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AFFECTIVE/MOTIVATIONAL FACTORS IN ALCOHOLIC KORSAKOFF SYNDROME

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AFFECTIVE/MOTIVATIONAL FACTORS IN ALCOHOLIC KORSAKOFF SYNDROME

by

DONALD A. DAVIDOFF

A dissertation submitted to the Graduate Faculty in Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

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ABSTRACT

AFFECTIVE/MOTIVATIONAL FACTORS IN ALCOHOLIC KORSAKOFF SYNDROME

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Researchers, in studying the profound anterograde amnesia of the alcoholic Korsakoff patient, have generally overlooked the motivational aspects of memory and learning. Additionally, the fact that such patients evidence limbic damage and present clinically with little initiative and flat affect suggests that affective/ motivational factors might play a role in the disorder. This study assessed the role that such factors play in the recall of short stories by alcoholic Korsakoffs. Given the effects of motivation on learning, this investigation hypothesized that through the use of highly affective stimuli to evoke a higher level of motivation, increased learning and retention would result.

Patients with alcoholic Korsakoff syndrome, detoxified alcoholics and normal control subjects were read nine short stories, into each of which was inserted either a neutral, aggressive or sexual phrase. After each story was read once, subjects were asked for an immediate recall of the story. Following a 30-second delay, a second recall was elicited. Ten minutes elapsed between story presentations.

The substantive results of the study were three-fold:

1. the normals and alcoholics evidenced no differences as to amount recalled either by story type or by recall.

2. The Korsakoffs recalled proportionately more of the sexually-charged stories than either the aggressively charged or neutral stories, regardless of recall.

3. Although the Korsakoffs did initially recall proportionately more of the sexual stories, the proportion forgotten of each story from first to second recall was the same, regardless of emotional valence.

These results provide evidence that suggests there is an affective/motivational component to the psychopathology of the Korsakoff syndrome. It has been demonstrated that highly affective stimuli evoked heightened attention and resulted in increased levels of learning. In terms of the encoding paradigm, this heightened attention allowed the Korsakoff patient to semantically encode more features of the stimulus material. That the rate of decay of information from memory showed no differential effects according to the valence of the stimulus refutes the argument that the basis for the Korsakoff's amnesia lies in their inability to encode semantically. Instead it effectively divides the memory deficit into two distinct components - one attentional and the other retentional.

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CHAPTER 1

INTRODUCTION

The nature of the exact relationship between emotions and memory, remains to this date, a highly speculative one. Both entities are given a central place in personality theory and the psychological literature gives ample evidence that an interrelation is generally assumed (Rapaport, 1942/1971). Yet the examination of these two entities has, for the most part, taken independent paths, and there thus exists a paucity of literature that adequately examines the inter-relationships of emotions and memory.

One such pathway has derived from the clinical point of view. The clinician is intimately concerned with the memorial process from the viewpoint of forgetting; with forgetting explained in terms of repression. This tendency is explicable by the reminder that the conscious revival of the forgotten is a critical objective of most therapeutic situations. This goal, the reappearance in consciousness of a former precept, became established by the early assumption that the key factor in neurotic disturbance is a memory of an actual event - an experience residue isolated through repression because of its emotional impact, which by virtue of that repression acquires pre-emptive power over behavior. In this assumption, the forgotten event is the cause of present difficulties and only by recalling the event and the emotional experience that accompanied it, does it lose its force. This was one of Freud's important early concerns, as for instance, when he experimented with methods for eliciting forgotten memories (see his early papers on hysteria, eg., 1893-5/1955) and was likewise instrumental to his notion of abreaction (the discharge of emotion attached to previously repressed experience (Freud, 1893/1955, 1895/1966)). Freud eventually discovered that what was

repressed was as often a fantasy or wish as it was an actual event. Thus the clinician became less interested in how emotions influence memories of actual events and more involved in understanding instinctual drive derivatives and in bringing unconscious material to consciousness.

The experimental psychologist set out on a different pathway. For the most part he focused on the more positive side of the memorial process-perception, registration, coding, consolidation and retrieval - and attempted to measure it and examine how it changes over a period of time. It was Ebbinghaus, who, in 1885 began the scientific study of memory with the first experiments on memorization, using nonsense materials. These experiments showed that orderly data could be obtained and suggested that the appropriate way to study memory was, in the good tradition of the biological sciences, to simplify. Simplification was accomplished by removing the trappings of past learning and attitudes through the use of meaningless material - in other words, a total de-emphasis of the role emotions might play on memory.

The literature thus records these two divergent pathways and the result is a literature concerning emotions and the unconscious from the clinicians, and a vast array of articles from the experimentalists about "pure" memory. The obvious question that remains, is whether there is an approach that offers a more satisfactory understanding. The answer is to be found in the realm of cognitive psychology - from the cognitive experimentalists, on the one hand and the ego-psychoanalytic clinicians and theoreticians, on the other.

The beginnings of cognitive psychology occurred at the same time that Ebbinghaus was simplifying memory theory, when Ribot composed his classic work Diseases of Memory (1881/1882), in which he conceptualized memory as an active process and described not only the pathology of memory but elucidated some of

the fundamental aspects of the memorial process, such as registration and recollection. He viewed, for example, recollection as a localization in time, accomplished by construction from a series of temporal reference points. Ribot further emphasized the necessity of examining pathological cases in order to more fully understand normal memory. It was in this spirit, that seven years later, S.S. Korsakoff published his first in a series of papers, describing a syndrome that was later to bear his name. Aside from his clinical observations (which remain as salient today as they were 100 years ago), Korsakoff analyzed this syndrome from a cognitive point of view that still seems apt today. In part, he viewed this amnesic syndrome as primarily a failure in recollection, an inability to recall an experienced event as an event from one's past, as a segment from a continuous temporal stream. The cognitive view of memory was further enhanced by William James' treatise Principles of Psychology (1890). His chapter on memory is strikingly up-to-date, not only elucidating stages in the memorial process (registration, primary memory (today called short-term memory) and secondary memory (today called long-term memory)), but also emphasizing the notion of temporal integration and a self-awareness of the past. The century closed with an affirmation of both the importance of the role of memory and the cognitive point of view in Janet's address to the London Congress of Experimental Psychology (1898) which he began with the statement, "The part played by memory is of paramount importance in the functioning of the person, and its smallest alterations have grave pathological consequences." Yet even this portentious statement did not prevent the cognitive approach to memory from falling into relative unpopularity (with few exceptions, such as Bartlett's Remembering, 1932) until George Talland's elegant application of cognitive notions to the understanding of alcoholic Korsakoff's syndrome in this work Deranged Memory (1965).

As mentioned earlier, the focus of the clinicians was primarily on the process of forgetting. Although Freud did speculate on how memory traces are established and retained (1900/1953, 1925/1961, 1895/1966), his suggestions were largely unheeded. As George Klein (1966) states, Freud "did in scattered instances offer hints on these matters (i.e., about acquisition and storage of memories), particularly...to the importance of state of consciousness and of its affective concomitants in trace formation, ... but there have been few attempts...to make systematic capital of this in a theory of memory" (p. 379). The attempts that have occurred have derived from the branch of psychoanalytic theory known as ego psychology which corresponds with the cognitive point of view. Beginning with Anna Freud's (1936/1966) delineation of particular ego functions and extending such with Hartmann's (1939/1958) notion of conflict-free autonomous thought functions, psychoanalytic ego psychology has made attempts to begin to delineate the relationship of emotions to memory and the relationship of both to personality development. Most notable in this respect is David Rapaport's Emotions and Memory (1942/1971) which to this date remains the most complete critical survey of the subject, reviewing the literature available from three points of view (from general experimental psychology, from clinical psychiatry and from psychoanalytic theory), and attempting to provide a theoretical framework to encompass the diversity. Rapaport continued to expand and refine his theory (1951), proposing that, for example, memory storage can occur in terms of drive-organized and conceptual (non-drive) organizations. George Klein (1970) further expanded cognitive-ego psychoanalytic theory with his notions of cognitive controls and individual cognitive styles (much as personality styles) in general, and with notions of leveling and sharpening with regards to memory, in particular.

The current theoretical ego psychoanalytic notions concerning emotions and memory that derived from Klein's work can be found in the writings of Loewald (1955, 1971, 1976), Rubinfine (1967, 1973) and Paul (1959, 1964, 1967) and perhaps can best be summarized by noting Paul's (1964) conclusions that the individual's memorial process, as well as other cognitive functions, is relatively independent of the influences of drives, as long as that individual is in a wakeful, alert state. Once the state of consciousness is altered or impaired, however, drives and affects play an organizing and selecting role in cognitive functioning. He thus agreed with Rapaport's earlier notions concerning emotions and memory but clarified the particular relationship by focusing on the important variable of state-of-consciousness.

