmograph responses (ie. blood volume) in 28 alcoholics, 21 brain damaged patients and 24 hospital controls. In this study, all subject groups including alcoholics fell into two distinct categories with respect to their vasomotor response

style. Subjects responded either with dilation or constriction of blood vessels following cold pressor stimulation. There was no difference between groups in this aspect of their response nor was there any difference between groups in the degree of initial plethysmograph response. However, brain damaged subjects and alcoholics responded additively to multiple stressors - that is, their overall response level increased when the motor task was added. Normals' response level decreased under these conditions. Lovallo et al. concluded that the homeostatic mechanisms involved in normal response to multiple stressors are disrupted in brain damaged and alcoholic individuals.

These five studies generally support the clinical suggestion that alcoholics with no clinically apparent symptoms of Korsakoff's Syndrome and those who clearly have this condition do not operate normally with respect to autonomic arousability. Although most stressors used were physical, there is some suggestion that affect arousing verbal or pictoral stimuli relate to similar autonomic hypoarousability in Korsakoff patients and in other alcoholics.

Only two studies have been found that assess affective functioning in Korsakoff's Syndrome from a behavioural perspective. Johnson, Kim and Risse (1985) studied nine Korsakoff patients' ability to acquire affective response. Types of stimuli used were passages of Korean music and photographs of faces with accompanying biographical information. Korsakoff patients formed preferences for unfamiliar melodies in a manner similar to that of both alcoholic and nonalcoholic age-matched controls. The method used for preference induction was repetition of exposure (Zajonc, 1980). In forming preferences for photographs of people aided by biographical information, Korsakoff patients responded in the same direction as normals but their range of response was narrowed. Johnson et al. concluded that Korsakoff patients and alcoholics are normal in forming some types of preference - that is, those that are based on sensory or perceptual processes in the absence of reflective memory for meaningful content. They also suggest that affective response (preference in this case) will be narrowed or flattened to the degree that it depends on the involvement of cortically-based, cognitive activity as distinct form the purely

subcortical aspects of emotional response.

The finding that Korsakoff patients were less likely to change their judgment may be important in differentiating affective responding in Korsakoff's patients from that of normals. This tendency was more marked for positive than for negative evaluations, and it may be indicative of a different evaluative process across groups, of a difference between degree of felt positive and negative affect in this group, or to the fact that Korsakoff patients appear to start out evaluating both melodies and people more positively than do normal controls. Overall, the results of this study suggest that Korsakoff patients differ from normal controls in their formation of preferences and in their evaluation of people's character. Johnson et al., also noted that Korsakoff patients' recognition of the two faces used in this study was errorless, even after 20 days had elapsed. This suggests that either prolonged involvement with a stimulus or pairing that stimulus with an emotional descriptor may enhance recognition in Korsakoff's Syndrome. This study raises interesting questions about preference formation (a form of emotional responsiveness) and

its relation to memory in Korsakoff's Syndrome. Elements of this method can be used to address the questions asked in the current research.

The only other behavioural study found claiming to measure emotional responding in Korsakoff patients was done by Grossman and Butters (1986). These investigators assessed the ability of six alcoholic Korsakoff patients to categorize birds within the assumed emotional category of 'predator' and found that, unlike controls, Korsakoff patients tended to associate birds of prey only with the category 'bird.' Based on these data, Grossman and Butters concluded that the clinical group is compromised in appreciation of affective content of words.

This interpretation of the findings is not the only possible explanation for the lack of flexible categorization on the part of Korsakoff patients. For example, Butters and his colleagues have suggested that "Korsakoff patients fail to analyze all of the attributes or dimensions of new stimuli and thereby form degraded engrams which are sensitive to interference and (are) difficult to retrieve," (Biber, et al., 1981, pg. 316). This interpretation has also been made by Cermak and Moreines (1976) and

by Cermak, Naus, and Reale (1976), who suggested that Korsakoff patients seem not to spontaneously encode all of the semantic attributes of a word. In the work reported by Grossman & Butters (1986) the category 'predator' would involve deeper (second level) semantic processing than would the category 'bird' (first level). According to the 'shallow processing hypothesis' Korsakoff patients should attend preferentially to the category, 'bird.'

Grossman and Butters' (1986) findings could also be due to the Korsakoff's group being unable to remember what had occurred in the practice session. Because subjects were read definitions of the bird-names used in the test, the normal controls may have remembered the birds being described as predators in the definitions whereas Korsakoff's would clearly not. This could have affected their later choices if Korsakoff patients were acting on their usual, shallow processing, definitions of the words or even on the simplest one.

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Grossman and Butters' (1986) interpretation of their data is questionable because the category 'predator' is assumed to be emotional with no evidence given for this assumption, and because there

are simpler alternative explanations. Categorizing a particular type of bird as a predator may simply be more difficult. Because Butters and Cermak (1980) have previously used a shallow processing interpretation it seems reasonable that Butters would make the same, less tenuous, interpretation of his current findings. This study seems most useful in supporting the 'shallow processing hypothesis' and in raising questions about Korsakoff patients' ability to switch categories, rather that helping to delineate the relationship between emotion and memory.

No other studies were identified that address the behavioural aspects of emotional functioning in Korsakoff patients. These studies by Johnson et al. (1985) and by Grossman and Butters (1985) do not provide sufficient evidence upon which to base a theory and, furthermore, the validity of the tasks used as indicators of emotional activity is questionable. Whereas the preference formation study (Johnson et al., 1985) has face validity as having examined some aspect of emotional response, the study by Grossman and Butters (1985) does not. It seems more a test of cognitive than of affective activity.

Regardless of the suitability of physiological or behavioural measures chosen or of interpretations offered by these studies, it is clear that the question of whether Korsakoff patients and other alcoholics are impaired in emotional responsivity requires further study.

Because emotional functioning in Korsakoff's Syndrome has not yet been clearly described, it is difficult to make a comprehensive comparison with other disorders in that regard. There is evidence that Korsakoff patients differ from Parkinson's and Huntingdon's patients in their autonomic responsivity (Oscar-Berman & Gade, 1979), and there was also a difference identified between Korsakoff patients and a group of 21 brain damaged subjects of various types (Lovallo et al., 1973). These studies do appear to indicate a psychophysiological difference between Korsakoff patients and those with brain lesions with different etiologies.

The behavioural data on emotional functioning in Korsakoff patients and other clinical groups are too scant to permit comparison with other brain damaged groups. Korsakoff patients have been described, clinically, as both euphoric and docile. They have

good social skills and appearance generally, and they do not usually experience mood swings. Notwithstanding the clinical reports, there is little research evidence to support these assertions.

There is some support for the assertion that relatively specific emotional deficits usually occur in certain other clinical groups, although degree and timing of the deficits often differs across individual patients. For example, Parkinson's Disease often results in depression (Celesia & Wanamaker, 1972; Mayeux, Stern, Rosen, & Leventhal, 1981) and Huntingdon's Disease patients frequently are apathetic, aggressive and irritable, with a tendency toward suicidal behaviour (Heilman et al., 1985). They may also exhibit mania and depression (Folstein, Folstein, & McHugh, 1979). Alzheimer's patients often exhibit personality change, eccentricity, apathy and distractablilty at various points in the progression of the illness (Kwentus, Hart, Lingon, Taylor, & Silverman, 1986). Right hemisphere lesion patients are flat and indifferent in their presentation, but do not generally manifest clinical depression. In addition to this they may show decreased comprehension and/or expression of

emotion, and they have decreased memory for affect-laden material (Heilman et al., 1985; Ross, 1985). Left hemisphere lesioned patients have intact comprehension of emotion but they may have difficulty expressing it. They often show profound depression and are sometimes indifferent in their presentation. However, left hemisphere patients are able to feel anger and other emotions (Heilman et al., 1985). Limbic system lesions resulting from Herpes Simplex Encephalitis or Limbic Cancer often result in emotional changes such as anxiety and agitation along with inappropriate expression of affect (Corsellis, Goldberg, & Norton, 1968; Mesulam, 1985).

Overall, there is not one, general, affective disturbance associated with neurological disease. Each disorder seems to have its own pattern of deficits, and none seems to incorporate the clinical description of the affective component of Korsakoff's Syndrome. With the present lack of research data on emotional functioning in Korsakoff's Syndrome this possibility cannot be excluded, but it does seem unlikely.

INTERACTION OF EMOTION AND MEMORY IN KORSAKOFF'S SYNDROME

There is little published research addressing the possibility that emotional deficits are involved in Korsakoff patients' memory disorder as suggested by Talland (1965) and others. This is not surprising, because most work on this disorder has been done by theorists whose interests are in the cognitive aspects of memory and not in Korsakoff's Syndrome, per se. For example, much of the work published during the eighties on Korsakoff's Syndrome has been undertaken by researchers who are primarily investigating specific theories of memory (Albert, Butters, & Levine, 1980; Cermak, 1982; Cermak, O'Connor, & Talbot, 1986; Cohen & Squire, 1980; Graf, Schimamura, & Squire, 1985; Graf, Squire, & Mandler, 1984; Hirst, Johnson, Kim, Phelps, Risse, & Volpe, 1986; Huppert & Piercy, 1982; Jacoby, 1982; Kinsbourne & Winocur, 1980; Kinsbourne & Wood, 1982; MacAndrew, Glisky, & Schacter, 1987; Moss, Albert, Butters, & Payne, 1986; Ryan, Butters, Montgomery, Adinolfi, & Didario, 1980; Schacter & Graf, 1986; Shimamura & Squire, 1986(a);1987; Squire & Cohen, 1984; Warrington & Weiskrantz, 1982). In these

cases, Korsakoff patients were selected because of the specificity of their memory disorder rather than to understand the syndrome, itself. In fact, they were grouped together with other amnesics in a number of these studies.

Furthermore, the relationship between affect and memory is, itself, poorly understood. This may be due, in part, to the complexity and confusion in the literature on emotion. There is a lack of consensus about what emotion actually is and how it functions (Arnold, 1984; Bower, 1981; Jung, 1935; Lazarus, 1984; Zajonc, 1980) and the difficulties encountered when doing research in this area are formidable. Nevertheless, if the goal is to understand Korsakoff's Syndrome the possibility of a relationship between emotional and memory impairments should be considered.

A small number of studies have examined, directly, the interaction of emotion and memory in Korsakoff's Syndrome. Davidoff, Butters, Gerstman, Zurif, Paul, and Mattis (1984) manipulated the affective content of paragraphs using a procedure similar to the Logical Memory Subtest of the Wechsler Memory Scale (Wechsler, 1945). They tested nine each

of Korsakoff patients, alcoholics with no apparent memory deficit, and nonhospitalized normal controls for memory of the stories' contents at both immediate and delayed recall. Groups were matched on age and education. As expected, Korsakoff patients recalled significantly fewer phrases than did the other two groups, and there was a significant decrease in performance at delayed recall (30 seconds after completion of the immediate recall task).

In addition to generally poorer recall Korsakoff patients differed in their pattern of response. At immediate recall they did significantly better (relative to their own baseline score) on stories with sexual content than on stories with aggressive or neutral content. The other groups' performance did not differ across story types. The authors concluded that this apparent advantage for sexual content was likely not related to a greater depth of processing for sexual material because Korsakoff patients' rapid rate of forgetting was equivalent across all story types. Davidoff et al. concluded that affective factors play a minor role in Korsakoff patients' memory functioning that is restricted to a facilitation of immediate recall for specifically

sexual material. The implication, here, is that Korsakoff patients' immediate recall may be more affected by personally salient emotional material than is that of normal subjects.

The conclusions drawn by Davidoff et al. are made questionable by what seems to be purely intuitive manipulation of the emotional/neutral and the aggressive/sexual factors. First, there is no mention of the neutral sections of the stories or the emotion-laden phrases having been rated by independent raters. This writer and others who read the article found the example stories labelled "neutral" to be notably aggressive and judged them highly likely to produce emotional arousal. A second problem is that the sexual passages upon which the differential sensitivity of Korsakoff patients to sexual and aggressive stimuli is based seem, themselves, highly aggressive (eg. about rape) as well as sexual. The increase in performance for these passages may, therefore, have been due to the additive effects of two highly arousing topics at once, rather than to the sexuality aspect, alone. Nevertheless, the between-groups difference in specific reactivity to certain emotion-laden stimuli

remains. Considering the confounds in the stimuli used some conclusions drawn by Davidoff et al. are questionable, but their data do suggest that Korsakoff patients and normals react differently to some emotion-laden stimuli.

A long term, single case study of the relationship between affect and memory in one Korsakoff's patient is provided by Zola-Morgan and Oberg (1980). A 56 year old, male, alcoholic Korsakoff's patient was studied for two years. He was taken on two trips around Boston and questioned at various time points from 24 hours to two years after these events occurred. Some information was taken through interview using cued recall, some was spontaneously offered by the patient, and more structured tasks such as multiple choice and true/false card sort were also used.

As expected, the subject neither recalled nor recognized all of the events correctly. Zola-Morgan and Oberg (1980) report that he did recall some aspects of the trips that were of particular emotional significance for him, but it is not clear whether these were freely recalled or were actually responses to verbal and written cues.

Zola-Morgan and Oberg (1980) concluded that these data, particularly the subject's pattern of forgetting, cannot be accommodated by most current theories of Korsakoffian amnesia because of the differential retrieval of personally significant material. They also interpret their data as supportive of Weiskrantz' (date not stated) hypothesis that Korsakoff patients have a dissociation between levels of processing.

These suggestions are intriguing but there are problems with the methodology used in this study that make it difficult to interpret the findings. There is no mention of how or when the emotionality or personal salience of the remembered events was determined, for example. Was this done before the trip or after? Did the patient or the authors decide which bits of information, out of all those information segments contained in the trips, were personally significant to the patient? Furthermore, the report does not clearly describe the retrieval situations. Consequently, it is difficult to confirm the authors' assertions that the patient did recall or recognize certain material. Zola-Morgan and Oberg (1980) seem to have drawn their conclusions in the

absence of needed information, (i.e., whether some of the forgotten material was also emotionally significant). Also, the recall task seems to have been confounded by cueing and guessing to the extent that it may actually have been a priming situation. However, the data do suggest a positive correlation between degree of emotional content and memory of that content. If the authors' descriptions do reflect the data accurately, then their suggestion that Korsakoff patients have better memory for emotionally salient than for neutral material gains support. However, such a conclusion can only be considered tentative at this point.

The most detailed study, to date, of the relationship between emotion and memory in alcoholic Korsakoff patients and other subgroups of alcoholics is that of Markowitsch et al. (1986), who examined both Korsakoff patients' memory performance as a function of emotional content, and their SCR response to emotion-laden stimuli. Using recognition scores, Markowitsch et al. found that Korsakoff patients performed significantly less well than age- and education-matched controls on both emotional and neutral pictures ten minutes after first

presentation, but two days later there was no difference in performance between Korsakoff patients and controls. Korsakoff patients' performance improved at delayed testing and control subjects' performance deteriorated over time, resulting in disappearance of the difference between groups at the ten-minute testing interval. Unlike controls, Korsakoff patients recognized more emotional pictures than neutral pictures at ten minutes, but this advantage for emotional content did not carry over to the delayed (two days) testing session. Keeping in mind that conclusions drawn by Markowitsch et al. are impossible to evaluate as reported for reasons reported earlier in this paper, there are some interesting findings.