Klein (1966) himself sought to synthesize traditional psychoanalytic notions of repression with an active theory of remembering by noting the possibility of, an explanation for, and the implications of, repression occurring at various stages of memory (e.g., perception, STM, consolidation, LTM and retrieval). Finally, the differential effects of emotional and neutral stimuli on memorial processes has been utilized as a diagnostic clinical instrument with children by Santostefano (1976).

Thus far, the most complete understanding of alcoholic Korsakoff syndrome has been provided by those following in the tradition of Ribot and Korsakoff, most notably Talland's (1965) work and the recent volume by Butters and Cermak (1980). Yet the cognitive-experimentalists have tended to ignore the possible enhancement of their theoretical positions that would be realized by incorporation of some of the notions of the psychoanalytic ego psychologists. Keeping in mind the often 'affectless' characterization of alcoholic Korsakoff patients and the knowledge that the neurological damage suffered by these patients involves systems theorized

to mediate emotional experience (Papez, 1937, MacLean, 1949), it would seem necessary to examine the nature of the influence of emotions on memory in these patients whose state of consciousness is highly abnormal. Only the psychoanalytic ego psychologists offer an appropriate perspective on that problem, while only the cognitive experimentalists offer an adequate understanding of the cognitive losses suffered by alcoholic Korsakoff patients. The present study does not seek to integrate the two spheres of cognitive psychological theory, but rather hopes to provide some data for the basis of a synthesis of the two spheres. The selection of the highly emotionally charged material for this study thus derives from basic psychoanalytic theory, while the methods employed and the variables examined are those typical of the cognitive experimentalists. The end result should provide additional information on an area often overlooked in the attempts to understand the alcoholic Korsakoff syndrome as well as supplying some experimental evidence in support of current ego-psychoanalytic notions regarding the influence of emotions on memorial processes.[1]

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[1] It will be apparent that the analyses of memory utilized in this study are rooted in the verbal domain; whether these analyses operate over other, non-verbal, domains is an open question.

CHAPTER 2

REVIEW OF THE LITERATURE

The single most striking disruption in alcoholic Korsakoff patients is a profound anterograde amnesia. Clinically these patients appear to be unable to learn and/or remember any new information. Additionally there is a retrograde amnesia characterized by a temporal gradient in which memories for very remote events are relatively spared. In other words, while these patients cannot recall events, either personal or general, from the near distant past, they do retain the capability for recalling information up to their early adulthood with reasonable accuracy, albeit at levels still inferior in comparison to the recall of normals (Albert, Butters, & Brandt, 1981; Albert, Butters, & Levin, 1979; Butters & Albert 1982; Cohen and Squire, 1981; Marslen-Wilson & Teuber, 1975; Meudell, Northern, Snowden, & Neary, 1980; Seltzer & Benson, 1974; Squire & Cohen, 1982). All of this occurs in conjunction with IQ scores within normal limits, including Digit Span. Butters & Cermak (1975) have shown that the only significant deficit on the Wechsler Adult Intelligence Scale (WAIS) is performance on the Digit Symbol subtest. Thus, most research since the publication of Talland's (1965) work, has focused on the purely cognitive aspects of memory disorders.

Implicit in most of this research have been three assumptions: (a) there is a correlation between behavior and neuroanatomical structure; (b) that the specific structure damaged in alcoholic Korsakoff patients must directly mediate some memorial function (as opposed to emotion or attention); and (c) that a single point in the flow of memory could be isolated whose disruption could explain the whole range of the deficit. Thus, over the last fifteen years the disruption has been attributed to a deficit in one or more of the following stages of memory:

(a) sensory processing of incoming information (Oscar-Berman, Goodglass, & Cherlow, 1973); (b) short-term memory (STM) (Butters, Lewis, Cermak, & Goodglass, 1973; Cermak & Butters, 1972; Cermak & Moreines, 1976; Samuels, Butters, Goodglass, & Brody, 1971); (c) encoding (Butters & Cermak, 1980; Cermak & Butters, 1972; Cermak, Butters, & Gerrein, 1973; Cermak, Butters, and Moreines, 1974; Cermak & Moreines, 1976; Glosser, Butters, & Samuels, 1976; Oscar-Berman, 1973; Oscar-Berman & Samuels, 1977); (d) consolidation (Butters, Miliotis, Albert & Sax, 1983; Greenberg, Pearlman, Brooks, Mayer, & Hartmann, 1968); (e) information tagging (Cermak & Butters, 1973; Cermak, et. al., 1973); and/or (f) information retrieval (Baddeley & Warrington, 1970, 1973; Kinsbourne & Wood, 1975; McDowall, 1979; Warrington & Weiskrantz, 1970; Winocur & Weiskrantz, 1976). The attempt to isolate the memory deficit to a single stage has been unsuccessful because deficits appear in each of the stages listed above. It is the purpose of this paper to raise the possibility that the alcoholic Korsakoff syndrome involves more than simply a cognitive memory loss and to suggest that affective-motivational aspects of memory and learning have thus far been underestimated. Additionally, the fact that alcoholic Korsakoff patients have limbic damage (Butters and Cermak, 1980; Victor, Adams and Collins, 1971) and present clinically with little initiative and flat affect (Butters and Cermak, 1980; Talland, 1965) also suggest that motivational factors might play a role in the disorder. Given the effects of motivation on learning, this investigation hypothesizes that through the use of highly emotional stimuli to evoke a higher level of motivation, increased learning and retention will result among these subjects.

Over the last fifteen years, since the publication of George Talland's seminal work, cataloguing the cognitive deficits of Korsakoff patients, a number of theories have been proposed to account for the psychopathology of the

alcoholic Korsakoff syndrome. While differing in focus and detail, each theory has in common an approach based on the role cognitive functions play in the syndrome. Most prominent among these theories is the levels of processing framework (Craik & Lockhart, 1972; Craik & Tulving, 1975; Fisher & Craik, 1977; and Tulving, 1970) which hypothesized that memory could be understood as a byproduct of perceptual analysis with the longevity of the memory as a positive function of the depth to which the stimulus has been analyzed. The Boston Group, led by Butters and Cermak, sought to provide evidence that the alcoholic Korsakoff patient's memory disorder could be explained by an appeal to the levels of processing paradigm. They discovered that these alcoholic Korsakoff patients had an information processing deficit of such magnitude as to seriously impair their encoding capabilities and consequently their ability to learn new information (Butters & Cermak, 1974, 1975, 1976, 1980). While this approach has garnered considerable attention throughout the 1970's, other cognitively-oriented theories have also been proposed to account for the impairments in alcoholic Korsakoff patients. Among these theories have been explanations that appeal to: (1) deficits in the consolidation process (Hebb, 1949; Milner, 1968); (2) retrieval-interference theory (Warrington & Weiskrantz, 1970, 1973, 1978); (3) the patient's inability to discriminate context (Huppert & Piercy, 1976; Kinsbourne & Wood, 1975; Winocur & Kinsbourne, 1976, 1978; Winocur, Kinsbourne & Moscovitch, 1981); (4) deficits in the patient's ability to use imaginal features of verbal information (Baddeley, 1975); and (5) the inability to form "cognitive maps" (hypothesized to be essential to learning) (O'Keefe and Nadel, 1978). Although each of the aforementioned approaches to the alcoholic Korsakoff syndrome does explain some aspects of the observed deficits, each, of itself, is either incapable of explaining the syndrome unitarily, or else has generated

a great deal of conflicting data that the theory is unable to account for (see, for example, Albert, Butters & Levin, 1979a; Cermak, 1975; Piercy, 1977). For the most part, the role that affective/motivational factors play in the Korsakoff syndrome have been largely ignored. A number of recent studies of Korsakoff patients that, for example, (1) clearly documented motivational anomalies (Oscar-Berman, 1980; Oscar-Berman, Heyman, Bonner, & Ryder, 1980; Oscar-Berman, Sahakian, & Wikmark, 1976), (2) provided evidence that affective personally experienced events are better retained than neutral impersonal facts (Zola-Morgan & Oberg, 1980) and (3) indicated the possibility that a high level of affective- motivational arousal could lead to better performance on particular cognitive tasks (Biber, Butters, Rosen, Gerstman, & Mattis, 1981), make it no longer possible to dismiss explanations of the observed psychopathology that stress affective/motivational factors.

The observation that the depth of the amnesia in the alcoholic Korsakoff syndrome varies according to the patient's emotional and motivational states was first made by Korsakoff (1889/1955) himself. Bönhoffer (1901, 1904), noting that the Korsakoff patient's ability to register new information was likely to be quite efficient for matters of especial interest, was the first to explicitly suggest, that in addition to the organic damage inherent in the syndrome, there was a functional component, as well. Gregor, first in a study with Römer (1907) and later in a paper by himself (1909) was the first to demonstrate what particular types of stimuli are best remembered by Korsakoff patients. He clearly demonstrated not only that recent experiences were not entirely lost to the Korsakoff patient, but that verbally connected coherent prose material is recalled significantly better than other verbal stimuli such as poetry or nonsense syllables. Gregor ultimately agreed with Bönhoffer in viewing the basic dysfunction as an attitudinal one, rather than a purely cognitive one. It then remained for Claparède

(1911/1951) to set forth a formal theory and devise an experiment to clarify the nature and extent of the affective/motivational involvement in the syndrome. Using a painful stimulus, he demonstrated that such highly affective events can be remembered. His theory hinged on two notions - first that there exists a dual system of memories, one organized on the basis of drives and the other conceptual-associational in nature (an idea almost prescient of current psychoanalytic thinking; Rapaport, 1951) and second, that if an event is highly affective in nature, it can be stored and, in some manner, later recalled.

Hartmann and Betlheim (1924/1951) in an experimental study with three Korsakoff patients demonstrated that stories with drive-related themes (i.e. sex or death) can be remembered. The authors noted a tendency toward symbolic distortion of the crudely obscene and blasphemous content, illustrating that for these patients the information was available, albeit in a distorted form. In a second study, Hartmann (1930), with four alcoholic Korsakoff patients, again demonstrated that drive-related material can be retained by such patients but that material of disagreeable content tends to be omitted or distorted in a manner so as to render it less graphic when such patients are asked for recall of specific stories. Schilder, who for a time collaborated with Hartmann, wrote a series of papers discussing organic amnesias. He, at first, observed the same mechanisms at work in the Korsakoff syndrome and hysteria (Hartmann & Schilder, 1925) and then called attention to the importance of affective factors in organic amnesias (Schilder & Curran, 1935). His final formulation of the Korsakoff syndrome, published posthumously, is that the syndrome consists of two components, one purely cognitive, and the other an affective disturbance, neither of which is secondary to the other (Schilder, 1942).

Gamper (1928, 1929), Krauss (1930) and Bürger-Prinz & Kaila (1930/1951) were all struck by the Korsakoff patient's inability to motivate himself and

consequently attributed the basic dysfunction to the conative (i.e. motivational) sphere. Bürger-Prinz & Kaila, in particular, point out that the Korsakoff patients' blandness and apathy prevent even the internal rise of the need to remember or relate an event to their total life experience. They go on to point out (in a way reminiscent of Claparède's theory), that the actualization of memories and thoughts is a function of the affects aroused by a particular situation and if given an intensely arousing context, the Korsakoff patient's memory performance can be quite good. In other words, they hypothesize that if the Korsakoff patient is given a memory task designed to arouse affects and interest, he will be motivated to recall such events. Other studies providing additional evidence for this notion of a lack of internal motivation were done by Schied (1934), Körner (1935), Bürger-Prinz & Büsson (1943) and Horányi (1946).

Rapaport (1942/1971) in his ground-breaking work on the influence of emotions on memory felt that much could be understood through investigation of the Korsakoff syndrome because nowhere else are these processes "as amenable to investigation" (p.231). In reviewing all the available literature, he explained how virtually all of the disparate theories concerning the psychopathology of the Korsakoff syndrome were reducible to an explanation involving a disturbance in the emotional sphere, and concluded that:

> It is now beyond doubt that the Korsakoff syndrome which originally was considered to be a registration and retention loss due to organic lesions, has now proved to imply important emotional components which effect the appearance of such losses (p.231).

In a later book of readings, Rapaport (1951) selected a series of papers all pointing to emotional or motivational influences in the psychopathology of the Korsakoff syndrome.

Gantt and Muncie (1942) demonstrated that Korsakoff patients are extremely difficult to condition using a Pavlovian paradigm, but that highly affective events experienced as part of the conditioning (e.g. pain) can be recalled by the patient, given the proper context - in this case by showing the subject the experimental apparatus after a hiatus of several days. Lidz (1942) told of a case study in which a Korsakoff patient was accidently provided a highly emotional stimulus, namely being told that he was going to be executed. Not only did this patient retain this knowledge for a period of days, but it also served to motivate him to move out of his apathetic state and take various adaptive actions.

Davidson (1948), while acknowledging the organic origins of the syndrome, interviewed eight Korsakoff patients under sodium amytal and developed a model of the syndrome wherein some of the patients' cognitive disorders derived from an affective and motivational derangement. He was also the first to note the significance of Papez' (1937) circuit in the Korsakoff syndrome, pointing out the relationship between emotions and particular neuroanatomical structures and noting that these structures are invariably implicated in the disorder. Similarly, Lindberg (1948), in studying a single subject, felt that it was necessary to invoke psychological factors, in addition to the lesional cerebral disturbance, in order to adequately explain the full range of the observed psychopathology. Weinstein, in a series of papers stretching over two decades, further elaborated Davidson's & Lindberg's point of view (Weinstein, 1969; Weinstein & Kahn, 1953, 1955; Weinstein & Lyerly, 1968; and Weinstein, Marvin & Keller, 1962). Weinstein focused on the individual's adaptation to his organic memory disorder and noted that the manner in which the individual adjusted to his particular difficulties was related to personality factors. He concluded that: (1) emotionally-laden material is not forgotten by these patients, only transformed; (2) amnesia is a pattern

of language, which, although organic in origin, serves a function similar to that served by the parapraxes of everyday life; and (3) the meaning and extent of the individual's amnesia varies along the dimensions of neurological intactness, social context and personality (Weinstein, et. al., 1962).

A comprehensive theory encompassing the cognitive deficits and affective/motivational factors in the context of the known neuropathology (i.e. damage to Papez' circuit) was offered by Kral (1956). He postulated that two factors will determine whether a Korsakoff patient will recall an event, namely - (1) the severity of the syndrome and (2) the "charge" or meaning of the experience. Kral's notion of charge includes a variety of affective factors including attitude of the patient, both at the time of the experience and at the time of recall and the intensity of the emotional experience. Sir Aubrey Lewis (1961) conducted a review of the literature on the Korsakoff syndrome and, combined with his own anecdotal experiences, concluded that, in addition to organically induced memory impairments, emotional factors play a role in what is recalled (and how accurately it is recalled) and give rise to such processes as condensation and repression in ways analagous to how such processes function in normal memory.

Talland (1965) attributed the basic dysfunction in the Korsakoff syndrome to an inadequacy of the conative function. His theory of premature closure of activation ascribes the psychopathology to an inability to maintain an emotional involvement in a new experience long enough to consolidate an effective memory of it. Unfortunately his study of the recall of affective and neutral passages did not provide experimental proof for his theory because they elicited no differences according to type of passage from the Korsakoff patients, possibly because the texts were so short (only five phrases or bits, a single sentence) so as to confound the results. Among the authors who accepted the validity of Talland's theory

and chose to ignore the obvious experimental contradiction were Greenberg, Pearlman, Brooks, Mayer & Hartmann, who, in 1968, examined the dream process of Korsakoff patients. They found that both the quality and quantity of the dreams of these patients were severely impaired and concluded that the impairment might be related to a disturbance of affective activation during the dream in much the same way as Talland suggests for the waking state. They hypothesized that this disturbance derives from the neuropathological disconnection in Papez' circuit, but imply that if an event has a highly affective charge, the increase in emotion might be sufficient to overcome the hippocampal-cortical block with a resultant improvement in memory for the event.

Wechsler (1973) in a study involving groups of brain-damaged patients of mixed etiologies concluded that cerebral dysfunction due to organic disease results in greater impairment of recall for disagreeable, emotionally charged, verbally presented material than for neutral material. A second study (Wechsler, 1976) showed similar results for visually presented stimuli.

Recent studies by Oscar-Berman of the Boston group have examined the more subtle features of the alcoholic Korsakoff syndrome, including attentional, perceptual and motivational features. In particular, two experiments were done to assess one aspect of motivation, namely the sensitivity of Korsakoff patients to changes in reinforcement contingencies (Oscar-Berman, et. al., 1980, 1976). Although it was noted that these patients do not appear to evidence a non-specific motivational deficit, such patients do have difficulty in recognizing the relevance of cues and therefore in forming new associations subsequent to unlearning an old response (Oscar-Berman, 1980). This motivational anomaly, taken in combination with the Korsakoffs' tendency to adopt problem-solving strategies (or responses) before all relevant information is processed (Oberg & Oscar-Berman, 1976), subnormal arousal levels (Oscar-Berman & Gade, 1979), deficits in active

attention processes and abnormally high recognition thresholds (Oscar-Berman & Samuels, 1977) indicates serious deficiencies in such patients' sensitivity to available rewards. Oscar-Berman (1980) suggests that the net effect of all of these abnormalities is to make learning more difficult. It would therefore be necessary to make the relevance of a particular item or bit of information exceedingly clear if a Korsakoff patient is expected to learn it.