The overall tendency was for Korsakoff patients to do poorly on recognition of visually presented material with the indication that recognition may be better for emotional stimuli. Age-matched controls and alcoholics showed no difference between emotional and neutral pictures in recognition scores. These data seem to support those of Davidoff et al. (1984) and Zola-Morgan and Oberg (1980), who suggest that emotional content improves at least some aspects of

memory performance in Korsakoff patients, but not enough to bring their performance up to normal levels.

The three studies discussed here are the only relatively recent published works found that investigate the relationship between emotion and memory in Korsakoff's Syndrome. Given that the suggestion was made over 20 years ago of an important interaction between these two functions in Korsakoff patients, the dearth of research in the area is surprising. Clearly, more work is needed before the validity of this suggestion can be assessed.

INTERACTION OF EMOTION AND MEMORY IN THE GENERAL POPULATION

In the general population the relationship between emotion and memory has most frequently been studied using verbal recall. Some researchers have used subject-generated paired-associates to specifically examine the interaction between emotional content of stimulus words and recall, at both immediate and delayed testing intervals. In the first study of this type (Keet, 1948) subjects were asked to free-associate to the list of 100 words

contained in Jung's Word Association Test (Stein & Riviere, 1973). The list was repeated, and those stimulus words to which the subject both reacted more slowly and produced a different associate on the second presentation were judged to be traumatic. Quicker associations that were repeated on the second trial were judged to be neutral. Either neutral or traumatic words were then presented in a gridlike array. That is, a grid of 40 words was presented to the subject with the target word embedded in its centre. Subjects recognized neutral target words better than traumatic ones. Several attempts to replicate these findings have been unsuccessful (Grummon & Butler, 1953; Levinger & Clark, 1961; Merrill, 1952) but with some modification this methodology has been shown to result in better immediate recall of neutral than of emotional words in several studies. A discussion of this body of work follows.

Levinger and Clark (1961) investigated the relationship between emotional content and recall by asking 20 female subjects to free-associate to a list of emotional and neutral words that had been equated for frequency of usage in the English language.

After an unspecified time interval subjects were asked to recall or guess what their previous response had been. Emotional words (as rated by the subject) were forgotten significantly more often than were neutral words, and words which evoked a high variability in responses across subjects were also forgotten more frequently. These factors were independently related to forgetting. Levinger and Clark concluded that forgetting of words is related to emotional content as well as to other stimulus characteristics.

In a second study using Levinger and Clark's (1961) method, Parkin, Lewinson, and Folkard (1982) tested the interaction between recall and emotional content of words with the addition of delay as a factor in the design. In this study two groups of 12 randomly assigned women were tested for recall of their own free-associations to emotional and neutral words at either two minutes or seven days' delay. Associates to emotional words were remembered less well than those to neutral words at short delay but this difference did not occur at the longer delay. Parkin et al. did not control any stimulus characteristics other than emotionality. Therefore,

such variables as abstractness, frequency or meaningfulness may have accounted for a portion of the apparent relationship between emotional content and recall. Based on their finding that emotional associates were recalled less well than neutral associates, Parkin et al. concluded that there is a relationship between emotion and memory. Further, they suggest that the arousal-consolidation hypothesis (Walker, 1958) explains this occurrence and the subsequent disappearance of the effect at delayed testing.

Sinton (1981) also attempted to test the interaction between retention interval and emotional content on recall of subject-generated paired-associates using Levinger and Clark's (1961) methodology. He tested 20 male and 20 female subjects for retention of their first association to emotional and neutral words. Subjects were randomly assigned to either immediate (5 minutes) or delayed (24 hours) recall conditions. Stimulus words were rated on emotionality by ten independent raters, and they were equated for meaningfulness (Paivio, Yuille, & Madigan, 1968), and frequency (Kucera & Francis, 1967). Independent variables were emotionality and

concreteness (Paivio, et al., 1968). Emotionality and concreteness were independently and negatively related to recall errors. Furthermore, the interaction between retention interval and emotionality was significant due, primarily, to more forgetting of neutral words than of emotional words. There was also a difference between males' and females' results. For men emotional content decreased recall regardless of word abstractness or time of testing. For women the negative effect of emotionality on recall seen at five minutes did not extend to the 24 hour testing time and this was particularly noticeable for concrete words. Sinton (1981) also found, as did Jung (Stein & Riviere, 1973) in the original work done with word associations, that emotional content in a stimulus word would increase reaction time on the following word association. Sinton concluded that emotion does seem to act as a determinant of memory and he related these findings to earlier work by psychodynamic theories on the repression construct.

In two further experiments using this method Rossman (1984) again found that associations to emotional stimuli were more often forgotten at

immediate recall. Rossman included three mixed-sex groups in his first experiment. One group was tested for recall immediately after the associations list was presented, one was tested at 20 minutes, and a third was tested at 24 hours. In this experiment there was a main effect for emotionality on recall, but the interaction found by Parkin et al. (1982) and by Sinton (1981) between emotionality of stimulus words and retention interval was not found. This lack of interaction was repeated in Rossman's second experiment. In the second experiment, Rossman duplicated Parkin et al.'s (1982) study except for using a different word list. As with Parkin et al., Rossman did not control for the language aspects of stimulus words and it is, therefore, not possible to determine the relative effects of these variables in the different results seen across studies.

Other studies offer further support for the suggestion that emotional content increases retrieval errors at immediate testing intervals. Kleinsmith and Kaplan (1963) paired numbers with either emotional or neutral words and tested for recall at five time intervals ranging from two minutes to one week. A clear interaction occurred between emotional

content and retention interval in this study, with numbers paired with emotional words being remembered less well than those paired with neutral words at immediate recall. Walker and Tarte (1963) found the same recall-time interaction using the number-word pairing method, but presenting high and low arousal word pairs separately.

Christianson and Nilsson (1984) induced emotional arousal with a series of unpleasant pictures and tested (at 12 minutes) for both recall and recognition of words paired with these pictures or with neutral pictures. Both SCR and self-report data showed that the aversive pictures induced emotional arousal which carried over into the subsequent picture-word pairing. Recall of words encoded during high arousal was poorer than for those encoded during baseline SCR levels, regardless of the type of picture it had actually been paired with. Recognition was poorer for words paired with traumatic than with neutral pictures but there was no decrement during the high arousal/neutral stimulus condition for recognition.

In some studies poorer recall of associates to emotional than to neutral words has not been found.

Smith and Harleston (1966) examined retrieval of self-generated paired-associates using a 10-minute test interval. These investigators used 60 nouns categorized into emotional versus neutral and abstract versus concrete words. The words were randomized into lists and presented to 40 female subjects for an association and then for retrieval 10 minutes after completion of the stimulus list. Whereas concreteness was related to recall in this study, emotionality was not. Inclusion of a no-delay recall condition would have made comparison with other studies more informative, however this finding does underscore the importance of time factors in this type of research. It also indicates that stimulus characteristics such as concreteness should be controlled.

Maltzman, Kantor and Langdon (1966) tested the relationship between emotional content and memory using free recall of emotional and neutral word lists. In this study emotional words were remembered better than neutral words both at immediate and delayed (30 minutes) recall. Rees-Nishio (1984) also found better retrieval of emotion-laden than of neutral words using a free recall design with only

one retention interval.

Although this body of research addresses two separate issues - the relationship between emotional content and memory, and the time interaction between retention interval and emotional content - only the first is of specific relevance for addressing responsiveness to emotion-laden material in Korsakoff's Syndrome. If Korsakoff patients differ from normals in their response to verbal material with emotional content, this should be evident at short retention intervals. The research has shown a consistent decrement in immediate recall of emotionally arousing, self-generated paired-associates as compared with those that are neutral when the interval between word list presentation and retention interval is five minutes or less. There is also some suggestion that the immediate memory decrement occurs for experimenter-generated paired-associations (Christianson & Nilsson, 1984; Kleinsmith & Kaplan, 1963; Walker & Tarte, 1963). This negative correlation between recall and emotional arousal apparently does not hold in the case of free recall (Maltzman et al., 1966; Rees-Nishio, 1984). Further,

it is unclear whether this relationship can be generalized across sex of subject or to retention intervals longer than five minutes. It is also unclear how much of the relationship seen between emotional content and recall is due to the influence of semantic characteristics of the stimulus words. There may be numerous mediating factors affecting this relationship, and further studies in this area should take these variables into account.

Clearly, there are questions remaining about how emotional content and emotional arousal affect memory for verbal stimuli in normals. However, the research does offer some relatively consistent findings and these can be used to further investigate this relationship in Korsakoff patients. Because Levinger and Clark's (1961) subject-generated paired-associates method has shown a negative correlation between emotional content and immediate memory, it can be modified and extended to answer a number of questions about Korsakoff's Syndrome and about emotion and memory, generally.

If Korsakoff patients do suffer from deficits in emotional arousal, then the effects of emotion on memory performance that are seen in most studies of

people with normal affective responsiveness should not occur in this patient group. As a result of examining these issues in the clinical group of interest, information will also be gained about the relationship of emotion and memory, generally.

THEORIES ABOUT THE EMOTION-MEMORY INTERACTION

Because affective functioning in Korsakoff's Syndrome and its possible impact on their memory performance is of primary interest in this study, there follows a review of theories about the functional relationship between emotion and memory. A number of theories have been put forward during the past 80 years about this relationship. Some of these have concentrated on predicting particular aspects of the interaction such as direction (positive versus negative), selectivity (certain emotions affect retrieval of only certain types of material) or the effect of intensity change on that relationship. Others have attempted to build general models explaining the apparent relationship between emotional content and memory. Still others seem to be purely descriptive and none, so far, accounts for all of the data in the literature.

The intent of the present research is to describe a very narrow segment of the interaction between emotional content of verbal material and memory during the process of examining the response of Korsakoff patients to emotion-laden verbal material. This study is not designed to test a particular theory of memory or to provide a definitive test of its interaction with emotion. The aspect of this issue that is of specific importance in the present study is whether it can reasonably be assumed that an interaction does occur between emotion and memory in normal subjects. Because this study assumes, based on evidence cited earlier, that such an interaction does or can occur in asking the question of whether the relationship holds for Korsakoff patients, it is useful to describe some of the theories addressing this issue.

Early on, Freud (1899/1965; 1923/1960) developed the Repression Theory, which stated that the quality of emotional input will influence accessibility of that material at a later time. That is, negatively charged material will be less accessible.

Bartlett (1932) theorized that the emotional attitude ("feelings, strivings, interests") of the

rememberer influences and transforms the nature of later recall or reproduction. Bartlett assumed that emotional state of an individual during encoding influences not only error rate, but specifically which pieces of information out of the stimulus array are retrieved correctly, and the content of errors made. Bartlett also suggested that remembering (recall) was more dependent on personal significance of the material than was recognition.

Jung (see Stein & Riviere, 1973) held that emotional content of a stimulus strongly influences both reaction time and forgetting. In Jung's view, reaction time is increased for emotional material and it is more likely to be forgotten than is neutral material. He states that errors in reproduction occur because the stimulus word, "has hit on what I call a complex, a conglomeration of psychic contents characterized by a peculiar or perhaps painful feeling-tone," (Jung, 1935).

Lipmann (1911) thought that the "vividness" of a memory is a function of the strength of a memory trace which, itself, varies with the "interest tone" of the stimulus material. Lipmann suggested (Lipmann & Wertheimer, 1907) that a subject has a more vivid

memory if the stimulus is interesting to her/him than if the stimulus is judged dull by that subject. Lipmann used the term, "vividness" to refer to the intensity of a trace. He thought that stimuli of particular interest to an individual ("interest-toned perception complexes") leave especially intense traces. This results in memory traces that disappear less rapidly than others, are revived more easily, and that carry locational and temporal information.

These early theories of the memory/emotion interaction generated a large body of research, primarily in the clinical arena. However, they are largely descriptive. More recently, several theories have arisen which try to explain the apparent relationship in more detail. Walker's (1958) Action Decrement Theory postulates that affective content in the stimulus increases the strength of a memory trace, but decreases its availability at relatively short retention intervals. He suggests that availability is hindered because the trace is engaged in being consolidated for that period of time. This, Walker suggests, protects the memory trace from disruption during the consolidation period. In this view, later retrieval favours emotion-laden material

because it has a stronger trace, overall. While Walker's theory does explain the experimental evidence for the existence of an arousal-related decrement in the cued recall of incidentally learned paired-associates at shorter retention intervals (eg., Christianson & Nilsson, 1984; Kleinsmith & Kaplan, 1963; 1964; Parkin et al., 1982; Sinton, 1981; Walker & Tarte, 1963) and the disappearance of that decrement at longer retention intervals, it does not explain why this effect is not seen for free-recall (eg., Maltzman et al., 1966; Rees-Nishio, 1984). It seems that a broader explanation is needed that will account for existing findings.

A somewhat different focus is taken by Bower (1981) in examining the relationship between emotion and memory. Bower's Mood State Dependent Theory suggests that mood congruent material is both learned and retrieved better because the associations between memory nodes are brought closer to some critical accessing threshold when a subject is in a mood that is congruent with the affective charge of the material to be learned. That is, the effects of mood state and stimulus are additive. Here, the subject's

mood is thought to provide a context which interacts with stimulus content to facilitate retrieval. Because most of Bower's work was done using hypnotized subjects under very specific conditions, it is not clear whether his theory can be supported in the general case. Also, since the mood-state dependent effect tends to disappear when recognition or cued recall are used rather than free recall, it seems unlikely that Bower's theory can be considered definitive in explaining the relationship between emotion and memory. Finally, this theory does not account for the difference between free-recall of emotion-laden material and retrieval of incidentally learned paired-associates with emotional content.

The theories offered by Lazarus (1984) and Arnold (1960; 1984), about the relationship between affect and memory, are very like one another. For both of these theorists, appraisal of the stimulus is a primary factor in retention. Arnold holds that both emotional state of the rememberer and the emotion-eliciting content of stimulus material (via its influence on the affective memory system) influence recall. Further, she suggests that recognition is actually a feeling which results from

accessing the affective memory system. All recognition and deliberate recall is influenced by this system, which is one of a group of memory subsystems and which contains the actual experience of an emotion. These feeling memories are elicited by stimuli that are in some way related to the original stimulus, and the result is recall or recognition. For Lazarus and Arnold there is also an appraisal of "good or bad" in each encounter with a stimulus. This appraisal becomes part of the affective memory circuit and it influences retrieval. If a stimulus is not appraised as "good to remember" it likely will be forgotten.

Arnold bases her theory on a comprehensive analysis of brain physiology and function, and on an exhaustive review of the pertinent research. The theory is wide-ranging and thorough, and it takes account of a large body of research data. However, it is primarily descriptive, at least in the area relating to the affect/memory interaction - few specific predictions are made.

In addressing the clinical group of interest in the present study, Arnold suggests that affective circuitry is disrupted in Korsakoff patients and this

accounts for their inability to recognize people or things they have seen moments before. She postulates that Korsakoff patients do not experience the "feeling of familiarity" needed for recognition to occur. Arnold uses Warrington and Weizkrantz's (1970) word completion (priming) task as evidence that they can learn but cannot recognize.