Zola-Morgan and Oberg (1980) found that aspects of an event personally experienced by a Korsakoff patient can be retained for at least two years after the event. The article suggests that those aspects which are retained most consistently and vividly over such a time period are experiences that are associated with relatively intense affects. Finally, in a facial recognition task, Biber, et. al. (1981) demonstrated that when Korsakoff patients were asked to make a likeability judgment of the faces, their recognition scores improved significantly. Although these findings can be explained by limited encoding hypotheses (Butters & Cermak, 1980), the authors suggest that the role of affective/motivational factors cannot be ignored. The process of making likeability judgments may have had motivational/affective, as well as cognitive, consequences and the significant improvement in the memory of the Korsakoff patients following such judgments might reflect some form of affective/motivational arousal.

There have been a number of studies done to examine what factors do influence the retention of verbal material. Several studies utilizing a normal population have shown that meaningful, verbally connected prose material (i.e. narrative texts) is remembered better than relatively meaningless unconnected material (McGeoch & McGeoch, 1936; McGeoch & McKinney, 1934). Other studies have demonstrated that whether the material to be retained is emotionally charged or not, makes little difference in the degree to which such material is retained as long as it is ensured that the subjects are fully awake,

alert, and attentive (Kott, 1955, Riggs, 1956; Smith, 1954). In a study done to examine the effect of the variable of state of consciousness on recall of emotionally charged material, Paul (1964) found that those subjects in an altered state of consciousness do retain emotionally charged material better than neutral material, while those subjects in a normal, wakeful state retain both types of material equally well. As an explanation for the findings, Paul suggests that drive content facilitated retention by those in an altered state, because such material was more vivid and "captured" the subjects attention. In other words, for these subjects, it did not require much voluntary expenditure of attention to attend to the drive-related stimuli because their attention was drawn by forces which the subjects considered outside of their voluntary control. Paul then appeals to current psychoanalytic constructs which relate the roles of drives, cognitive functions and state of consciousness (Klein, 1954; Loewald, 1965). He summarizes these relationships by stating that: (1) the waking state of consciousness is characterized by the capacity for the relative autonomy of cognitive functioning, the ability to direct one's attention relatively independently from the interference of drives or affects; and (2) in an altered state of consciousness this relative autonomy is impaired and emotions play an organizing and selecting role in cognitive functioning. He then concludes with the unequivocal statement that a relationship between drives and memory does exist, but that it is vitally mediated by state of consciousness.

There is virtually universal agreement that the state-of-consciousness of patients with Korsakoff syndrome is markedly altered from that of the normal, wakeful, alert state. Some authors, such as Kral (1956), have attributed the entire range of the psychopathology in the syndrome to the consequences of impaired consciousness, while other authors have simply noted such a state as a part of the symptomatology (see, for example, Talland, 1965). It is also well

known that emotions can and do operate as motivating factors because they arouse, sustain and direct activity (Arnold, 1960; Leeper, 1948) as well as provide the necessary cues and directions for ongoing cognitive processes (Izard, 1978). As Oscar-Berman (1980) points out, the cognitive processes that are involved in the memory process are all intertwined: memory depends on learning (and vice-versa); learning and memory depend upon attention, motivation and the amount of information that can be processed which in turn is dependent on level of arousal; and level of arousal and attention depend on level of motivation. In other words, if the level of motivation is increased, arousal and attention would be heightened and memory and learning might be more efficient. The present study then, constitutes an attempt to examine specific aspects of the role that affective/motivational factors might play in the psychopathology of the Korsakoff syndrome. The major aim is to see if a direct relationship between the emotional charge of a stimulus and its retention exists for Korsakoff patients. In keeping with Paul's findings and given the effects of motivation on learning, this investigation makes the following hypothesis. Through the use of highly emotional stimuli to evoke a higher level of motivation, increased learning and retention will result among subjects with Korsakoff syndrome. While control subjects are expected, overall, to perform better than Korsakoff subjects, it is expected that their retention will be the same regardless of whether or not the stimulus is emotionally charged.

The development of the stimulus material derived from three criteria with the goal being to develop such materials that would demonstrate as large a difference in retention as possible. First, short paragraphs involving a single theme were developed because narrative texts are recalled better than less coherent verbal material by both normal subjects (McGeoch & McGeoch, 1936) and by Korsakoff patients (Gregor, 1909). The second criterion related to the

length of each paragraph. The fact that Korsakoff patients exhibit a normal digit span (Butters & Cermak, 1975) and a normal sentence span (Talland, 1965) set the lower limit. The upper limit concern was to make the stories long enough to be a test of memory, but not so long as to be unwieldly. Two possibilities were offered by the literature - the much used Cowboy story by Franz (1919) and the logical memory passages of the Wechsler Memory Scale (1945). Both choices have been conveniently divided into short units of several words each (bits of information) that can be used to provide a quantitative measure of recall, the former into 27 bits and the latter into 23 bits. To ease possible comparisons with Wechsler Memory Scale scores, it was decided to match the stimulus materials to the length and format of the passages in the Wechsler test.

The third and final criterion related to the specific type of emotional stimulus to be used. Hartmann and Betlheim (1924/1951) utilized themes that were graphically obscene, blasphemous, or related to violent death and dying. Talland (1965) chose a short sexually explicit theme of rape and incest, while Wechsler (1973) chose a story dealing with the long term effects of illness. All are clearly emotionally charged and conceivably applicable to this study. Derivations from psychoanalytic theory suggested that passages relating to primitive drives or instincts might be most effective in establishing differential learning (Arnold, 1960; Kott, 1955; Paul, 1964). Freud (1905/1953, 1940/1964) placed great emphasis on the sexual drive and its derivatives, attributing to them a pivotal role as a prime mover (or motivator) of human actions and human development. Later theorists viewed aggression and the aggressive drive as an equally important force in human affairs (Hartmann, 1939/1958; Jacobson, 1964; Rudolph, 1981; Spitz, 1965). Emotions and affects are directly derivable from the expression of, and conflicts surrounding the expression of, these drives (Arnold, 1960). It has been shown that material with sexual or aggressive

content does attain a vividness that is capable of drawing the attention of subjects who are functioning in an impaired state of consciousness (Paul, 1964; Santostefano, 1976). Thus, three types of stories were utilized, a neutral story and two emotionally-charged stories - one with an aggressive theme and one with a sexual theme.

In order to minimize the degree to which retention of stimulus might be influenced by the entire story and not just the emotionally charged content, a format was utilized whereby only the middle phrase of each story was varied. Thus any single story could become thematically sexual, agressive or neutral through the insertion of the appropriate phrase. To minimize the differences in the familiarity to the experimental subjects of these variable phrases, each phrase was matched for frequency according to the tables available in the Thorndike and Lorge Teachers Word Book of 30,000 Words (1944).

Finally, while it is generally acknowledged that alcoholic Korsakoff patients do have a memory storage capacity within normal limits (e.g. they evidence both normal digit span and sentence span), their short term memory, in general, remains deficient, in part, due to the rapid decay of stored information (Cermak, Butters and Goodglass, 1971; Kinsbourne and Wood, 1975). This rapid decay of stored information has been explained as a combination of the Korsakoff's shallow encoding strategies and increased susceptibility to the effects of certain kinds of interference (DeLuca, Cermak and Butters, 1976). In particular, it has been demonstrated that Korsakoff patients are particularly prone to information loss when their ability to rehearse or recirculate stimulus materials are interfered with by verbal distractor tasks (Cermak, Reale, and DeLuca, 1977). In order to examine the effect that emotionally charged stimulus stories might have on this process of information decay or forgetting, it is necessary to

require each subject to repeat each story twice such that they are asked for the first recall immediately following the presentation of the stimulus, then they are given 30 seconds of a verbal distractor task and then, finally, asked for a second recall of the story. By comparing each group's performance from the first to the second recall a measure of this information decay can be examined. It is expected that only the Korsakoff group will evidence significant loss of information. Furthermore, it is suggested that the emotional charged stimuli will not only lead to increased levels of arousal and attention but that they will also lead to increased depth of processing. This deeper level of processing will, in turn, lead to lowered susceptibility to verbal interference as well as increased levels of retention and should be evidenced by less information decay on the charged stimuli than on the neutral stimuli.