Arnold's ideas are supported by Shimamura and Squire's (1986a) report that Korsakoff patients are impaired in their "feeling of knowing." However, some types of recognition performance are still quite good in Korsakoff patients (Huppert & Piercy, 1976), and Arnold has not taken this into account in her hypotheses. Overall, the data from studies of Korsakoff patients do not offer clear support for the portion of Arnold's theory addressing the interaction between emotion and memory (via affective memory) and memory performance. Perhaps Korsakoff patients are not, after all, impaired in their affective responsiveness and consequently, Arnold's suggestion that recognition is an affective response need not be challenged by the incidences of relatively good recognition performance in Korsakoff's Syndrome. Alternatively, Korsakoff patients may be affectively

impaired and the error may be in having equated recognition and affective experience. Another problem for Arnold's theory is that it does not account for the reported decrement in retrieval, by normals, of emotion-laden paired associates at relatively short retention intervals.

One theorist who addresses the relationship between affect and memory from the perspective of two separate systems interacting with one another is Zajonc (1980). Zajonc suggests that the systems are parallel, separate and partially independent, in that affect is always present as a companion to thought (i.e., memory), but the reverse need not be true.[1] In Zajonc's model affect occurs before cognition in response to any stimulus. Zajonc further suggests that recognition responses are made from a different system than are affective judgements. This is in direct contrast to the suggestion by Arnold (1984) that recognition is based on affective memory and is, itself, an affective response. Zajonc further suggests that emotional content enhances memory, and he supports this with references to relevant research (Bower & Karlin, 1974; Keenan & Baillett, 1979; Patterson & Baddeley, 1977; Rogers, Kuiper, & Kirker,

1977; Sadalla & Loftness, 1972; Strand & Meuller, 1977; Warrington & Ackroyd, 1975).

As with other theories that assign a facilitative role to emotion in the emotion/memory interaction, Zajonc's theory is supported by reseach on free recall of word lists (Maltzman et al., 1966; Rees-Nishio, 1984) but it does not account for the data on incidental recall of emotion-laden versus neutral paired-associates. No explanation is offered for the differences between paired-associate retrieval and free recall in Zajonc's theory.

The final theorist discussed here is Eysenck (1982). Generally, Eysenck's theory states that an increase in arousal reduces the influence of the subject's surroundings, leading to better retention over the long term. Increased arousal is thought to focus the subject's attention on a narrower range of items within the stimulus situation. In the experimental situation, arousal would facilitate retention of the specific stimulus as described by the experimenter. With lower levels of arousal, a wider range of items contained within the stimulus situation are encoded, according to Eysenck, and this results in poorer retention.[2] Emotional arousal, in

Eysenck's view, exerts a facilitatory influence on memory retention and performance at an optimal level. As with most other theories, Eysenck does not account for what he has labelled the robust findings of a decrement in retrieval of emotion-laden paired-associates at short retention intervals.

Although none of the theories described here accounts for all of the existing data, all assume that an interaction of emotion and memory can occur in many situations. In some cases emotion/arousal is thought to facilitate retrieval (e.g. Eysenck, 1967; Zajonc, 1980) while in others it is assumed to hinder retrieval (e.g. Freud, 1925; Jung, in Stein & Riviere, 1973). Still others (Bower, 1980) suggest that emotion can do either, depending on the situation. None of these theories presents a coherent picture with testable predictions while also adequately accounting for the research findings, and the present study does not espouse a particular theory concerning the interaction of emotion with memory. The only assumption being made in this regard is that such an interaction can, in some situations, exist. Further research into this relationship, for Korsakoff patients and for others,

will yield information about Korsakoff's Syndrome and about the relationship between these two functions. It should also provide a more comprehensive data base for theory development.

SUMMARY

The small number of studies that have, so far, addressed emotional responsiveness of Korsakoff patients has generally found this patient group as well as non-Korsakoffian alcoholics to be hypoarousable. This hypoarousability is apparent for both physical and emotional stressors on measures of autonomic arousal. Although the data are scant there is also some suggestion that Korsakoff patients are less reactive to emotional stimuli on a behavioural level than are normal subjects.

Whereas Korsakoff patients seem to be hyporeactive to emotional stimuli when the response is measured directly, the available data suggest that some types of emotional content may selectively enhance immediate memory for Korsakoff patients but not for normals - at least for story content and for pictures (Davidoff et al., 1984; Markowitsch et al., 1986). Thus, when response to emotion-laden material

is measured indirectly, that is through its effect on another variable (memory), Korsakoff patients seem to be hypereactive.

These findings appear contradictory. If Korsakoff's patients are less reactive to emotional content than are normals, their memory performance would be expected to be less affected by emotional stimuli than would be the case for normals. Clearly, there is a need for well controlled research that looks at both of these variables together, so that this confusion can be eliminated. A study is proposed, therefore, which compares the reactivity of Korsakoff patients, alcoholics with no clinical signs of Korsakoff's Syndrome, and nonalcoholics to emotion-laden stimuli, both directly and through its relationship to memory performance. The experimental methods used to look at this relationship are recall of subject-generated paired-associates, which has shown a relatively consistent effect for emotional versus neutral content in normal subjects (e.g., Sinton, 1981), and recognition of experimenter-generated associations between faces and verbal descriptors, which has shown some interesting results in Korsakoff patients (Johnson et al., 1984).

METHODOLOGICAL ISSUES

ADAPTING THE SUBJECT-GENERATED PAIRED-ASSOCIATES METHOD

The subject-generated paired-associates task has been selected because of its previous reliability in showing differential retrieval of emotion-laden versus neutral material. However, in order to use it to assess the relationship between affect and memory in Korsakoff patients, two related issues must first be considered. The first requirement is to take into account the specific type of memory deficit found in this clinical group and the second is to consider what assumptions are being made about memory and its interaction with emotion.

The specific character of the memory deficit seen in Korsakoff's amnesia is particularly relevant in choosing an appropriate retrieval task. If Korsakoff patients cannot remember an event that occurred five or ten minutes ago it is pointless to ask them to retrieve a word pair by remembering or imagining their earlier response and repeating it. If the recall task used in previous experiments with normal subjects relies exclusively on this mechanism

for producing a response, then Korsakoff patients would be expected to perform very poorly regardless of the emotional content of stimulus words used. In this case, a floor effect would obscure any relationship between emotional content and memory in Korsakoff patients.

One cannot be certain, however, that the retrieval instructions previously used in this type of experiment do rely solely on memory of the prior pairing event to produce the response. It is possible that responses were made based on a memory system usually considered to be intact in Korsakoff patients. It is difficult, therefore, to predict whether they will do well on this task or whether their performance will be too poor to measure differentially between emotion-laden and neutral material. The very nature of the "learning trial" used in this method suggests that a priming task is being set up and, because Korsakoff's subjects have been shown to perform at nearly normal levels on priming tasks (Graf, Squire, & Mandler, 1984; Warrington & Weiskrantz, 1970) they may do well in retrieving this material. When researching the relationship between emotion and memory in

Korsakoff's Syndrome, it is important that the retrieval task be one that subjects can perform.

It has been shown (Graf, et al., 1984; Warrington & Weiskrantz, 1970) that certain types of retrieval instructions, usually called priming tasks, generally yield normal performance in Korsakoff patients. Such tasks include asking subjects to guess what has occurred previously, asking them "what goes with" a verbal probe, and asking them to complete word fragments. It seems reasonable to suggest that a retrieval instruction similar to a priming task would be more likely to yield usable results with Korsakoff patients than would a task which may depend primarily on imagining a past event. In this research the possibility of Korsakoff patients doing relatively well on retrieval will be maximized by using instructions that will access aspects of memory thought to be intact in this group.

It becomes apparent when discussing the type of retrieval task most suitable for use with Korsakoff patients that a second, more general, issue must also be considered. That is, the theory of memory and its interaction with emotion underlying the method chosen and the questions addressed in the research being

done. An assumption made here is that all research involving memory proceeds either implicitly or explicitly from a theoretical base. It is not the intent of this work to define memory, but neither can memory theories be totally ignored when using a memory task as the primary dependent variable. Given that a number of authors have recently reviewed the literature in support of their own memory theories (Johnson, 1983; Schacter, 1987; Squire, 1986; Poulos & Wilkinson, 1984) it would be redundant to repeat the exercise here. The gist of these reviews and the weight of recent evidence makes it plausible to assert that memory is not a unitary entity but is made up of at least two and possibly more interactive systems, and this is the general position taken in the present research.

One of the multiple-system memory theories that accounts rather well for existing data is that of Wilkinson and Poulos (1987), and this theory will be used as a descriptive basis from which to work. Wilkinson and Poulos (1987) characterize memory as being made up of two interactive subsystems. The distinction between the two can best be described as the difference between remembering (experiential) and

knowing (abstractive). Experiential memory requires directed attention in order to imagine past events, whereas abstractive memory is devoid of imagery and is based on associative links that are relatively automatic (see Wilkinson & Poulos, 1987 for a detailed explanation of the theory).

Using the concepts of experiential and abstractive memory in examining the subject-generated paired-associates paradigm a problem arises in identifying which system is being accessed during the retrieval phase. The recall task used in previous work with normals does not clearly access one memory system or the other. The task accesses already existing associations and may, therefore, be considered an example of priming. Both priming and the act of guessing among choices are thought to bias response (via instructions) toward using the abstractive system in the Wilkinson-Poulos theory of memory. On the other hand, the retrieval instructions for this task ask subjects to remember a prior pairing event, which is thought to access experiential memory. If a dual memory system is assumed, it is impossible to tell whether one or both of the systems is responsible for the results seen.[3]

This need not be a crucial issue if the focus of the research is specifically the existence of an emotion-memory interaction in Korsakoff patients, and if tasks which allow access to a wide enough range of hypothesized memory systems are included in the design. However, the possibility of problems with acquiring interpretable data should be anticipated, and minimized. In the present research, this condition is met by providing for the possibility that Korsakoff patients may not do well when asked to remember the prior pairing event. If, as Poulos and Wilkinson (1984) suggest, Korsakoff patients have a normally functioning abstractive system and a nonfunctional experiential system, a retrieval task is needed that will bias both normals and Korsakoff patients toward using the abstractive system in producing their retrieval response. Asking for the first word that comes to mind and stressing the need for speed in responding should satisfy this requirement (Wilkinson & Poulos, 1987).

Altering the retrieval instruction introduces a further complication, however. Because the relatively stable negative relationship between emotional content and recall of subject-generated

This need not be a crucial issue if the focus of the research is specifically the existence of an emotion-memory interaction in Korsakoff patients, and if tasks which allow access to a wide enough range of hypothesized memory systems are included in the design. However, the possibility of problems with acquiring interpretable data should be anticipated, and minimized. In the present research, this condition is met by providing for the possibility that Korsakoff patients may not do well when asked to remember the prior pairing event. If, as Poulos and Wilkinson (1984) suggest, Korsakoff patients have a normally functioning abstractive system and a nonfunctional experiential system, a retrieval task is needed that will bias both normals and Korsakoff patients toward using the abstractive system in producing their retrieval response. Asking for the first word that comes to mind and stressing the need for speed in responding should satisfy this requirement (Wilkinson & Poulos, 1987).

Altering the retrieval instruction introduces a further complication, however. Because the relatively stable negative relationship between emotional content and recall of subject-generated

paired-associates has been shown with a task that does not clearly differenciate between the two memory systems, it is difficult to predict whether the same relationship would exist when the response is biased toward the abstractive system. Perhaps minimizing the involvement of the experiential system under the second retrieval condition will result in disappearance of the decrement in recall of emotional words that has usually been found with normals. Such a finding would suggest that emotional arousal interacts differently with the two memory systems, or at least with the two types of retrieval instructions. It would also suggest that emotion is not necessarily an intrinsic part of every memory. It is, therefore, useful to retain the original instruction (recall condition) which allows access to either memory system but biases toward use of the experiential system, and to add a second retrieval instruction (associative condition) which, although it also allows access to both, biases toward the abstractive system.

As can be seen from the above discussion, viewing memory as a multiple-system entity unavoidably introduces a certain amount of conceptual

and methodological complexity not previously contained within the subject-generated paired-associates design. This research will, therefore, examine the effect not only of varying levels of emotionality in verbal stimuli, but of using instructions designed to bias retrieval toward the abstractive system versus the experiential system. Inclusion of the two retrieval conditions will offer the opportunity to see whether memory performance is affected, in Korsakoff's patients, by the addition of emotional content to the stimulus - that is, by increasing emotional arousal. The findings of Zola-Morgan and Oberg (1980) and Davidoff et al., (1985) suggest this as a possibility and such an outcome would have important implications for understanding the memory deficit in Korsakoff's Syndrome.

THE ROLE OF REACTION TIME

Another variable that should be considered when using the subject-generated paired-associates method to look at affective functioning in Korsakoff patients is reaction time/response latency. Jung (in Stein & Riviere, 1973) and Sinton (1981) found that

reaction time of normal subjects was longer for the free-association made following an emotion-laden word pair than following a neutral word pair. Jung also reports that free-association time is longer to verbs, adjectives and abstract nouns than to concrete nouns, and for less educated than for more educated subjects. Hall and Ugelow (1957) report that free-association time varies as a function of a word's Thorndike-Lorge frequency count. These findings indicate that free-association reaction time is related to a variety of both stimulus and subject characteristics. It must, therefore, be suspected as a contributor to the variability when subject or stimulus characteristics are used as independent variables in an experiment.

Researchers who have used the subject-generated paired-associates method to look at the relationship between affect and memory have used reaction time at either the free-association or the recall phase as a dependent variable - that is as a measure of emotional interference. This is based on Jung's (1935) postulation of the complex as an agent of response repression.

The findings of Hall and Ugelow (1957), Jung (in

Stein & Riviere, 1973) and Sinton (1981) suggest that free-association reaction time might be more appropriately used as a covariate in this design, because of the apparent relationship between response latency and a variety of stimulus characteristics. If reaction time is used as a covariate, an existing relationship between emotional content and memory is less likely to be obscured by the presence of confounding relationships between response latency and these variables.

PAIRING FACES WITH VERBAL DESCRIPTORS

The method of pairing emotion-laden descriptors with pictorial probes has been used with Korsakoff patients to discriminate face recognition from recall of affectively toned verbal descriptors (Johnson et al., 1985). However, in that study only two faces were used and each was coupled with a large amount of verbal descriptive material. Because face recognition was fairly good for the Korsakoff patients there is some indication that emotional material does not adversely affect performance. However, since only two faces were used and there was no emotionally neutral stimulus material, little can

be concluded about the relationship of emotional content to memory for faces. Increasing the number of stimulus faces used and adding a neutral condition is a useful extension of this method for assessing the relationship between emotional responsiveness and memory in Korsakoff's Syndrome.

In a series of studies using normal subjects, wherein the additional dimension of aversive emotional content was introduced into a test of retrieval of associations between facial photographs and verbal descriptors, Christianson and Nilsson (1984) and Christianson et al., (1985) concluded that aversive emotional content disrupts retrieval of the association in normal subjects. If Korsakoff patients are hypoarousable then no decrement should be seen when negative emotional content is introduced into a pairing of faces with descriptive material. Because face recognition performance can be relatively good for Korsakoff patients, pairing faces with descriptors and introducing an emotional charge into the pairing event should provide information about affect and memory in this group. Using forced-choice recognition as a retrieval instruction should increase the likelihood of a relatively good

recognition rate because Korsakoff patients can rely on a familiarity judgement arising from the abstractive memory system, which is assumed to be intact in this group.

DEPRESSION

A final variable that should be considered in this discussion is level of depression in Korsakoff's and other alcoholic patients. Lezak (1983) points out that depression can develop in brain-damaged individuals as a result of repeated failure to perform tasks formerly done with ease, and that this depression can adversely affect performance on neuropsychological tests. Korsakoff patients have typically been experiencing severe memory difficulties for some years and would, therefore, be at risk of developing this sort of reactive depression. Furthermore, these people have usually been in hospitals or other long term care facilities for a number of years and this, in itself, can result in depressed mood. There is also a relatively large body of research linking depression and memory deficits (Coughlan, & Hollows, 1984; Henry, Weingartner, & Murphy, 1973; Silberman, Weingartner,

Lorcia, Byrnes, & Post, 1983; Sternberg & Jarvik, 1976), although there have been negative findings as well (Davis, & Unruh, 1980; Rush, Weissenberg, Vinson, & Giles, 1983). Given that this issue has not been resolved, definitively, it would be prudent to try to control for effects of depression on memory performance in this research. Decreased Skin Conductance Level is reportedly a sensitive marker for distinguishing depressed from nondepressed individuals. Korsakoff patients have decreased SCL relative to normals (Knott & Bulmer, 1985; Oscar-Berman & Gade, 1979), and this may be indicative of depression. It is prudent, therefore, to monitor levels of depression in this group.

SUMMARY

In order to address the emotional and memorial aspects of functioning in Korsakoff's Syndrome both response latency and depression must be considered along with the primary variables of interest. Furthermore, in examining these functional aspects of Korsakoff's Syndrome, some useful information can be gained concerning methods of investigating these variables in the general population.

Conceptually, this research can be viewed as having two points of interest. The first is affective response in Korsakoff patients and how it relates to their memory performance. The second focus is methodological and theoretical issues regarding the use of the subject-generated paired-associates method to investigate the relationship between emotion and memory.

RESEARCH QUESTIONS

The primary focus of the study is on three specific questions:

1. Are Korsakoff patients and alcoholics with no symptoms of Korsakoff's Syndrome hypoarousable to verbal stimuli when compared with nonalcoholics?
2. Is the relationship between emotionality of verbal stimuli and retrieval the same for Korsakoff patients, nonKorsakoffian alcoholics and nonalcoholics when the subject-generated paired-associates procedure is used and when subject/stimulus variables are controlled?
3. Is the relationship between face recognition and emotional content of verbal descriptors the same for

Korsakoff patients, former heavy drinkers, and light to moderate drinkers?

The second focus of the study is on the following issue:

1. Does the negative relationship between emotional content of stimulus words and retrieval of verbal, subject-generated paired-associates hold when instructions are biased toward maximizing involvement of the abstractive memory system?

CHAPTER 3

METHOD

The experimental method used in this research is described below. In selecting a design that would adequately assess the relationship between emotional responsiveness and memory in Korsakoff's Syndrome a number of practical factors had to be taken into account. The previously reported specificity of Korsakoff patients' retrieval abilities played a large role in determining the measures and instructions chosen. The likelihood that some available Korsakoff's subjects would also have measurable dementia affected the choice of subjects and sample size. The need to gather as much relevant data as possible without taxing clinical subjects to the point that they would either refuse to participate or quit trying influenced the choice of measurement instruments and the data-collection set-up. The difficulty in finding co-operative comparison subjects in the correct age range influenced both the number and type of non-Korsakoff's subjects participating in the study.

The choice of experimental design was affected by other variables, as well. In order to maximize the likelihood of detecting abnormalities in emotional responsiveness of Korsakoff's subjects, the following steps were taken. The methods chosen for examining the emotion-memory interaction were directed toward Korsakoff patients' intact abilities. Both words and pictures were used as stimuli. Both subject-generated and experimenter-generated paired-associates were used. Self-report measures and unobtrusive measures were both employed as indices of emotional functioning. There follows a description of the design, predictions, pilot work, subjects and procedures used in this research.

DESIGN

Two separate tasks were used to assess the relationship between emotional content and retrieval in Korsakoff patients. These tasks are the subject-generated paired-associates method previously used by Sinton (1981) and others to examine this relationship in normal subjects, and pairing faces with descriptive phrases, which is a modification of a task previously used by Johnson et al. (1984) to

assess both retrieval and acquisition of affective response (liking) in Korsakoff's Syndrome.

For the sake of comparability between groups, neuropsychological tests and self-report measures of affect were included in the design to compare subjects and to statistically equate them if relationships between these variables and the dependent variables of interest became apparent.

INDEPENDENT VARIABLES:

In the subject-generated paired-associates task, independent variables were group (Light Drinkers; Former Heavy Drinkers; Korsakoff patients), emotionality of stimuli (Emotional; Neutral), and type of retrieval instruction (Recall Condition; Associative Condition).

In the faces-paired-with-descriptors task, independent variables were group (as above), emotionality of stimulus (as above), prior exposure to a face (new vs old), and distractor type (intralist vs extralist).

DEPENDENT VARIABLES:

In the subject-generated paired-associates task the dependent variables were number of retrieval errors or mismatches between first and second association to a word, depending upon the retrieval instruction used. Because reading of the literature yielded an unclear picture of the most appropriate use of response latency (as a covariate or as a dependent variable), it was first considered as a covariate in this research. Subsequently, response latency was a dependent variable in other analyses.

In the faces-paired-with-descriptors task, dependent variables were number of forced-choice recognition errors for face pairs, number of forced-choice recognition errors for face-statement pairs and likeability ratings for faces.

Dependent variables for the affective and neuropsychological measures are described in a later section.

COVARIATES:

In the subject-generated paired-associates task, covariates considered were depression and response latency to first presentation of the word. These

were subsequently used as dependent variables in other analyses.

PREDICTIONS:

1. Although behavioural data are contradictory, electrophysiological data suggest that Korsakoff patients are hypoarousable to emotional stimuli. If this hypoarousability indicates flattened affective responsiveness, then Korsakoff's sufferers should be generally hypoarousable on behavioural emotional measures, also. Effects of emotion on memory should then be diminished. Such a finding would support the popular view that Korsakoff patients are emotionally impaired. Conversely, if the effects of emotion on memory are not diminished in Korsakoff patients, the popular view is not supported. Given the contradictory nature of available behavioural data, its scarcity and questions about its construct validity, no firm predictions are made concerning Korsakoff patients' emotional responsiveness.

2. If Talland (1965) is correct in asserting that the memory deficits in Korsakoff's Syndrome are related to their flattened affect or to a lack of

involvement with the stimulus material, then memory performance and emotional responsiveness should both be disrupted in this group. If it can be shown that memory is impaired in the presence of normal emotional responsiveness, then this idea is not supported.

3. Normal subjects are expected to have significantly more errors for emotional than neutral items on the recall task for self-generated paired-associates.

4. Data presented by Christianson et al. (1983), lead to the suggestion that normal subjects will show poorer retrieval of face-statement pairs having negative emotional content than for those with neutral content.

5. Zajonc's (1980) work indicates that likeability ratings may be higher for familiar than for unfamiliar faces. However, it is unclear whether this effect will show up with only one prior exposure.

6. It is predicted that Korsakoff patients will be significantly impaired, relative to normals, on tasks which primarily access the experiential memory system (Poulos & Wilkinson, 1984).

7. Korsakoff patients are expected not to differ from normal subjects on tasks which are biased toward use of the abstractive system (Poulos & Wilkinson, 1984).

PILOT WORK:

1. A pilot of six normal subjects, three female and three male, revealed no difference between number of emotional and neutral errors on the associative condition. It was expected, therefore, that the same would occur for normal subjects in this study. This aspect of the study is exploratory, there being no prediction about emotion in the Wilkinson-Poulos (1987) theory of memory.

ETHICAL CONSIDERATIONS:

Each subject was warned, in advance, that some words used in the study may be offensive to him. None wished to withdraw at this point. In order to

avoid contamination of the results subjects were not told, during the self-generated paired-association phase of the tasks, that a memory test was being undertaken. However, at the end of the session each was thoroughly informed about the purpose of the experiment and was given the opportunity to withdraw his data. None wished to do so.

SUBJECTS

Five Korsakoff patients, 16 former heavy drinkers with no clinical signs of Korsakoff's Syndrome, and 15 light drinkers were included in the study. All were male. Light drinkers were men who reported never having consumed more than 20 drinks per week. Former heavy drinkers were those who answered, "yes," to the question, "Was there ever a period of time when you were a heavy drinker?" and who reported having consumed more than 25 drinks per week for at least one year. In most cases, those classed as former heavy drinkers could not remember the number of drinks per week they actually had consumed, but reported that it was, "a lot more than 25 drinks."

Light drinkers and former heavy drinkers were

accessed through notices posted in all Fire Stations throughout Metropolitan Toronto, at the Good Samaritan Home for Men, at a number of churches in Toronto, and at the Addiction Research Foundation. An advertisement was run in four consecutive issues of a monthly Seniors' Magazine, and two announcements, three months apart, ran on CBC's Morning Show in Toronto. This yielded 15 light drinkers and 16 former heavy drinkers.

Korsakoff's subjects were accessed through Addiction Research Foundation files, referrals from the Neurology and Psychology Departments at Toronto Western Hospital and from Rest Homes in parts of Southern Ontario. This yielded five available Korsakoff's subjects with no apparent signs of concurrent dementia or other psychiatric diagnosis, and who were not taking psychoactive drugs.

Because the questions and issues of specific interest in this study were adequately addressed by the data gathered from five Korsakoff's subjects a sample of this size was considered sufficient for the current research. Most published studies of Korsakoff's Syndrome are done with groups of similar size (see Appendix 1 for examples).

All subjects were pretested using the WAIS Verbal tests (Matarazzo, 1972; Wechsler, 1958) and the Wechsler Memory Scale (WMS) (Wechsler, 1945). The WAIS and WMS were chosen because most other studies of Korsakoff patients have used these versions, specifically, and their use, here, allows ease of comparison across studies. Because intelligence and memory scales were used only as screening devices in this study, use of the tests most often employed for detecting Korsakoff's Syndrome (WAIS & WMS) was considered to be the most appropriate option in this case. Korsakoff's subjects were required to have a Wechsler Memory Quotient at least 15 points below their Wechsler Verbal IQ and a physician's diagnosis of Korsakoff's Syndrome.

The three groups did not differ significantly on age, WAIS Verbal IQ or language background. Other neuropsychological tests used at pretest to monitor problem solving abilities and cognitive functions were the Block Design Subtest of the WAIS and the Trail Making Test Part B, a subtest of the Halstead-Reitan Battery (Armitage, 1946; Reitan, 1955).

The Geriatric Depression Scale (Brinks, 1982) and the Profile of Mood States (McNair, Lorr, & Droppleman, 1971) were used to monitor affective state in all groups, along with two interview questions concerning their perceived level of depression.

MATERIALS

SELF-GENERATED PAIRED-ASSOCIATES TASK:

Thirty-two "high emotion" and 32 "low emotion" words were combined and randomized, with five buffer words at the beginning and end of the list. The words were pre-rated on degree of emotionality, associative difficulty, concreteness, and pleasantness (Brown & Ure, 1969). Some of the words used (36 words) had previously been rated on these dimensions (Brown & Ure, 1969) and others (28 words) were pre-rated (7-point scale) by at least 30 independent raters.

High and low emotionality words were chosen from those at least .5 standard deviations above and below the mean. These high and low emotionality lists were balanced for associative difficulty, pleasantness,

number of syllables (1-3 syllables), and general category of word (eg. body parts).

Because abstractness is a dimension which relates to retrieval latency for verbal material (Smith & Harleston, 1966) and because concrete words are remembered better than abstract words (Day & Bellezza, 1983; Gorman, 1961; Paivio, Clark, & Khan, 1988; Smith & Harleston, 1966), only concrete nouns were used in the stimulus list. Six additional words (balanced on the above variables) were included in the associative retrieval task to allow for comparison of reaction times for new and repeated stimuli (Appendix 2).

All stimulus words, excluding buffers, were presented to the subject in a randomized, questionnaire format after completion of all retrieval tasks. Subjects were asked to rate each word for emotionality on a 7-point scale (1=no emotion; 7=strongest emotion).

FACE-DESCRIPTOR PAIRED-ASSOCIATES TASK:

Three sets of slides were prepared, each being made up of some combination of items from a pool of 36 faces and 56 descriptor statements. All

photographs were of the head and shoulder portion of middle-aged males, all wearing business suits and ties. It was a fairly homogeneous group of faces. None had beards, two had a small moustache, and 4 wore glasses. All pairings of faces were accomplished by drawing from a hat.

The descriptor statements were short phrases, describing an activity (Appendix 2). Six independent raters showed 100% agreement in sorting these into emotional and neutral categories.

Set #1 - The first set of 21 slide pairs each contained a face and a descriptor statement. Eight of the statements were of negative emotional tone and eight were neutral. Five additional neutral face-descriptor pairs were used as buffers, three at the beginning and two at the end of the list, for a total of 21 pairs of study slides. Face-descriptor pairs were counterbalanced so that different pairings occurred for half of the subjects in each group.

Set #2 - The second set of slides consisted of pairs of faces - the 21 faces used in the study slides, each paired with a novel distractor face.

Set #3 - The third set of slides consisted of

a face and three descriptors. Each face was paired with its previous descriptor, a descriptor previously seen paired with another face, and a novel descriptor. All three descriptors on a slide were of the same emotional tone.

PROCEDURE

SUBJECT-GENERATED PAIRED-ASSOCIATES TASK:

The words were presented on audiotape. Both stimulus and response were recorded on a stereo audiorecorder system and reaction time was measured from this taped record. Reaction times were also recorded manually during the taping session. In nearly all cases, response times used were an average of two measurements - either taken from the tape, alone, or from the tape and the time noted during the session. A stop watch was used to time reactions to the nearest .01 seconds, with measurement interval being from onset of stimulus word to onset of response.

Subjects were seated facing a plain wall. The lists of words were presented at 10 second intervals, because eight seconds is the usual maximum response

latency in free-association (Sinton, 1981). Subjects were asked to say the first word that came to mind as quickly as possible after hearing the stimulus word. Subjects were not told, at this time, that a memory task was included, but only that reaction time was being measured.

Immediately after the subject had free-associated to the entire list of 74 words, the retrieval tasks began. The Recall task was carried out first, followed by the Associative task, to avoid confounding retrieval condition with delay.

Under the Recall condition, one half of the stimulus list (32 words) was presented a second time and the subject was asked to produce the same response he had given previously to each stimulus word, again using the ten-second time frame. Guessing was strongly discouraged in verbal instructions for the Recall condition, to minimize the possibility that responses for this part of the task would be based on familiarity-based recognition or on priming (Graf et al., 1985; Shimamura & Squire, 1987). This was also an attempt to bias responses toward the Wilkinson-Poulos experiential memory system (Poulos & Wilkinson, 1984).

The remaining 32 words were used for the Associative retrieval condition. The Associative condition involved asking the subject to respond with the first word that came to mind and he was, again, instructed to respond as quickly as possible. Each retrieval list was randomized into a different order from that of the free-association list, and it was balanced for the stimulus characteristics listed previously.