Three subject groups, alcoholic Korsakoff patients (K), alcohol-free chronic alcoholics (A), and normal controls (N), participated in this study. The reason for the inclusion of the A subjects is because current thinking places such chronic alcoholics on a continuum between alcoholic Korsakoff patients and nonalcoholics (Butters & Cermak, 1980). For example, a recent study suggests that long-term alcoholics with no clinically obvious cognitive impairments may have a subtle information processing deficit that impairs their ability to learn and remember efficiently (Brandt, Butters, Ryan & Bayog, 1983; Ryan & Butters, 1980a,b, 1983; Ryan, Butters, Montgomery, Adinolfi & Didario, 1980). Long-term chronic alcoholics however, do not evidence the gross anterograde amnesia that is typical of the Korsakoff patient, and the memory impairment is demonstrable only through relatively subtle and complex tests. In addition, despite these demonstrations of a continuity between long-term alcoholics and alcoholic Korsakoff patients,

no investigators have yet determined that the affective-motivational deficits so characteristic of Korsakoff's syndrome exist to any degree in long-term detoxified alcoholics. The evidence, in fact, points to the contrary, that after a period of detoxification, chronic alcoholics are clinically indistinguishable from non-alcoholics as to personality functioning (Valliant, 1983). In this case, the affective charge of a particular stimulus story would not be expected to have an effect on the retention of that story. It is predicted that their performance would, on that basis, be indistinguishable from the N's in this present study.

In sum, the following predictions are made: 1) N's and A's will, overall, remember more of each story than K's; 2) A's will show no significant differences in overall performance from N's; 3) N's and A's will remember each type of story equally well; 4) K's will remember proportionately more of the emotionally charged stories than the neutral stories; 5) N's and A's will show no differences in overall performance from the first recall to the second recall; 6) K's will perform significantly less well on the second recall than on the first recall; and 7) K's will forget proportionately less of the emotionally charged stories than the neutral stories from the first recall to the second recall.

CHAPTER 3

METHODOLOGY

Subjects. Three subject groups, each with nine subjects, participated in this investigation: (1) alcoholic Korsakoff patients (Ks); (2) alcohol-free chronic alcoholics (As); and (3) nonalcoholic normal controls (Ns). All of the subjects, in all three groups, were male.

All of the Ks employed in this study were diagnosed and treated at the Boston, Brockton, and Bedford VA Medical Centers. Aside from one patient who was residing at home, all were either hospitalized or in nursing homes when tested. They all evidenced a severe memory defect as assessed by clinical methods. They were unable to recall day-do-day and current events and had retrograde amnesia of varying degrees. None of the patients showed signs of general dementia and their intellectual functioning as measured by the Wechsler Adult Intelligence Scale (WAIS) was within normal limits. As a group their mean full-scale IQ was 104 (WAIS); their mean MQ as measured by the Wechsler Memory Scale (WMS) was 79, their mean educational grade level was 12.4, and their mean age at the time of testing was 59. All of them had been born in the Boston area and were of similar ethnic origins. (Table I provides details of age, education and WAIS and WMS results for the Ks and other groups).

The second group, the As, had all either been in treatment at the Boston VA Medical Center or in residence at a local alcoholic half-way house for at least 30 days (i.e. alcohol free for at least 30 days). By clinical assessment, none of these patients evidenced signs of Korsakoff syndrome. The mean IQ (WAIS) of this group was 115, the mean MQ (WMS) was 123, their mean educational grade level was 12.2, and their mean age was 54. All had been born in the Boston area and were of ethnic origins similar to the K population.

				WAIS						WMS				
GROUP		AGE	EDUC.	VIQ	PIQ	FIQ	MQ	INFO	ORIENT	Ment Cont.	Log Mem	Digits	VisRep	Assoc Lrn
		58.8		106.9	99.3	104.0	79.3							
Ks	1	(8.64)	12.4	(10.25)	(8.70)	(7.48)	(10.98)	2.78	3.00	5.56	5.56	9.78	4.89	6.17
		54.3		116.0	111.4	114.9	122.7							
As	2	(4.76)	12.7	(8.43)	(7.81)	(8.05)	(13.42)	5.78	5.00	7.33	12.72	11.78	10.00	12.28
		56.2		111.2	103.8	109.4	114.9							
Ns	3	(5.04)	12.4	(8.39)	(5.74)	(6.17)	(9.09)	5.89	5.00	5.89	10.56	11.22	9.94	12.17

TABLE I. Standardized test results.

Standard deviations are given in parentheses.

The third group, the Ns, were matched for age, education and intellectual abilities to the Ks and As. They were all nonhospitalized volunteers, recruited from a pool of volunteers that had replied to a newspaper advertisement soliciting subjects. By clinical assessment, none of these subjects evidenced signs of acute alcoholism or of Korsakoff syndrome. The mean IQ (WAIS) of this group was 109, the mean MQ (WMS) was 115, the mean educational grade level was 12.4, and their mean age was 56. All had been born in the Boston area and were of ethnic origins similar to the K population.

Materials and Procedure. The stimuli utilized in this investigation consisted of a series of nine stories to be used in conjunction with nine phrases. Each of the stories was made up of twenty-three phrases or bits of information and was similar in format and length to the narrative passages in the Logical Memory section of the Wechsler Memory Scale (1945). Additionally, all of the stories contained approximately the same amount of detail, such as, for example, a single proper name and all were told in the third person. In the middle of each story, at phrase #12, one of the aforementioned nine phrases could be inserted. These nine inserts consisted of three neutral, three aggressive and three sexual phrases. Each of these phrases had been matched for frequency according to the Thorndike and Lorge tables (1944). Any single phrase could be inserted in any single story. Thus each story served as an essentially neutral matrix to which an emotionally charged or affectless phrase could be inserted so as to color the entire story, and render it either emotional or colorless.

Each subject was read the entire series of nine stories.[1] The testing of all subjects occurred in the morning. The nine stories were presented in a

[1]See Appendix I for materials used in this study.

pre-established scrambled order with one major, albeit, arbitrary, restriction: a neutral story (n) was always followed by an aggressive story (a) which was, in turn, followed by a sexual story (s). A particular individual subject could, however, be given either a neutral, an aggressive or a sexual story first, depending upon the pre-established order. Overall, the same order was followed for each group. (Table II provides details of the order of administration of the stories.) Each subject then, was given three of each type of story (i.e. 3n, 3a, 3s). Prior to beginning the series of stories, each subject was read the following statement:

> I want you to know that this is a test involving emotions and memory. I will administer several tests of memory and intellectual capacity to you in the next couple of hours. There are no risks and no discomfort involved in these tests, although I may ask you to repeat some verbal material that you may find vulgar or distasteful. Keep in mind that the results of these tests will be kept strictly confidential. You may ask questions about any or all of the procedures involved in these tests.

Following the reading of the above statement the actual test administration was begun. Before administering any of the stimulus stories, each subject was given two sample stories according to the test procedure for practice. These stories were the two Logical Memory Stories from the Wechsler Memory Scale-Form II (1948). Each of the eleven stories followed the same procedure. This test procedure included the following instructions and went as follows:

> I am going to read you a story. Later you'll be asked for your memory of it. I will ask you to recall each story as accurately as you possibly can. I will read each story once at my usual reading speed. Please do not ask any questions about what I read to you-first because this is a memory experiment and I wouldn't be able to tell you and second, because I don't want anything to interrupt your concentration.
> The tape recorder is to record your responses.
> Please relax and try to concentrate on the story as I read it to you.
> Do you have any questions before we begin?
> Ready?
> Listen closely and remember this story:

STORY

Now, as accurately, completely and faithfully as you can, please tell me the story that I just read to you.

RECALL I

Any more?
Now, count backwards from 100 by 3's (30 sec.)

COUNTING

Now, again, as accurately, completely and faithfully as you can, please tell me again the story that I just read to you.

RECALL II

Any more?
Does anything else occur to you about this story? Any stray fact or thought?

Thus, each subject was read a story once and then asked for immediate recall of that story. A 30-second delay followed during which the subject counted backward by threes. Following this, a second recall of that story was requested. Ten minutes were then allowed before presentation of the next story, during which the subject was engaged in a variety of distractor tasks.

All of a subject's responses were tape recorded to provide an accurate record of each subject's reproductions. Each reproduction was scored for accuracy, with the highest possible score, per recall, being twenty-three. Accuracy was scored on a two-point scale: one point for either a word-perfect information unit or a synonym with a closely related meaning, and a score of zero for either missed or incorrect phrases. Two examiners scored all reproductions independently and discrepancies were eliminated afterwards by discussion. Three steps were taken to promote consistent scoring: (1) A running list of decisions was kept and compiled into a manual that could be consulted during scoring; (2) Reproductions were scored by story and not by subject; and (2) Each examiner re-scored the entire set of reproductions a second time, a few weeks after completion of the first scoring.

Subject #								
1	2	3	4	5	6	7	8	9
A-1	C-5	E-9	G-4	I-8	B-3	D-7	F-2	H-6
B-2	D-6	F-1	H-5	A-9	C-4	E-8	G-3	I-7
C-3	E-7	G-2	I-6	B-1	D-5	F-9	H-4	A-8
D-4	D-8	H-3	A-7	C-2	E-6	G-1	I-5	B-9
E-5	G-9	I-4	B-8	D-3	F-7	H-2	A-6	C-1
F-6	H-1	A-5	C-9	E-4	G-8	I-3	B-7	D-2
G-7	I-2	B-6	D-1	F-5	H-9	A-4	C-8	E-3
H-8	A-3	C-7	E-2	G-6	I-1	B-5	D-9	F-4
I-9	B-4	D-8	F-3	H-7	A-2	C-6	E-1	G-5

TABLE II. The order of administration

Key: Letters refer to a particular 23 phrase story
Numbers refer to a particular stimulus phrase to be inserted in a story such that the nos. 1, 4, 7 are neutral; 2, 5, 8 are aggressive; and 3, 6, 9 are sexual

The above rotations allow each stimulus phrase to be paired with each story. These rotations also allow the alternation of the type of emotional charge that each subject begins with. Thus, for S_1 the series began with a neutral phrase, for S_2 with an aggressive phrase, for S_3 a sexual phrase, and so on, alternating n-a-s.

CHAPTER 4

RESULTS

Number of phrases correctly recalled per recall for each of the three types of stories (neutral, aggressive, sexual) read to each subject out of a possible maximum score of 69 per recall per type of story (23 phrases per story x 3 stories of each type) was first tabulated for each subject (group means are shown in Table III). Ceiling effects were not evidenced for any subject. These raw data were then initially entered into a three-way ANOVA with repeated measures (3 groups x 3 types of stories x 2 recalls). This yielded main effects for group ($df = 2$, $F = 41.45$, $p < .001$), for type of story ($df = 2$, $F = 5.81$, $p = .006$) and for recall ($df = 1$, $F = 11.44$, $p = .003$). There was also a significant group by recall interaction ($df = 2$, $F = 14.81$, $p < .001$) (see figure 1).

Overall group comparisons utilizing 2 sample t-Tests ($\nu = 16$, 2-tailed) showed that the alcoholic Korsakoff patients recalled a smaller total number of phrases correctly than either the normal control group ($t = 8.545$, $p < .001$) or the detoxified alcoholic group ($t = 7.744$, $p < .001$). The normal control group and the detoxified alcoholic group comparison revealed no significant differences in total amount recalled.

The raw scores were then normalized by conversion to ratio scores because the effects to be observed operate on a percentage of total recall basis rather than on an absolute difference basis. The reason for this lies in the nature of the difference between the Korsakoff group and the groups with intact memorial processes. Since the absolute amount of information that can be recalled by the detoxified alcoholics and normal controls is so much greater than for the Korsakoffs, a variation in recall of several phrases becomes insignificant for

GROUP	FIRST RECALL TYPE OF STORY			SECOND RECALL TYPE OF STORY		
	NEUTRAL	AGGRESSIVE	SEXUAL	NEUTRAL	AGGRESSIVE	SEXUAL
NORMALS	34.44	37.44	37.00	35.56	36.33	37.56
	(7.52)	(4.59)	(7.79)	(7.28)	(4.06)	(6.75)
ALCOHOLICS	33.56	34.67	35.67	35.11	33.44	36.00
	(6.09)	(6.06)	(7.78)	(5.84)	(6.00)	(6.71)
KORSAKOFFS	17.56	17.22	23.00	12.11	12.33	18.78
	(5.20)	(4.12)	(5.64)	(6.01)	(5.68)	(6.14)

TABLE III. Mean number of phrases correctly recalled per recall for each type of story (max. score per repetition is 69).
Standard deviations are given in parentheses.

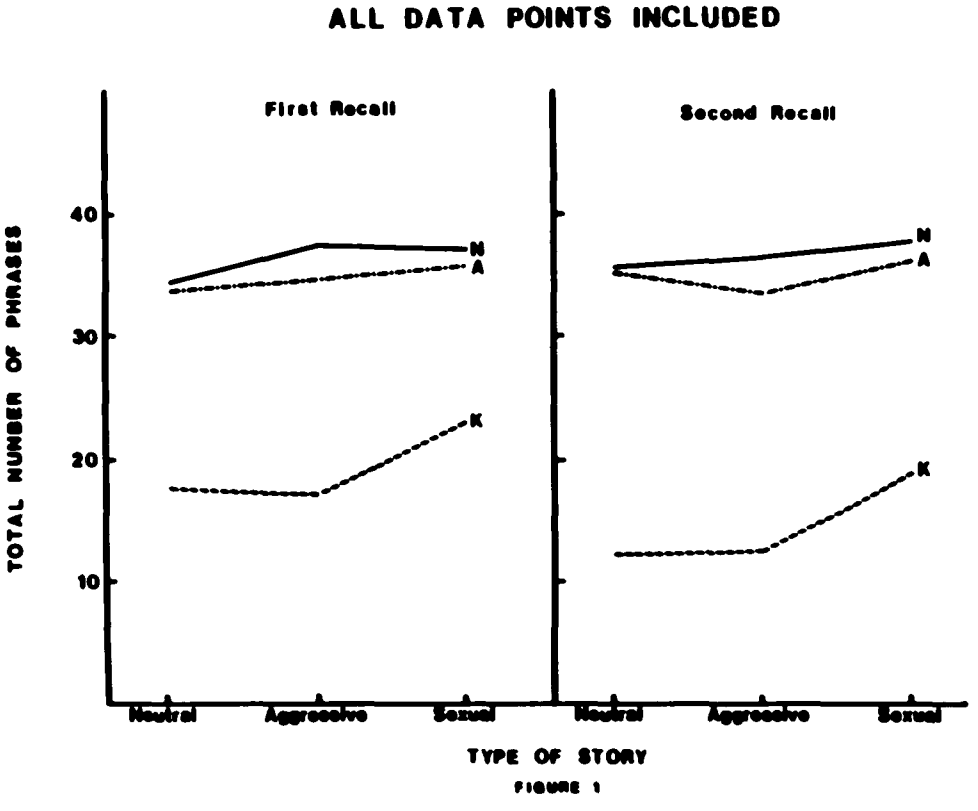
ALL DATA POINTS INCLUDED
First Recall
Second Recall
TOTAL NUMBER OF PHRASES
40
30
20
10
N
A
K
Neutral
Aggressive
Sexual
TYPE OF STORY

FIGURE 1

the alcoholics and normals, while the same absolute difference implies a substantial change for the Korsakoffs. By treating, for example, a five phrase difference in recall for the Korsakoffs in the same manner as for the normals and alcoholics, it ignores the fact that the implications of that absolute difference are actually quite different for the Korsakoffs, due to their amnestic difficulties which results in significantly lowered overall recall.

The normalization of each subject's raw scores was computed in the following manner:

First, each of the individual's six raw scores was considered, these being:

1. Number of phrases correctly recalled in the first recall of the neutral stories (n1)
2. Number of phrases correctly recalled in the second recall of the neutral stories (n2)
3. Number of phrases correctly recalled in the first recall of the aggressive stories (a1)
4. Number of phrases correctly recalled in the second recall of the aggressive stories (a2)
5. Number of phrases correctly recalled in the first recall of the sexual stories (s1)
6. Number of phrases correctly recalled in the second recall of the sexual stories (s2)

Second, these six raw scores were then summed to produce a total raw score for each subject such that:

$$\text{TOTAL} = n_1 + n_2 + a_1 + a_2 + s_1 + s_2.$$

Third, each of the aforementioned six raw scores could then be divided by this total raw score to form six ratio scores, such that, for example:

$$\text{Sex Ratio 1 (sr1)} = \frac{\text{s1}}{\text{TOTAL}}$$

Finally, each of the six ratio scores is multiplied by 100% to form a percentage score. Thus, the total percentage score for each subject, summed across both recalls and all experimental conditions will be 100%.

As an example, if a particular subject had the following scores:

35 and 32 on 1st and 2nd recall of the neutral stories
36 and 35 on 1st and 2nd recall of the aggressive stories
and 39 and 36 on 1st and 2nd recall of the sexual stories

then that particular subject's percentage sex ratio 1 (%sr1) score would be (39 divided by 213) times 100% or 18.3%, his percentage Sex Ratio 2 (%sr2) score would be (36 divided by 213) times 100% or 16.9%, and so on). Each subject's score is thus normalized according to his own capacities for recall.