Reaction time was measured at both free-association and retrieval phases. After completing the retrieval tasks subjects were given a booklet containing the randomized list of stimulus words, and asked to rate each on a one-to-seven point scale for emotionality.

FACE-DESCRIPTOR PAIRED-ASSOCIATES TASK:

Subjects were seated facing a screen and Set #1 of the slides (faces with descriptors) was presented at inter-stimulus-intervals of one every 10 seconds. Subjects were asked to look at the face, read the descriptor aloud, and imagine the person doing whatever activity the accompanying statement described. Subjects were told that they would be

asked to recognize the face later.

After a five minute delay during which the Trail Making Test Part B was administered, Slide Set #2 was presented (pairs of faces), and the subject was asked which one from each pair of faces he had been shown earlier. He was instructed to guess when uncertain.

After choosing a familiar face, the subject was asked to rate both the familiar and the unfamiliar face on likeability using a scale of 1-11 (with 1 representing "dislike extremely" and 11 representing "like extremely").

Finally, Set #3 slides were shown. Subjects were asked to indicate which of the three statements had originally been paired with the face. Guessing was encouraged in this segment of the task to maximize the likelihood of retrieval based on feelings of familiarity and to bias the response toward the associative memory system (Poulos & Wilkinson, 1984).

CHAPTER 4

RESULTS

Results of SPSSX (1983) data analyses are reported below. Between-group comparisons on demographics, mood scales, the Halstead-Reitan Trailmaking Test Part B, the WAIS and the WMS are reported first, followed by retrieval scores on the Self-generated paired-associates task and the Face-descriptor matching task. Scores on Recall of word pairs are then compared with scores on Recall of face-statement pairs. Group comparisons on Likeability Ratings for faces, Response Latencies on the Self-generated Paired-associates, and Verbal-Stimulus List Likeability Ratings are then reported.

GROUP COMPARISONS:

Analysis of Variance (ANOVA) revealed no significant difference between Korsakoff's subjects, former heavy drinkers and light drinkers on Wechsler Verbal IQ, age, education, or Halstead Reitan Trail Making Test Part B (Armitage, 1946; Reitan, 1955). However, ANOVA with Multiple Range Scheffe Tests

(Scheffe Test) (p=<.05) showed a significant decrement for Korsakoff's subjects when compared with lignt drinkers on Block Design (Table 1.1).

Table 1.1: Demographics and Neuropsychological Scores Across Groups

Category	Korsakoff's	Heavy Drinkers	Light Drinkers
Age	63.6 (5.7)	55.6 (7.9)	56.6 (8.9)
Education	12.6 (4.5)	14.3 (3.3)	14.9 (3.3)
MQ	85.8 (5.6)	119.1 (17.4)	130.3 (14.3)
Logical Memory	3.5 (1.9)	9.1 (2.5)	11.4 (3.4)
Digit Span	11.0 (2.2)	12.4 (2.5)	13.3 (2.0)
Visual Repro.	4.8 (2.7)	9.8 (2.6)	11.9 (2.4)
E.P.A.'s	6.8 (2.4)	8.0 (0.7)	8.3 (0.8)
H.P.A.'s	0.8 (1.3)	6.1 (2.8)	6.7 (2.6)
VIQ	119.4 (15.2)	128.6 (13.7)	134.5 (12.0)
Trails B	135.0 (65.5)	112.4 (64.2)	78.8 (36.1)
Block Design	22.8 (15.2)	34.2 (8.9)	40.3 (10.3)

Significant differences were found between Korsakoff patients and the other two groups on the Wechsler Memory Quotient (MQ) ($p=.000$), due primarily to Korsakoff's subjects performing significantly below light drinkers ($p=.000$) and former heavy drinkers ($p=.001$) on the Logical Memory Subtest, the Visual Reproduction Subtest ($p=.002$) and ($p=.009$) respectively, and Unrelated Paired-Associates ($p=.000$) and ($p=.000$) respectively. Korsakoff patients also did significantly less well than light drinkers on the related paired-associates subtest (EPA) when ANOVA with Scheffe Tests ($p=<.05$) were used for individual comparisons across groups. These data are shown in Table 1.1.

Because WAIS and WMS scores obtained for all subjects were relatively high, test protocols were rescored by a second rater. The second rater was not aware of which protocols belonged to light drinkers, former heavy drinkers or Korsakoff's Subjects. Inter-rater correlations for the WAIS-VIQ and the WMS-MQ were .99 and .88, respectively.

SELF-GENERATED PAIRED-ASSOCIATES TASK:

Korsakoff's subjects made significantly more recall errors for both emotional and neutral word pairs than did the other two groups (Table 2.1). Both misses and intrusions were classed as errors in this task.

Table 2.1: Self-Generated Paired Associates Task: Mean Emotional and Neutral Recall Errors Within Groups

Category	Korsakoff's	Heavy Drinkers	Light Drinkers
Emotional Errors	10.40	4.31	3.47
Neutral Errors	9.40	2.81	2.13
Total Errors	19.80	7.12	5.60

Multiple Analysis of Variance (MANOVA) with response latency covaried showed a significant main effect for group ($p=.000$) and this was confirmed using Scheffe Tests for multiple comparisons ($P=<.05$). There was also a significant main effect for emotion ($p=.001$), with fewer emotion-laden word pairs than neutral pairs being recalled. The group-by-emotion interaction was not significant. Response

latency was covaried in an attempt to remove noise introduced by individual differences such as education (Hall & Ugelow, 1957) and by stimulus characteristics such as part of speech, or abstractness (Jung, in Stein & Riviere, 1973; Sinton, 1981).

When the Associative condition of the task was analyzed for changed associations on second presentation, there were no significant effects on MANOVA with response latency covaried, or on Scheffe Tests for individual comparisons (Table 2.2).

Table 2.2: Self-Generated Paired-Associates Task: Mean Emotional and Neutral Changed Associates Within Groups

Changed Associates	Korsakoff's	Heavy Drinkers	Light Drinkers
Emotional Changed	9.40	6.88	5.87
Neutral Changed	7.80	7.75	6.47
Total Changed	17.20	14.63	12.34

Scores for Recall and Associative conditions were also analyzed together, in order to examine

interactions between emotional content and the two sets of task instructions. MANOVA, again with response latency covaried, showed significant main effects for group (p=.006) and for retrieval task (p=.005). A significant interaction occurred for group-by-task (p=.03) in this analysis (Tables 2.1 & 2.2).

Recall data were compared across groups for number of correct sexual items versus nonsexual, emotion-laden items. MANOVA showed a significant effect for group (p=.000), and separate Scheffe comparisons for sexual and for nonsexual-emotional items identified the group effect as Korsakoff patients making significantly fewer correct responses than did both other groups for both subcategories of emotion-laden items. There was also a significant effect for type of word in this analysis (p=.006), with more correct responses being made for nonsexual, emotion-laden items than for sexual terms. The interaction was not significant in this analysis (Table 2.3).

Table 2.3: Self-Generated Paired-Associates Task: Mean Correct Responses for Sexual and Nonsexual Emotional Items Within Groups

Category	Korsakoff's	Heavy Drinkers	Light Drinkers
Sexual Items Correct	.60	2.81	2.87
Nonsexual Items Correct*	4.40 (1.47)	8.88 (2.96)	9.67 (3.22)
Total Items Correct	5.00	11.69	12.54

* Because there were 3 times as many nonsexual (n=12) as sexual (n=4) emotional items, the nonsexual category was divided by 3 for the ANOVA. The actual number is shown in this table, with the equated value used in the ANOVA shown in parentheses.

SUMMARY:

Retrieval scores for Self-generated paired-associates showed a difference for recall and associative conditions. Under instructions to remember an earlier response significantly more errors were made on emotion-laden pairs, and Korsakoff's subjects made more errors than did the other two groups. Under instructions to produce the first word that came to mind in response to a stimulus from the same original list, no differences occurred for groups or for emotional content of

stimuli. Furthermore, sexual content seemed no more memorable than other emotion-laden material.

RETRIEVAL OF FACES AND FACE-STATEMENT PAIRS:

ANOVA with Scheffe tests for individual comparisons revealed a significant difference between Korsakoff patients and the other two groups on recognition of familiar faces (Table 3.1). On this task Korsakoff patients' scores did not differ significantly from chance.

Table 3.1: Face Recognition Task: Mean Emotional and Neutral Errors Within Groups

Category	Korsakoff's	Heavy Drinkers	Light Drinkers
Emotional Errors	3.00	.94	.47
Neutral Errors	2.40	.81	.80
Total Errors	5.40	1.75	1.27

Neither can it be asserted that the Korsakoff's group differed significantly from chance on recall of face-statement pairs, and their scores were significantly below scores obtained by the other two

groups on Scheffe tests (p=<.05) (Table 3.2). MANOVA showed that more intralist than extralist errors were made in this multiple choice task (Table 3.3).

Table 3.2: Face-Statement Recognition: Mean Emotional and Neutral Recognition Errors Within Groups

Category	Korsakoff's	Heavy Drinkers	Light Drinkers
Emotional Errors	5.00	3.06	1.67
Neutral Errors	5.20	3.25	2.80
Total Errors	10.20	6.31	4.47

Table 3.3: Face-Statement Recognition: Mean Intralist and Extralist Errors Within Groups

Category	Korsakoff's	Heavy Drinkers	Light Drinkers
Intralist Errors	6.20	5.38	4.13
Extralist Errors	4.00	.94	.47
Total Errors	10.20	6.32	4.60

RECALL OF WORD PAIRS VERSUS RECOGNITION OF FACE-STATEMENT PAIRS:

In order to examine the relationship between emotional content and type of stimulus material, a MANOVA was done using scores from the self-generated paired-associates recall task and the face-statement pairs, together, as independent variables. Along with main effects for group ($p=.000$) and type of stimulus material ($p=.01$), there was a significant interaction between stimulus material and emotional content ($p=.008$). Table 3.4 shows that more errors were made on the emotional word pairs whereas more neutral errors were made in face-statement pairs.

Table 3.4: Self-Generated Paired-Associates Recall Errors and Face-Statement Pair Recognition Errors for Emotional and Neutral Stimuli

Category	Korsakoff's	Heavy Drinkers	Light Drinkers
P.A. Recall Errors			
Emotional	10.40	4.31	3.47
Neutral	9.40	2.81	2.13
Face/Statement Errors*			
Emotional	10.00	6.13	3.33
Neutral	10.40	6.50	5.60

* Actual number of face-statement errors is one-half the value shown here.

LIKEABILITY RATINGS:

MANOVA showed that faces originally paired with negative emotional descriptors were liked less well, later, than were those originally paired with neutral descriptors ($p=.001$) (Table 4.1).

Table 4.1: Face Rating Task: Mean Likeability Rating for Emotional and Neutral Faces Within Groups

Category	Korsakoff's	Heavy Drinkers	Light Drinkers
Emotional Faces	5.48	5.94	5.93
Neutral Faces	5.80	6.38	6.34
All Faces	5.64	6.16	6.14

Familiar faces were also preferred to unfamiliar faces ($p=.02$) (Table 4.2). There were no group differences on likeability ratings and range of response was not narrower for Korsakoff patients than for the other groups.

Table 4.2: Face Rating Task: Mean Likeability Ratings for Familiar and Unfamiliar Faces Within Groups

Category	Korsakoff's	Heavy Drinkers	Light Drinkers
Familiar Faces	5.64	6.14	6.14
Unfamiliar Faces	5.34	5.82	5.68
All Faces	5.49	5.98	5.91

RESPONSE LATENCY:

Reaction time comparisons for emotional versus neutral words across groups at all three taping events (pairing trial - Table 5.1; recall task - Table 5.2; associative task - Table 5.3) showed only a main effect for group. In these three, separate analyses the group differences found were sigificant at the following probability levels: p=.04 for the first paired-association, p=.04 for the recall task, and p=.01 for the associative task. ANOVA with Scheffe tests showed that this was due to Korsakoff patients responding more slowly than light drinkers (p=<.05).

Table 5.1: Self-Generated Paired-Associates Task: Mean Response Latency Measured in Seconds for Emotional and Neutral Words at First Paired-Association Trial Within Groups

Category	Korsakoff's	Heavy Drinkers	Light Drinkers
Emotional Words	2.82	2.93	2.21
Neutral Words	2.96	2.82	2.17
All Words	2.89	2.86	2.19

Table 5.2: Self-Generated Paired-Associates Task: Mean Response Latency Measured in Seconds for Recall of Emotional and Neutral Words Within Groups

Category	Korsakoff's	Heavy Drinkers	Light Drinkers
Emotional Words	2.72	2.82	2.16
Neutral Words	2.63	2.43	1.98
All Words	2.67	2.63	2.07

Table 5.3: Self-Generated Paired-Associates Task: Mean Response Latency Measured in Seconds on Associative Task for Emotional and Neutral Words Within Groups

Category	Korsakoff's	Heavy Drinkers	Light Drinkers
Emotional Words	2.44	2.66	1.84
Neutral Words	2.81	2.66	1.79
All Words	2.63	2.66	1.82

In comparing response latency on the associative task (words being presented for the second time) with

the six new words added to this list, MANOVA showed main effects for group (p=.01) and word familiarity (p=.02). Scheffe tests showed that the group difference was due to heavy drinkers being slower to respond than were light drinkers on this task (p=<.05). As expected, responses were generally quicker to the words being presented for the second time (Table 5.4).

Table 5.4: Self-Generated Paired-Associates Task: Mean Response Latency Measured in Seconds for Practice Effect on Words Used in Both Original Pairing Trial and Associative Trial Within Groups

Category	Korsakoff's	Heavy Drinkers	Light Drinkers
First Pairing Trial	2.85	3.00	2.10
Second Association Trial	2.62	2.66	1.82

Again using latency scores on the associative task, MANOVA showed that subjects responded more slowly when producing a response different from the response given on the first trial (p=.000) (Table 5.5). It should be noted here that subjects were not asked to give the same response on this second

presentation of the word but to respond as quickly as possible.

Table 5.5: Self-Generated Paired-Associates Task: Mean Response Latency Measured in Seconds for Changed or Same Associates on the Associative Trial

Category	Korsakoff's	Heavy Drinkers	Light Drinkers
Same Latency	2.15	2.31	1.65
Changed Latency	2.78	3.10	2.10
Overall Latency	2.45	2.70	1.88

When emotional and neutral words in the associative list were compared for decrease in latency on second presentation, MANOVA showed differences for group ($p=.009$) and for familiarity ($p=.004$) (Table 5.4), but no difference was found between emotional and neutral words in this analysis.

MANOVA revealed that subjects took longer to respond to words following an emotional word than to words not following an emotional word ($p=.04$).

RATING THE STIMULUS LIST:

MANOVA showed that subjects in this study rated words in the emotional category on the paired-associates task to be significantly more emotional than those in the neutral category. There were no significant differences across groups.

CHAPTER 5

DISCUSSION

EMOTIONAL RESPONSIVENESS IN KORSAKOFF'S SYNDROME

Because of the small sample of Korsakoff's subjects studied, these findings may not be representative of the total population of Korsakoff patients. The sample size used in this study is not atypical, however. Research in this area is generally done on small samples due to the relative rarity of Korsakoff's Syndrome (e.g., Cermak, et al., 1986; Davidoff et al., 1984; Hirst et al, 1986; Kenyon, Becker, Butters, & Hermann, 1984; Huppert & Piercy, 1976; Johnson, et al., 1985; Kinsbourne & Winocur, 1980; Markowitsch, et al., 1986; Oscar-Berman, Heymann, Bonner, & Ryder, 1980; Oscar-Berman, Sahakian, & Wikmark, 1976; Shimamura & Squire, 1986; Winocur, Kinsbourne, & Moscovitch, 1981; Zola-Morgan & Oberg, 1980). In order to minimize the interference of confounding variables in the current study, particular care was taken to eliminate factors that might directly affect the variables of primary interest. Toward this end, only Korsakoff patients

without concurrent dementia or other psychiatric diagnosis and who were not taking psychoactive drugs were admitted into the study. The fact that the clinical deficits usually seen in Korsakoff's Syndrome were statistically apparent with this small group indicates that the sample was, indeed, large enough to answer the questions asked in this research. Nevertheless, the conclusions drawn here should be applied to the general population of Korsakoff patients with caution.

Overall, the Korsakoff's subjects studied here did not differ from light drinkers and former heavy drinkers in their emotional responsiveness. Not only were there no detectable differences between Korsakoff patients and comparison groups in degree of response on self-report and other measures, but the same pattern of responsiveness was also seen across groups. Tests for mood states, both short and longer term, did not reveal differences. Liking ratings for faces of men paired with neutral or with negative descriptors showed the same pattern, both in range of responding and in degree, as did those of the other two groups studied. Preference was established just as quickly (only one exposure) for Korsakoff's

subjects as it was for others. Ratings of words used in the paired-association task for emotional content were not significantly different for Korsakoff patients, from those given by former heavy drinkers and light drinkers. Furthermore, Korsakoff's subjects showed the normal recall pattern (of lower recall scores for emotional than neutral words) on the self-generated paired-associates task, though their overall recall was much worse than the other groups' scores. This finding was corroborated in the memory for faces tasks where Korsakoff's subjects performed significantly less well than other subjects on face recognition, yet their liking ratings showed a normal pattern. Taken together, these findings support the conclusion that the Korsakoff patients studied in this research are relatively unimpaired in emotional responsiveness. Clearly, the current findings do not support the suggestion made by Talland (1965) and others that Korsakoff patients are generally deficient in their emotional responsiveness, or that they lack involvement with emotional stimuli.

These results indicate that Korsakoff patients and former heavy drinkers function relatively

normally on behavioural indices of emotional responsiveness, although psychophysiological data reported by other researchers indicate that both groups are hypoarousable to emotion-inducing stimuli. This discrepancy in findings for different kinds of measures suggests either insensitivity in behavioural measures or a real independence between these two indices of emotionality. Given the lack of consensus about the applicability of physiological measures for monitoring emotional response (Lang, et. al., 1981; Obrist et al., 1981) the latter idea seems more plausible.

With questions still unanswered concerning whether physiological and behavioural indices of emotional response do measure different events, the discrepancy indicated in Korsakoff patients between behavioural measures used here and psychophysiological measures taken by others underscores the need to address this issue. Just as the specific amnesia identified in Korsakoff's Syndrome has helped to increase understanding of memory, deficits in physiological response in the presence of relatively normal behavioural indices of emotional response for Korsakoff patients would be

valuable in understanding normal emotional functioning.

MEMORY IN KORSAKOFF'S SYNDROME

The pattern of memory impairments found in Korsakoff's subjects was consistent with those reported in the literature, generally. Korsakoff's subjects showed severe deficits in specific retrieval situations. They obtained a difference of 19 points or more between their Wechsler Memory Quotient (MQ) and their Wechlser Verbal Intelligence Quotient (VIQ), with the MQ decrement being due to deficits in the Logical Memory, Visual Reproduction and Associative Learning subtests.

When subjects were required to remember an earlier event their memory was severely impaired, and where tasks or instructions were designed to reveal effects of priming or "implicit memory," Korsakoff patients scored relatively well. Thus, they scored significantly less well than other subjects on recall of self-generated paired-associates but not on the associative matching task. Similarly, face recognition and face-statement matching scores were not distinguishable from chance levels for Korsakoff

patients, which suggests that these subjects could not remember the first presentation of the material a few minutes earlier. Also consistent with suggestions made in the literature is the discrepancy between memory for an episode and retention of information gained during that episode. Despite not being able to remember the faces when asked to do so directly, the face likeability ratings suggest that Korsakoff patients do retain some information about the event. This retention of affect-laden information in the absence of memory for the event, itself, was first noted by Claparede (1911) and it can be likened to the source amnesia described by recent researchers (Schacter, Harbluk, & McLachlan, 1984; Shimamura & Squire, 1987).

Assuming the existence of multiple memory systems (e.g., Tulving, 1983; Poulos & Wilkinson, 1984) there are at least two reasonable hypotheses suggested by these findings. Either information is encoded, separately, into one memory system or another or a memory trace is encoded only once and multiple memory systems have access to that trace. In the first case, Korsakoff's Syndrome would involve a dissociation between the systems - a failure of

communication between them. In the second instance, Korsakoff's Syndrome would result in a disruption or dissociation between at least one of the memory systems and the supply of memory traces. The data are not yet available that would preclude either of these possibilities. However, the principle of parsimony suggests that a "single-entry system" would be most reasonable.

If one assumes such a single-entry system, the present findings for Korsakoff patients suggest that there is a problem with accessing information once it enters their memory system or systems. This conclusion is supported by the relatively normal functioning of Korsakoff's subjects on tasks where the instruction is unobtrusive in its intent to obtain information (ie., the associative task and the likeability ratings) in conjunction with their being unable to produce a correct response when asked, directly, to do so. Clearly, some information is being encoded but it seems inaccessible to Korsakoff patients when they try to respond to a direct instruction to remember it. This can be described as a difference between normals and Korsakoff patients in direct versus indirect access to a memory

trace. Viewing the findings in this way, it can be suggested that Korsakoff's Syndrome involves damage to one of two or more accessibility pathways.

There is a great deal of evidence in this and other studies to suggest that Korsakoff patients retain some information but cannot always access that information. Warrington and Weiskrantz (1970; 1982) suggest that Korsakoff's Syndrome involves retrieval deficits in the form of disconnections between two components of the memory process. Kinsbourne and Wood (1982) and others suggest that Korsakoff's Syndrome results in impairment of a contextual component of memory. For the contextual theorists, retrieval instructions could be seen as part of the context of a retrieval situation. Others (Johnson, 1983; Poulos & Wilkinson, 1984; Tulving, 1983) suggest that a particular memory system is damaged in Korsakoff patients. The idea that a particular pathway or mode of access is disrupted in this group is not incompatible with any of the above hypotheses.

INTERACTION OF EMOTION AND MEMORY IN KORSAKOFF'S SYNDROME

As noted earlier, emotional content in stimulus material does not appear to affect the Korsakoff patients in this study differently from individuals with apparently normal memories. Given the small sample of Korsakoff's subjects studied here this cannot be stated unequivocally, but it can be concluded from the data at hand that the memory deficit found in Korsakoff's Syndrome is not due to a lack of emotional involvement with the stimulus as has been suggested earlier (Talland, 1965). In the presence of apparently normal emotional reactivity to stimulus content and in the presence of normal attentional capacity as indicated by normal scores on WAIS Digit-Span, the Korsakoff patients participating in this study showed the predicted, marked, selective memory deficits reported by other researchers. If these memory deficits were due to impaired emotional responsiveness as suggested by Talland (1965) then these causal emotional impairments should also show up when the memory deficits are detectable. Clearly, this is not the case in the current data.

Not only has it been suggested (Talland, 1965)

that lack of emotional responsivity affects memory but it has also been hypothesized that impaired memory results in impaired emotional responsivity. Johnson et al. (1985) assert that range and degree of emotional responsiveness are narrowed or flattened for Korsakoff patients to the extent that reflective memory is operating. That is, where this memory subsystem is involved retrieval of emotional material will be disrupted to some degree, whereas retrieval of perceptual information (for example) will not be different for emotional versus neutral material. This idea receives little support from current findings. The likeability judgements, the learning trial for face recognition, and the stimulus word rating task all require varying degrees of reflective memory involvement with no apparent narrowing or flattening of response range in the Korsakoff's group.

Finally, it has been suggested (Davidoff et al., 1984; Granholme et al., 1985) that immediate memory in Korsakoff patients may be facilitated by inclusion of emotional material of a specifically sexual nature. In the current study sexual content was not more salient for Korsakoff patients than for other

subjects. They made significantly fewer correct responses on the self-generated paired-associates recall task than did other groups on both sexual and nonsexual, emotion-laden items. Further, there was no between-group difference for sexual versus nonsexual items in number of correct responses made. All groups made proportionately fewer errors on non-sexual, emotion-laden items than on sexual ones. These data do not support the hypothesis that sexual content has a differentially facilitatory effect on immediate memory for this group.

SUMMARY

The results of this study add weight to the previously reported findings concerning the specificity of memory impairment in Korsakoff's Syndrome. They also support the suggestion made by Warrington and Weizkrantz (1970) that Korsakoff patients are deficient in the retrieval phase of memory performance rather than in encoding or consolidation, if one assumes that a memory trace is not encoded more than once (i.e., in any number of possible memory subsystems). Additionally, these

data support multiple memory theories such as those put forward by Poulos and Wilkinson (1984) which suggests that Korsakoff patients' specific memory deficit lies in their greatly diminished capacity to use the experiential memory system, in the presence of relatively normal abstractive memory functioning.

The current findings do not support suggestions made by previous researchers that Korsakoff's Syndrome results in impaired emotional responsiveness (Johnson et al., 1985; Talland, 1965). Neither do they support assertions that the relationship of emotion and memory differs for Korsakoff patients and normal individuals (Davidoff et al., 1984; Granholme et al., 1985; Johnson et al., 1985). Normal emotional responsiveness should be distinguished from normal retrieval of emotion-laden information. Normal emotional response need not, necessarily, result in normal retrieval of emotion-laden material, or vice versa. Korsakoff's subjects responded relatively normally in both of these areas. These two findings, together, suggest that continuing to label this group, "emotionally impaired" would be misleading, at best.

There remains a discrepancy between

psychophysiological findings regarding emotional functioning in Korsakoff's Syndrome (which suggest hyporeactivity in this group as well as in alcoholics generally) and behavioural data. To the extent that results from the present study can be considered representative of the general population of Korsakoff's psychosis, emotional responsiveness appears relatively normal on behavioural indices. It should be noted that the correlation between psychophysiological and behavioural measures of emotional/affective functioning is not strong in normal populations, either. Nevertheless, it may be fruitful to investigate further the relationship between indices of emotional response in Korsakoff patients.

The fact remains that some researchers and clinicians have noted behaviour in Korsakoff patients which seems to indicate a deficit in emotional response while no such behaviours occurred in the current sample. This disparity may be due to there existing two different types of Korsakoff's patient - one with emotional response deficits and one without. Such a suggestion is speculative but it is not unlikely, given that the neural lesions thought

to be responsible for Korsakoff's Syndrome are in an area of the brain which has numerous connections to the frontal cortex (Greenberg & Diamond, 1985; Tuck et al., 1984). In some cases of Korsakoff's Syndrome these pathways may be damaged while in others they remain intact. The suggestion that there may be one subgroup of Korsakoff patients with damage to frontal circuits is supported by the types of emotional response deficits usually reported for Korsakoff's Syndrome (Biemond, 1969; Cermak, 1982; Fisher & Adams, 1964; Lezak, 1985; Mesulam, 1985; Talland, 1965). These are similar to those described by Lezak (1983) for some patients with frontal brain damage.

MEMORY IN HEALTHY INDIVIDUALS

In addition to helping clarify emotional responsiveness and its relation to memory in Korsakoff's Syndrome, the findings of this study can be examined for information concerning memory and its relationship to emotion in normal individuals.

This research clearly supports a multiple system approach to memory, rather than a unitary one. Multiple system theories gain support, here, in comparing the performance of Korsakoff patients and

subjects with apparently normal memory functioning. Firstly, Korsakoff patients perform relatively normally on some indices of memory and badly on others. Unitary theorists would suggest that this differential functioning in an impaired group is due to the difficulty of the tasks but the data from this study do not support such a conclusion. In the recognition of faces task where most normal subjects made no errors at all (i.e., an easy task), Korsakoff patients performed very badly. On the other hand in the paired-associate recall and priming tasks, where most normal subjects made proportionately more errors than they had on the face recognition task, (suggesting it was more difficult than the face-recognition task) Korsakoff's subjects' performance was better than it was on face recognition.

Some unitary theorists (Craik & Lockhart, 1972) have postulated that depth of processing or amount of elaboration should be positively related to retrieval performance. In the present study the task on which Korsakoff patients did most poorly was the face-statement matching which required the most elaboration. This finding does not support the depth-of-processing notion put forward by Craik and

Lockhart.

A final relevant point to be made from the data at hand concerns the interaction of emotional content with retrieval performance. Unitary theories would suggest that emotional content should be related to retrieval performance in a consistent fashion, regardless of the test of memory being employed. Clearly, that is not the case in the present study. Emotional content is related to an increase in recall errors for self-generated paired-associates, but it has no apparent effect when priming retrieval instructions are used or when recalling a new, experimenter-generated, face-statement pairing event. Overall, the weight of evidence suggests that memory is not a unitary phenomenon, but that it is made up of at least two interactive systems.

Although this research was not set up to choose between the numerous multiple memory systems presented in the literature, it clearly does indicate that some form of multiple system theory is needed. It may be fruitful to think of memory systems in terms of two or more accessibility pathways. In principle, a dual memory system theory need not assume that two memory traces are laid down. Rather,

there would be two modes of accessing a single memory trace. Two separate accessing systems with important differences in the operating characteristics of each pathway are being hypothesized here.

In addition to supporting multiple memory system theories, the results of these experiments help to clarify a number of more specific issues within the memory literature. Assuming that memory is organized into multiple systems, one can then look at which system is primarily involved in a number of tasks. For the sake of clarity, the Poulos-Wilkinson (1984) dual memory model will be used as an explanatory tool in the discussion of these issues.

RECOGNITION

The current findings suggest that recognition of faces which have been seen only once for a ten second period may depend on experiential memory (ie., on remembering the actual incident when the face was seen), rather than on familiarity based recognition which would originate in the abstractive system. If, as Wilkinson & Poulos (1987) suggest, Korsakoff patients have relatively normal abstractive functioning then their poor performance in face

recognition suggests heavy dependence on the experiential system for this retrieval task.

Biber, et al., (1981) suggest that Korsakoff patients do poorly on face recognition because they attend only to superficial aspects of the visual array. This idea is based on improved face recognition in Korsakoff's subjects when the amount of elaboration per item is increased. This is a reasonable conclusion from the data in Biber et al.'s study. However, the current experiments offer a broader range of responses to look at and, therefore, suggest a different interpretation.