These percentage ratio scores (see Table IV for group means) were then entered as data into a three-way ANOVA with repeated measures (3 groups x 3 types of stories x 2 recalls) which yielded main effects for type of story ($df = 2, F = 10.264, p < .001$) and for recall ($df = 1, F = 8.060, p = .010$). There were also significant group by type of story interactions ($df = 4, F = 5.612, p = .001$) and group by recall interactions ($df = 2, F = 8.898, p = .002$) (see figure 2).

Between group comparisons were carried out for each type of story for each recall. These between group comparisons utilize 2 sample t-Tests with 16 degrees of freedom. Each is a two-tailed test because it is of interest whether any one group did better or worse than any other group on each type of story. The normal controls and the detoxified alcoholics did not differ significantly from each other. The normal controls and detoxified alcoholics were then combined and the Korsakoff group was compared with this combined group. It was determined that the Korsakoff group recalled proportionately more sexual stories on the first recall than the combined group ($t = 5.659, p < .001$)

GROUP	FIRST RECALL TYPE OF STORY			SECOND RECALL TYPE OF STORY		
	NEUTRAL	AGGRESSIVE	SEXUAL	NEUTRAL	AGGRESSIVE	SEXUAL
NORMALS	15.56	17.33	16.89	16.11	16.67	17.22
	(1.94)	(2.78)	(1.54)	(1.83)	(1.66)	(0.97)
ALCOHOLICS	16.11	16.67	17.11	17.00	16.00	17.22
	(1.76)	(1.66)	(2.37)	(1.66)	(1.58)	(1.39)
KORSAKOFFS	17.67	17.56	23.11	11.22	11.67	18.44
	(3.16)	(4.59)	(3.72)	(4.86)	(5.75)	(2.60)

TABLE IV. Mean percentage ratio scores for each group per recall for each type of story.
Standard deviations are shown in parentheses.

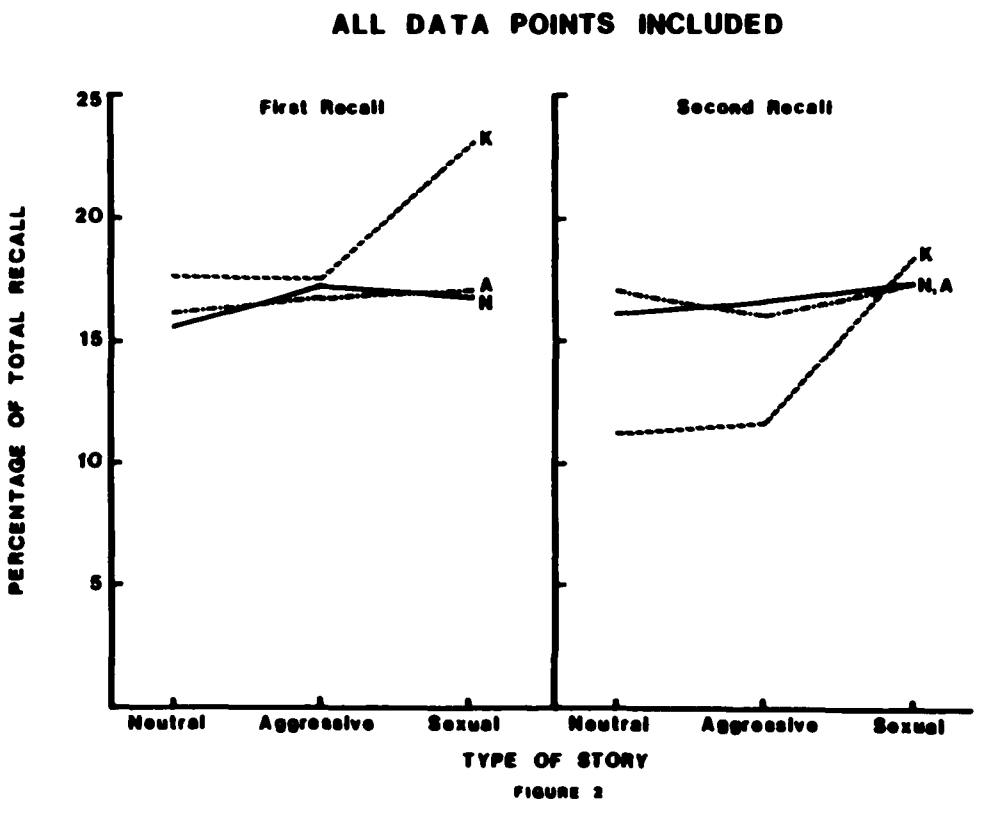
ALL DATA POINTS INCLUDED
First Recall
Second Recall
PERCENTAGE OF TOTAL RECALL
25
20
15
10
5
K
A
N
K
N, A
Neutral
Aggressive
Sexual
Neutral
Aggressive
Sexual
TYPE OF STORY

FIGURE 2

and proportionately less of both aggressive stories on the second recall than the combined group ($t = -3.254$, $p = .005$) and neutral stories on the second recall than the combined group ($t = -4.213$, $p < .001$). (see Table V and figure 3). The so-called "sexual proportion" of the Korsakoff group when compared with the sexual proportion of the combined group, is significantly higher on the first recall. Similar results occur on the second recall, but here, owing to the Korsakoff's impaired retention, their entire recall curve is lowered, such that when compared to the combined group, the Korsakoff's proportion of recall allocated to aggressive and neutral stories are both significantly lower than those proportions allocated by the combined group. The proportion relating to the sexual stories shows no differences between the two groups in this recall. These between group comparisons are unremarkable because they result from the normalization of the raw data. The important result here is the indication that a pattern exists such that the normal controls and detoxified alcoholics do not treat any one type of story differently from any other type, while the Korsakoffs do evidence differences. It remains, however, for the within group comparisons to determine the significance of these indications.

The crux of the results then lies in the important within group comparisons. These within group comparisons utilize paired t-Tests with 8 degrees of freedom. Comparisons of story types within each group are one-tailed because, as outlined previously, the expectation is that emotionally charged material will be better retained than neutral material. The combined group of normal controls and detoxified alcoholics revealed no significant differences as to type of story recalled for each recall. Thus, in the first recall, for the sexual and aggressive conditions there were no differences ($t = 0.000$, n.s.), for the sexual and neutral conditions, no differences ($t = 1.132$, n.s.) and for the aggressive and neutral conditions,

GROUP	FIRST RECALL TYPE OF STORY			SECOND RECALL TYPE OF STORY		
	NEUTRAL	AGGRESSIVE	SEXUAL	NEUTRAL	AGGRESSIVE	SEXUAL
COMBINED	15.83	17.00	17.00	16.56	16.33	17.22
	(1.82)	(2.25)	(1.94)	(1.76)	(1.61)	(1.17)
KORSAKOFF	17.67	17.56	23.11	11.22	11.67	18.44
	(3.16)	(4.59)	(3.72)	(4.86)	(5.75)	(2.60)

TABLE V. Mean percentage ratio score for each group per recall for each type of story.
Standard deviations are given in parentheses.

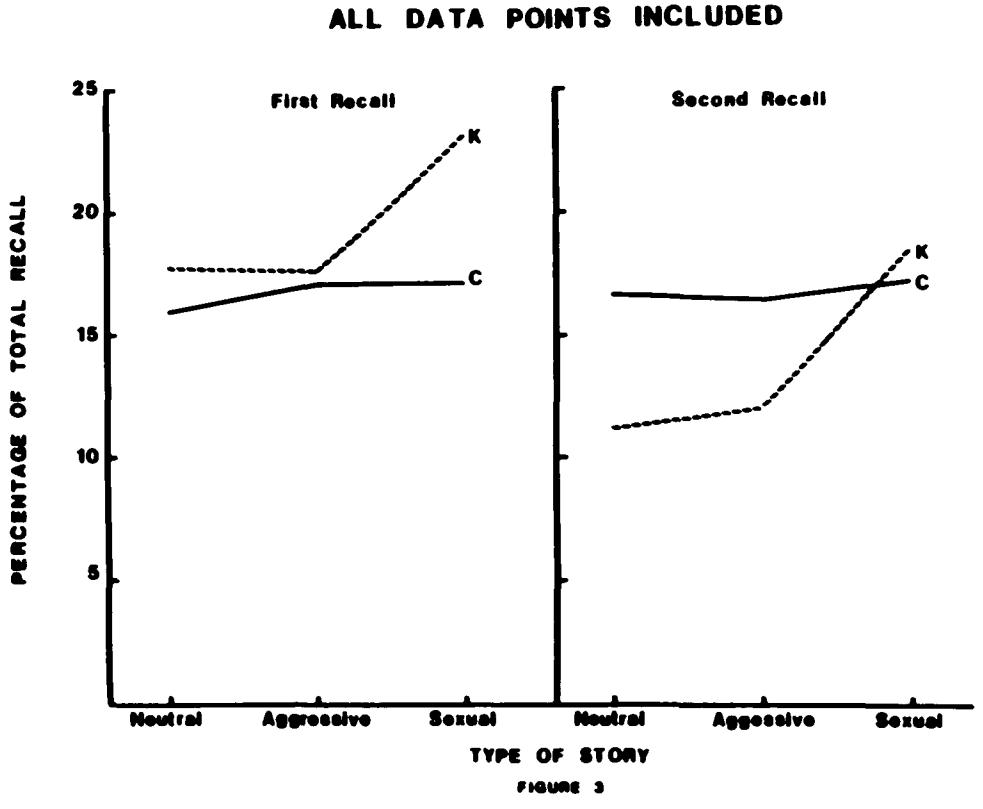
ALL DATA POINTS INCLUDED
First Recall
Second Recall
PERCENTAGE OF TOTAL RECALL
25
20
15
10
5
K
C
K
C
Neutral
Aggressive
Sexual
Neutral
Aggressive
Sexual
TYPE OF STORY