When all data are looked at together it becomes apparent that Korsakoff patients did register information about specific faces. It was retrieval of this information as a memory that was problematic for them. The likeability ratings indicate that Korsakoff's subjects did know something about the familiar faces - they liked them better than the new faces, just as normal subjects did. This does not, necessarily, exclude Biber et al.'s hypotheses due to the relatively large amount of elaboration possible during the learning trial, but neither does it indicate a different way of encoding faces from that

used by normal subjects.

The fact that Korsakoff's subjects responded to the faces with knowledge but were unable to retrieve that information in a forced-choice situation, suggests that a retrieval pathway may be impaired which should access that piece of information. It is hypothesized, here, that the accessibility pathway is the important factor in face-recognition performance, rather than the degree of elaboration as suggested by Biber et al. (1981). It is further suggested that likeability ratings may be a more sensitive index of registration of information than is forced-choice recognition.

Recognition for material other than faces may also be accessible via the experiential pathway. Analysis of intralist versus extralist errors on the face-statement matching task suggest that recognizing some types of verbal material, under some conditions, may depend on a well functioning experiential memory system. Korsakoff's subjects in this study made similar numbers of intralist and extralist errors - they were unable to retrieve information about the familiarity of a face-statement pair when directly asked to recognize a prior pairing, suggesting that

they were not able to use their supposedly intact abstractive memory system for this task. Normal subjects, on the other hand, made significantly fewer extralist errors, indicating intact processing for this task and the pathway involved. The groups did not differ on numbers of intralist errors. This implies that normals were able to recognize a previously seen item but not which face the item had been paired with, earlier. These findings suggest that the face-statement pairing was a relatively difficult task, which biases toward use of the experiential system. Even normals with their intact experiential system were unable to remember the pairing event well enough to match face with descriptor.

These data do not clearly localize face recognition in one memory system or the other, but they do suggest that the experiential system is the best candidate for this function. The most plausible explanation for the data at hand is that face recognition occurs via the experiential memory system, given that Korsakoff's subjects do badly on this task. It is also possible that recognition of faces is accomplished via the abstractive system,

with Korsakoff's subjects' poor performance being due to their lack of confidence in their own choices. If these subjects have little confidence in their own "hunches" they may choose to guess, resulting in their performing at chance on the face recognition task. Further studies are needed to clarify this relationship.

It seems that recognition performance must, normally, make use of both memory systems (or both accessibility pathways to a memory trace), and that the instructions given bias the use of one pathway (or system) over another in some situations. If recognition performance is responsive to both pathways and if it is very sensitive to accessing instructions, then this may explain some of the contradictions in the literature regarding recognition in Korsakoff patients. The suggestion that there are two, separate types of recognition is not new (Jacoby, 1982; Mandler, 1980). Perhaps, now, it would be useful to agree upon labelling for these different types of recognition and to then use these different labels in future recognition studies. This would help avoid confusion between familiarity of an item (recognition) and correctly recognizing an item

when asked directly to remember the earlier experience (also recognition).

PRIMING

There is also need to clarify the language used when discussing priming. The priming event, itself, should be distinguished from primed performance. Before discussing the two aspects of priming, however, it must be stated that assumptions are being made about what actually happens in the nervous system when a priming task is being performed. The assumption being made, here, is that priming constitutes the activation of pre-existing connections within memory (the activation hypothesis), coupled with some method of accessing that "warmed up" connection.

The activation theory suggests that priming is the "heating up" of existing memory traces or associations (Graf,Squire,& Mandler, 1984; Mandler, 1980; Morton, 1969). This theory assumes that the original association event in the self-generated paired-associates task used in this study primes the connection between the stimulus word and the subject's association word. If this is the case, the

primed association should be more quickly produced when triggered by a second presentation of the stimulus word than would a different association. This effect was found in both the recall and associative conditions, where "same" associations were produced significantly more quickly than were "different" associations.

The activation hypothesis also predicts that experimenter-generated associations or pairings should only be primed if closely related pairs are used. That is, a pairing of items not previously associated in memory should not present a retrieval advantage on second presentation when non-priming memory systems are eliminated. In the Korsakoff's group used in the present study no priming effect was found for experimenter-paired items on the face-statement pairing. Because the experiential memory system is, essentially, knocked out in Korsakoff patients they present a unique opportunity to study this effect. In normals either or both memory systems can be used in this situation and it would be impossible to tell whether priming had occurred. However, with Korsakoff patients assumed to be without benefit of an experiential system, only the

priming system is left. Consequently, it is possible to conclude that no priming occurred for these experimenter-generated connections.

A further issue with respect to priming is whether performance on priming tasks depends on the same memory pathways used in other tasks (eg., learning a skill) or whether it exists on its own as a separate pathway to the memory trace. The research reported here does not resolve this issue, but it does support earlier researchers who have suggested that priming and recall (or remembering a situation) are independent. This suggestion is supported by the Korsakoff patients' relatively normal performance on the associative task, which is clearly an example of priming as described by other researchers (Graf, et al., 1984; Graf, Shimamura, & Squire, 1985; Mandler, Graf, & Kraft, 1986; Schacter & Graf, 1986; Squire, Shimamura, & Graf, 1985; Wilkinson, & Poulos, 1987), in the presence of significantly poorer performance on recall tasks of various types.

It became apparent when attempting to interpret the findings of the current research that primed <u>performance</u> involves both heating up an existing association (this was done for all words in the

original paired-association task) and accessing that association indirectly - that is using specific retrieval instructions that do not involve remembering the pairing event. This occurred only in the association task. When Korsakoff's subjects were asked to remember the association event (recall task) they performed more poorly than other subjects, even though

association. So it seems that associations may be primed but these priming events can only be measured under specific, priming instructions. The priming event and performance are, therefore, distinct.

A new issue with respect to priming that arises from these data is its relation to emotion. The task in this study that is most clearly a priming task, both in the learning trial and in its accessing instructions, was not affected by emotional content in the stimulus material. This finding also helps to emphasize the independence of pathways used for priming performance and recall performance, because performance on the recall of verbal paired-associates task was different for emotion-laden versus neutral stimuli.

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Another suggestion in the literature that is

supported by the data at hand is the suggestion by Hirst, Johnson, Kim, Phelps, Risse, and Volpe, (1986) that recognition may be related to priming. Korsakoff patients are able to recognize faces on an indirect measure but not when asked, directly, whether they recognize them. This is similar to their retrieval performance for primed associations. They are able to produce primed responses when asked indirectly but not when asked directly to remember the priming event. It has been suggested that one type of recognition performance may rely on the experiential memory system while another, based on familiarity, relies on the abstractive memory system. If both priming and familiarity-based-recognition are functions of the abstractive memory system, as suggested by Wilkinson and Poulos (1987), then a relationship between priming and familiarity-based recognition is implied. Any recognition task that requires explicit memory of an event would be accomplished via the experiential system and would not, supposedly, be related to priming.

MEMORY-EMOTION INTERACTION IN NORMAL MEMORY

Besides indicating that the interaction of emotion with memory is not impaired in Korsakoff patients, the data provide information about the relationship of these two factors on a more general level. The robust finding that emotional content in stimulus material relates to poorer recall performance on self-generated paired-associates tasks (Levinger & Clark, 1961; Parkin, et al., 1982; Rossman, 1984; Sinton, 1981) is replicated in this study.

It has been hypothesized (Walker, 1958) that this decrement in recall of emotion-laden word pairs is due to a time-dependent protective mechanism whereby the trace is not available during its "consolidation period" - a period which differs for emotional and neutral words. This conclusion is based on data showing that the difference in recall of emotional versus neutral pairs disappears over time. The present study does not address the time issue as it relates to the effect of emotion on retrieval but the results do suggest an alternative hypothesis. Furthermore, an examination of the body of relevant data shows that what actually occurs, in

most instances, is a larger increase in neutral errors over time and not a decrease in emotional errors (Maltzman, et al., 1966; Parkin et al., 1983; Rossman, 1984; Sinton, 1981). Consequently, it seems more likely that fewer emotion-laden than neutral pairs actually form a trace in this situation, but that the traces are more stable over time (ie., stronger) than are those for neutral pairs.

These data suggest that the disruption in processing emotion-laden material may occur in the rehearsal period (the interstimulus interval). This period is labelled the "consolidation phase," by Walker (1958) and this label will be used in the following discussion. The current data are congruent with the suggestion that disruption may occur during the rehearsal phase and affect the actual strength of the encoded trace, rather than being a short-lived accessing difficulty, as suggested by Walker (1958). It is suggested, here, that there may be an attentional distraction occurring after onset of a strongly emotion-laden stimulus that interferes with consolidation of the trace. Such a conclusion is supported by the findings of this study and others (Jung, in Stein & Rivieri, 1973; Sinton, 1981) that

latency of response is increased for words following an emotion-laden pair in the original pairing trial. This implies that attention may be distracted during the consolidation period for the previous pair, which could result in disrupted consolidation of those memory traces. Hypothesized reasons for this occurrence are discussed following a consideration of the possible role of memory systems in this phenomenon.

It does seem likely that the effect of emotional content in stimuli occurs during the interstimulus interval, but the relationship is clearly not a simple one. The data collected here suggest that emotional content affects only the experiential memory system and not abstractive memory, because a significant effect was found for emotion only in the self-generated paired-associate cued recall task. However, simply suggesting that the existence of different memory systems that process emotional material differently is responsible for the mixed results seen in the literature does not fit the available data from this and other studies.

In the current study there was no relationship between emotion and memory in the self-generated

paired-associates priming task, in face recognition, or in cued recall of face-statement pairs. Because Korsakoff's subjects did badly on the face recognition and face-statement recognition tasks and because of the nature of the tasks, themselves, these are assumed to depend on the experiential system and should, therefore, show an effect for emotional content if that was the only important variable here. However, they did not.

Furthermore, other researchers report different results for seemingly similar types of tasks. One group of researchers (Smith & Harleston, 1966) did not find the often reported relationship between emotional content and retrieval using the self-generated paired-associates task. Other studies have identified the relationship between emotional content and retrieval in face-descriptor pairing tasks (Christianson & Nilsson, 1984) where none was found in the current study, and others report the finding with experimenter-generated word-number pairs (Kleinsmith & Kaplan, 1963; Walker & Tarte, 1963). Still other researchers have found the opposite relationship occurring, with emotional content increasing retrieval. This reversed effect has

usually been found with free recall of verbal lists (Maltzman et al., 1966; Rees-Nishio, 1984) but it is not always apparent in an uncued recall task, either (Christianson & Nilsson, 1984). There is clearly more going on here than can be explained by assigning the effects of emotion to one memory system or the other.

Given the relatively broad range of stimulus type on which the relationship between emotional content and retrieval has been found (verbal, pictorial, numeric stimuli), and given that the current research was careful to balance emotional and neutral verbal categories for stimulus characteristics such as abstractness, the suggestion put forward by some researchers that the retrieval differences are not really due to emotional content at all, but to abstractness of stimuli (e.g., Smith & Harleston, 1966) seems unlikely. Given, also, the disparate results found across studies for seemingly similar tasks, it seems unlikely that the relationship can be explained by type of task as defined to date.

However, one hypothesis that may explain the disparity of results relates to the anxiety level

induced in the subject during the learning trial, rather than the differences in stimuli, alone. It is quite likely, given the experimental set-up in this study, that subjects were somewhat anxious during the taped, verbal, paired-association task. The task is an adaptation of Jungian word association - a therapeutic technique that is widely known, if not understood, by the general public. It is quite widely assumed that a person reveals much about him/herself in word associations. Adding this to the likelihood that most of the subjects in this study experienced discomfort with a woman monitoring their more personally relevant responses, it is highly likely that they feared negative evaluation or simply felt anxious during the learning trial. In the case of the face-statement matching situation the subjects were not likely to feel threatened by the prospect of being negatively evaluated and, therefore, it is unlikely that this was a stressful situation for them. This experimental set-up is more likely to increase interest or attention than to interfere with rehearsal, if it has any effect at all.

If it is assumed that more emotional errors were made in the self-generated paired-associates recall

task used here because subjects were distracted during the consolidation phase whenever the stimulus situation induced anxiety, then one can see a relationship between poorer retrieval and anxiety. In fact, this suggestion is congruent with physiological findings from a number of paired-association experiments where this relationship between emotion and retrieval has been found (Levinger, & Clark, 1961; Maltzman, et al., 1966; Rossman, 1984). Similarly, Christianson & Nilsson (1983) used highly upsetting pictures in their face-descriptor matching experiments with GSR indices of arousal, and the predicted relationship between emotional content and retrieval did occur. On the other hand, the emotional descriptors paired with faces in the current research were rather mildly negative and may have induced interest or increased attention in the subjects. If this was, indeed, the case, this research indicates a U-shaped relationship between anxiety and the effect of emotional content on retrieval of paired-associations.

The idea that arousal can either enhance or decrease performance is not new. It is supported by a large body of research. There have been numerous

reports of high arousal interfering with a subject's ability to deal with task requirements (Child, & Waterhouse, 1953; Easterbrook, 1959; Sarason, Mandler, & Craighill, 1952), and there is also much evidence that arousal can improve performance under certain conditions (Baddeley, 1952; Easterbrook, 1959; Hockey, 1970; Weltman, Smith & Egstrom, 1971). Further, performance on easy tasks has been shown to be best during high arousal whereas performance on difficult tasks is best under low arousal conditions (Poulton, 1977).

Applying these concepts from research on the arousal-performance relationship to the body of research addressed in this study, it can be suggested that the relationship between emotion-laden material and retrieval may follow the Yerkes-Dodson Law (1908). In the self-generated paired-associates taks there were more errors on emotion-laden than on neutral pairs. In this, high anxiety, situation emotional content decreased performance. In the face-descriptor matching task emotional content did not decrease performance, in fact the trend is toward improved memory of emotion-laden material in this task. This

indicates that the emotion-memory interaction could be related to the level of arousal or anxiety induced within the subject, in a u-shaped curve. Such an explanation for the relationship between emotional content and retrieval fits the current data and that of others.

CONTINUUM-OF-IMPAIRMENT

The results do not clearly support or refute the continuum-of-impairment hypothesis. Data gathered from former heavy drinkers could be interpreted as support, given that this group generally scored between the light drinkers and the Korsakoff patients. However, the differences were not always significant. On the other hand, the former heavy drinkers scored more like light drinkers than like Korsakoff subjects on all measures except for response latencies to self-generated paired-associates, and this pattern of results could be seen as lack of support for there being a continuum of impairment.

In their speed of response to verbal stimuli, the former heavy drinkers were significantly slower than light drinkers. These findings indicate that

response latency (that is, word finding) may be a relatively sensitive indicator of alcohol-related brain damage. Further work in this area may reveal that this measure can be used as a diagnostic tool to detect early-stage alcohol-related brain damage. It may also be useful in future comparative studies of amnesic versus non-amnesic types of alcohol-related functional damage.

SUMMARY

The findings of this research indicate that emotional content of stimuli is related to decreased retrieval performance under some conditions, but this relationship does not hold across all conditions. It is suggested, here, that the relationship between emotional content and retrieval performance follows the Yerkes-Dodson Law (1908) which describes the relationship between arousal and performance, generally. It is further suggested that the effect of stimulus-induced arousal occurs during the rehearsal phase of learning, or the period after the information has registered. It is hypothesized that emotional content acts as either a distractor (in the case of high anxiety/arousal) or as a means of

focussing attention on the stimulus (in the case of moderate arousal levels). Finally, it appears that emotional content is not related to primed performance which, according to Wilkinson and Poulos (1987), occurs via the abstractive memory system. The emotion/retrieval interaction seems to take place via the experiential memory system.

The results of the current research also provide information on memory, itself, as distinct from its relationship with emotion. There is support for the conclusion that memory is made up of two or more systems and that it is not a unitary phenomenon. Unitary theories are incongruent with the findings that Korsakoff's subjects did worse on an "easy" than on a "harder" task, that increased elaboration did not increase performance in Korsakoff patients, and that emotion was not related to retrieval in a consistent manner across tasks.

This research also suggests that recognition performance may depend on the type of retrieval instruction given. That is, that recognition performance is accomplished via either the experiential or the abstractive memory system - or both working together. Recall performance, on the

other hand, is apparently accomplished via the experiential system, alone.

This research also supports the activation theory of priming - seeing priming as a 'heating up' of previously existing associations. However, it is suggested that priming performance should be distinguished from simply priming an association when discussing issues in this area. The subject-generated paired-associates task involved first priming or "heating-up" an existing association, but this did not necessarily lead to increased retrieval performance. This depended on retrieval instructions. Clearly, there are two parts to this process - the hypothesized event (priming) and the evidence that this event has occurred (primed performance).

PREFERENCE

A preference measure was included in this study both as an unobstrusive measure of the relationship between emotion and memory, and as a direct measure of emotional response acquisition in Korsakoff's Syndrome. Johnson et al. (1984) had reported that

Korsakoff patients could acquire preferences, and the intent in the current study was to explore this aspect of their emotional responsiveness with a somewhat larger stimulus sample. This part of the current study was exploratory and preference formation was not examined in detail. However there are ideas arising from these data that may be useful for future researchers in the area.

The results indicate that liking ratings can be used as a measure of implicit memory. This was the only measure used in the current study that was able to index the acquisition of knowledge about the stimuli, and thus can be considered a relatively sensitive measure of implicit memory. Further, these ratings are a relatively unobtrusive index of implicit memory.

Likeability ratings may also be a more sensitive measure of retention than is recognition. Because likeability ratings are given on a graduated scale and recognition is a yes/no, forced choice measure, finer discriminations can be made with the former.

This study also indicated that preference can be established in the absence of either recall or explicit recognition of the preferred stimulus. All

subjects preferred previously seen faces over new ones regardless their recognition performance. This finding is in line with that of other researchers (Kunst-Wilson & Zajonc, 1977; 1979; Seamon, Brody, & Kauff, 1983; Wilson, 1979) who found that preference grew from repeated short exposure independent of recognition (the exposure effect). The exposure situation differed in the current study from that used by researchers who have examined the "exposure effect," but the effect remained. In the present study only one exposure of relatively long duration was used, and in both this research and in other experimental situations recognition and preference formation were not related.

The exposure situation used in this study differed further from that used by Zajonc and others who have studied the exposure effect. This, second, difference was the inclusion of descriptive information. Preference was established for "nicer" versus "nasty" fellows in the current research. This inclusion of descriptive information has led to findings which support not only Zajonc's exposure effect, but also theorists whom Zajonc argues against.

Zajonc (1980) argued, based on the existence of the "exposure effect" that, "to arouse affect, objects need to be cognized very little - in fact minimally." On the other hand, Schacter and Singer (1962) consider cognitive activity a necessary component of every emotional experience. The current study was not set up to address the question of which factor - exposure or information - is more important in forming preferences. Perhaps neither is more salient. However, it is interesting to note that both exposure and information were related to preference formation and, therefore, both theories gain support. Perhaps Zajonc generalized beyond his recognition data in stating that "cognizing" is not necessary in preference formation. Cognitive activity other than recognition may be needed to establish a preference. Neither Zajonc's research nor the current study answers this question.

IMPLICATIONS FOR FURTHER RESEARCH

Although many studies of memory in Korsakoff's Syndrome have been carried out in recent years, there remain unanswered questions concerning both memory

and emotional responsiveness in this clinical syndrome. Given the small sample of Korsakoff patients studied in this and most other research on Korsakoff's Syndrome it is difficult to be certain of the generalizeability of the findings. Larger study samples are needed if this generalizeability is to be assured. However, given the small number of known and available Korsakoff's subjects in North America without concurrent dementia or other psychiatric diagnosis, and who are not taking psychoactive drugs, such a study might be prohibitively costly in both time and money.

If a larger sample of Korsakoff patients can be accessed, a question that could then be addressed is whether there are two types of Korsakoff patient -one having emotional response deficits and the other with only memory impairment. The disparity between the results of this research and some other reports (Davidoff et al., 1985; Johnson et al., 1984; Talland, 1965) indicates a need for this research.

Another area needing further investigation is the relationship between preference formation and cognitive activity or information about the stimulus. The question to be answered is whether exposure,

alone, is sufficient or whether some thought or information about the stimulus must be present.

A further issue requiring more research is the relationship between emotion and memory, generally. It would be informative to investigate further the relationship between emotional content and memory by manipulating the level or strength of emotionality in the stimulus. This could be accomplished by pairing faces with descriptors of different emotional strengths. Some only mildly negative and others so aversive that anxiety would be produced. Alternatively, dreadfully disturbing pictures to mildly negative ones could be paired with faces, rather than using verbal descriptors. Based on the findings of Christianson and Nilsson (1984) and on the hypothesis presented in this thesis, a decrement in recognition would be predicted for faces paired with very disturbing material versus mildly arousing or nonarousing material.

Finally, the correlation between psychophysiological and behavioural indices of emotional responsiveness (as well as between different indices within each of these categories) should be researched further.

FOOTNOTES

1. Zajonc's idea is similar to that of Tulving (1985) who hypothesized a hierarchy of memory systems.

2. This differs from contextual memory theories. Eysenck suggests that increased encoding of contextual information decreases retrieval of information, whereas contextual theorists such as Huppert and Piercy (1976) and Kinsbourne and Wood (1982) suggest that increased encoding of contextual information should increase retrieval.

3. The fact that none of these studies addresses the possibility that a particular memory system could be responsible for this effect indicates an underlying, unspecified assumption that memory is a unitary phenomenon.

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APPENDIX 1

RANGE OF SAMPLE SIZES USED IN STUDIES OF KORSAKOFF'S SYNDROME

AUTHOR & DATE	SAMPLE SIZE
Zola-Morgan & Oberg (1980)	1
Kenyon, Becker, Butters, & Hermann (1984)	3
Oscar-Berman, Heyman, Bonner, & Ryder (1980)	5
Kinsbourne & Winocur (1980)	5
Huppert & Piercy (1976)	5
Grossman & Butters (1986)	6
Cermak, O'connor, & Talbot (1986)	7
Shimamura & Squire '1986)	8
Johnson, et al., (1985)	9
Davidoff, et al., (1984)	9
Markowitsch et al., (1986)	9
Oscar-Berman, Salakian, & Wikmark (1976)	10
Winocur, Kinsbourne, & Moscovitch (1981)	13

APPENDIX 2

STIMULI

WORD LIST FOR SUBJECT-GENERATED PAIRED ASSOCIATES TASK:

RECALL CONDITION	ASSOCIATIVE CONDITION
"Emotional" Words:	
Cripple	Nurse
Winner	Women
Baby	Star
Applause	Autopsy
Brother	Daughter
Divorce	Penis
Ass	Snake
Health	Diamond
Bible	Suicide
Orgasm	Coward
War	Intercourse
Breasts	Painting
Cocaine	Corpse
Dancer	Drunkard
Prize	Virgin
Enema	Orchestra
"Neutral" Words:	
Magazines	Air
Instep	Industry
Deputy	Chin
Knuckle	Vodka
Frog	Chapter
Tattoo	Lawyer
Beard	Stomach
Citizen	Finger
Voter	Tailor
Fringe	Measurement
Hockey	Statue
Museum	Plate
Carpenter	Maintenance
Grime	Pine
Barber	King
Client	Foot

CUT-OFFS AND CRITERIA USED TO CATEGORIZE WORDS FOR SUBJECT-GENERATED PAIRED-ASSOCIATES TASKS

1. EMOTIONALITY - Words used were at least one-half standard deviation above and below the mean.

2. CONCRETENESS - Words used were rated more concrete than abstract (3.5 or greater on a 7.0 scale).

3. ASSOCIATIVE DIFFICULTY - Within one standard deviation of the mean on this variable.

4. PLEASANTNESS - Equal numbers of words above and below the mean on this variable. There were more useable "pleasant" words than there were "unpleasant" ones.

5. An attempt was made to include equal numbers of people, body parts, objects and animals. However, this was not very successful due to the small selection of words that could satisfy all of the above conditions.

6. Out of 123 words originally rated by independent raters for use in this study, only 28 satisfied the above conditions. Consequently, 34 retrieval words and the 6 extra words used in the Associative Condition were taken from a list published by Brown

. This resulted in different means being used for categorizing the two sets of words. However, the same categorization rules were used for each.

PHRASES USED IN FACE-DESCRIPTOR TASK

"Emotional" Phrases:

Strangling a Cat
Shooting a Policeman
Smothering a Baby
Screaming Obscenities
Stabbing a Clergyman
Punching His Grandmother
Raping a Woman
Beeting His Wife

"Neutral" Phrases:

Holding a Shovel
Painting a Wall
Writing a Letter
Drinking Coffee
Using the Telephone
Getting a Haircut
Reading a Book
Mowing the Lawn

APPENDIX 3

WMS/WAIS SCORES Korsakoff's Subjects
(MQ's rounded up)

sub	age	IQ	MQ	Log mem	Dig	VisR	Assoc	E	H
18	70	120	81	1.5	10	7	8.0	8.0	0
19	64	117	94	6.5	10	6	9.5	8.5	1
20	60	103	81	4.0	10	1	8.5	8.5	0
21	68	144	84	2.5	15	3	3.0	3.0	0
22	56	113	89	3.0	10	7	9.0	6.0	3
Mn	63.6	119.4	85.8	3.5	11.0	4.8	7.6	6.8	0.8

FACES AND WORDS: KORSAKOFF'S SUBJECTS

sub	Recall Err		Assoc Miss		Face Err	Statement Err			
	Emot	Neut	Emot	Neut		Em	Neu	In	Ex
18	14	15	13	15	3	6	6	4	8
19	7	4	6	2	6	5	6	10	1
20	10	7	8	6	5	5	6	6	5
21	12	12	12	9	4	5	6	6	5
22	9	9	8	7	9	4	2	5	1
Mn	10.4	9.4	9.4	7.8	5.4	5.0	5.2	6.2	4.0

WMS/WAIS SCORES: FORMER HEAVY DRINKERS

sub	age	IQ	MQ	LogM	Dig	VisR	Assoc	E	H
11	65	141	118	8.5	13	07	15.5	8.5	7.0
14	49	122	122	12.0	11	09	16.0	8.0	8.0
16	47	107	100	9.0	07	10	12.5	7.5	5.0
28	56	125	143	10.5	15	13	17.0	9.0	8.0
30	60	112	100	6.5	08	06	14.5	7.5	7.0
31	67	137	143	9.5	15	10	16.0	9.0	7.0
33	61	097	089	04.0	11	07	07.0	7.0	0.0
34	49	135	135	11.0	14	12	17.5	8.5	9.0
35	55	130	124	9.0	14	10	14.0	7.0	7.0
36	55	140	132	12.0	14	11	10.5	7.5	3.0
37	69	126	105	8.0	13	04	12.5	8.5	4.0
38	45	140	126	11.5	15	13	13.5	8.5	5.0
39	45	130	099	5.5	11	11	10.0	8.0	2.0
40	56	128	114	9.0	10	10	14.0	7.0	7.0
41	48	139	112	7 0	13	10	16.0	8.0	8.0
42	63	148	143	12.5	15	13	21.0	9.0	11.0
Mn	55.6	128.6	119.1	9.1	12.4	9.8	14.2	8.0	6.1

FACES AND WORDS: FORMER HEAVY DRINKERS

sub	Recall Err		Assoc Miss		Face Err	StatementErr			
	Emot	Neut	Emot	Neut		Em	Neu	In	Ex
11	5	4	8	8	2	2	3	4	1
14	5	4	6	5	1	5	2	5	2
16	4	1	5	2	0	3	2	4	1
28	4	4	8	8	1	3	2	5	0
30	3	1	13	15	4	3	4	7	0
31	3	4	5	10	1	7	5	9	3
33	10	9	11	13	7	5	3	8	0
34	3	0	8	12	1	3	5	8	0
36	1	1	13	15	0	4	1	5	0
35	4	1	4	4	0	1	2	3	0
37	12	9	11	11	6	2	4	6	0
38	3	2	0	1	0	3	5	7	1
39	6	2	6	3	2	4	3	2	5
40	0	0	3	5	0	2	5	7	0
41	4	3	3	9	0	1	4	3	2
42	2	1	6	3	3	1	2	3	0
Mn	4.3	2.9	6.9	7.8	1.8	3.1	3.3	5.4	.9

WMS/WAIS SCORES: LIGHT DRINKERS

sub	age	IQ	MQ	LogM	Dig	VisR	AssocE		H
12	42	113	122	13.0	12	12	18.0	9.0	9.0
15	41	136	124	10.0	15	10	15.5	8.5	7.0
17	58	134	140	9.5	15	13	15.5	8.5	7.0
24	68	134	132	11.0	11	12	12.0	8.0	4.0
25	57	146	143	15.0	13	14	17.5	8.5	9.0
26	49	127	129	10.5	10	14	16.0	8.0	8.0
27	48	136	143	17.5	15	13	18.0	9.0	9.0
29	64	144	126	7.0	14	13	13.0	6.0	7.0
32	55	152	143	13.0	15	14	12.0	8.0	4.0
44	58	122	118	8.5	14	10	9.5	7.5	2.0
43	55	134	143	15.5	13	14	19.0	9.0	10.0
45	59	150	143	13.0	15	13	15.5	8.5	7.0
46	65	144	143	11.5	13	12	19.0	9.0	10.0
47	72	133	106	4.5	15	7	13.0	8.0	5.0
48	58	113	100	11.0	9	7	11.5	8.5	3.0
Mn	56.6	134.5	130.3	11.4	13.3	11.9	15.0	8.3	6.7

FACES AND WORDS: LIGHT DRINKERS

sub	Recall Err		Assoc Miss		Face Err	Statement Err			
	Emot	Neut	Emot	Neut		Em	Neu	In	Ex
12	7	4	6	4	1	1	5	5	1
15	7	4	2	7	1	0	2	0	1
17	5	1	9	9	2	3	5	7	1
24	3	0	4	6	0	2	2	4	0
25	3	1	6	8	0	0	1	1	0
26	2	4	6	8	0	2	3	5	0
27	4	2	9	11	1	0	1	1	0
29	0	2	6	3	0	1	5	6	0
32	1	0	5	6	1	1	3	5	1
43	0	0	6	2	0	1	0	1	0
44	6	3	7	4	0	5	4	8	1
45	0	3	2	5	6	1	3	4	0
46	3	1	6	3	1	3	0	3	0
47	6	3	8	12	1	2	4	6	0
48	5	4	6	9	5	3	4	5	2
Mn	3.5	2.1	5.9	6.5	1.3	1.7	2.8	4.1	.5