FIGURE 3

again, no differences, ($t = 1.458$, n.s.). Similarly in the second recall for s and n conditions, no differences ($t = 1.589$, n.s.), for s and a conditions, no differences ($t = 1.203$, n.s.) and for a and n conditions, no differences ($t = .316$, n.s.). The Korsakoff group, however, revealed significant differences on the following comparisons: on the first recall, between the sexual and aggressive conditions ($t = 3.981$, $p = .002$) and between the sexual and neutral conditions ($t = 3.865$, $p = .003$); and on the second recall, again between the sexual and aggressive conditions ($t = 2.960$, $p = .009$) and between the sexual and neutral conditions ($t = 6.794$, $p < .001$). No differences within the Korsakoff group were found between the neutral and aggressive conditions in either the first recall ($t = .066$, n.s.) or the second recall ($t = .214$, n.s.). It would appear that the pattern suggested by the between group comparisons is confirmed by the within group comparisons.

In other words, the substantive results of these within group comparisons demonstrate that the Korsakoff subjects recall proportionately more sexual stories than either aggressive or neutral stories, regardless of which recall is examined. The normal controls and the detoxified alcoholics do not evidence such differences in recall amongst the different types of stories, allocating equal proportions of their total recall to each of the three types of stories, regardless of which recall is examined. Perhaps the most surprising element of these results is that the Korsakoff group recalled the aggressive and neutral stories in identical ways. The expectation, of course, was that the aggressive material would have been treated in a manner similar to the sexual material.

It is reasonable to consider whether the Korsakoffs' increased recall of the sexual stories was due solely to a better recall of the single sexual phrase inserted into the story matrix. The alternative hypothesis is that the single sexual phrase was not only recalled better per se, but that it, in some manner,

aided recall of other portions of the story matrix, as well, resulting in a so-called "spread-of-effect" across the story matrix. To examine this notion, within group comparisons were again made for the Korsakoff group. Again these comparisons utilize paired t-Tests ($\nu = 8$) and are one-tailed for the same reasons as previously mentioned (i.e. that emotionally charged material will be retained better than neutral material). In order to eliminate the effect due solely to recall of the charged phrase, performance on that phrase was subtracted from each subject's score (the "minus one" case). Furthermore, to examine how far this spread-of-affect might extend, within group comparisons were also made with the phrases to either side of the charged phrase, as well as the charged phrase, discounted ("minus three" case) and with the two phrases to either side of the charged phrase, as well as the charged phrase, discounted ("minus five" case).

Within group comparisons, then, yielded the following results for the Korsakoffs:

1. For "minus one" (performance on 12th or charged phrase discounted) - for recall one, significant differences between the s and a conditions ($t = 2.716$, $p = .014$) and between the s and n conditions ($t = 2.138$, $p = .033$); for recall two, significant differences between the s and a conditions ($t = 2.379$, $p = .023$) and between the s and n conditions ($t = 4.546$, $p = .001$). No significant differences were found between the a and n conditions in either the first recall ($t = -.490$, n.s.) or the second recall ($t = .790$, n.s.) (see table VI for group means and figure 4).

2. For "minus three" (11th, 12th and 13th phrases discounted) - for recall one, there are significant differences between the s and a conditions ($t = 2.132$, $p = .033$) and between the s and n conditions ($t = 2.056$, $p = .037$); for recall two, there are significant differences between the s and a

GROUP	FIRST RECALL TYPE OF STORY			SECOND RECALL TYPE OF STORY		
	NEUTRAL	AGGRESSIVE	SEXUAL	NEUTRAL	AGGRESSIVE	SEXUAL
COMBINED	15.17	16.06	15.67	15.72	15.33	15.83
	(1.79)	(2.13)	(2.00)	(1.67)	(1.68)	(1.51)
KORSAKOFF	16.89	16.00	20.11	11.33	10.44	15.44
	(3.30)	(4.50)	(3.37)	(4.00)	(5.25)	(3.21)

TABLE VI. Mean percentage ratio scores - "Minus One Case" (i.e. phrase #12 discounted). Standard deviations given in parentheses.

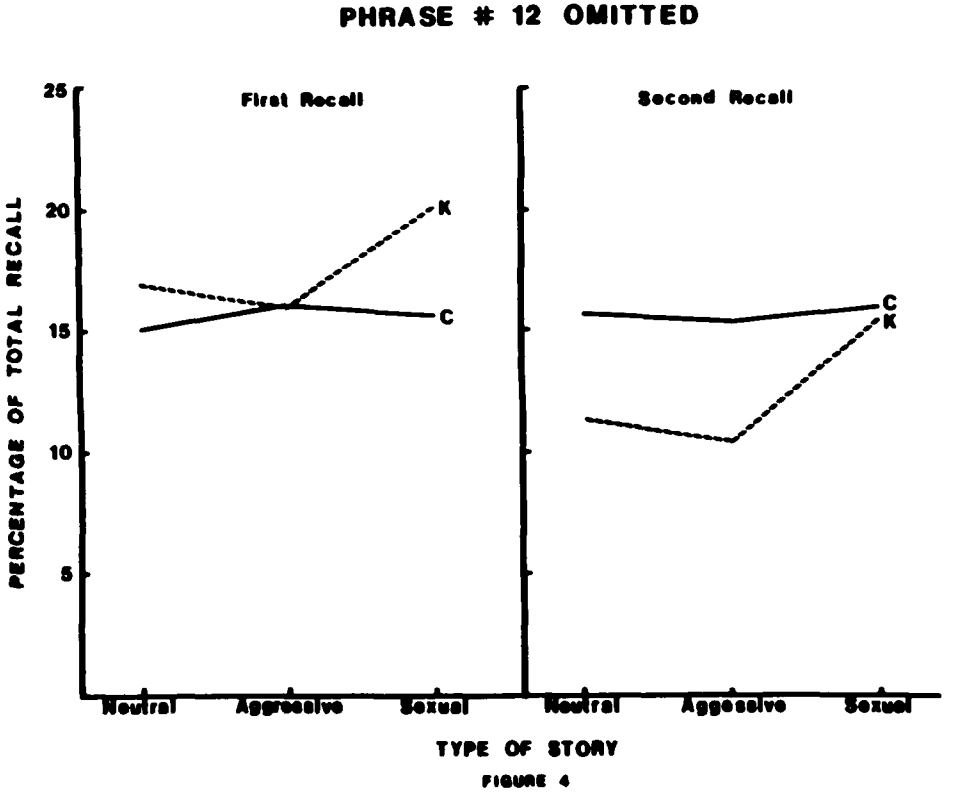
PHRASE # 12 OMITTED
First Recall
Second Recall
PERCENTAGE OF TOTAL RECALL
25
20
15
10
5
K
C
C
K
Neutral
Aggressive
Sexual
Neutral
Aggressive
Sexual
TYPE OF STORY

FIGURE 4

conditions (t = 1.973, p = .042) and between the s and n conditions (t = 2.359, p = .023). Again, no significant differences were found between the a and n conditions in either the first recall (t = 0.124, n.s.) or the second recall (t = 0.794, n.s.). (see Table VII for group means and figure 5).

3. For "minus five" (10th, 11th, 12th, 13th and 14th phrases discounted) - for recall one, there are significant differences between the s and a conditions (t = 2.324, p = .025) and between the s and n conditions (t = 2.052, p = .037); for recall two, there are significant differences between the s and a conditions (t = 2.393, p = .022) and between the s and n conditions (t = 2.259, p = .027). Again, no significant differences were found between the a and n conditions in either the first recall (t = 0.120, n.s.) or the second recall (t = -1.200, n.s.) (see Table VIII and figure 6).

There were no significant differences as to type of story recalled within the combined group of normal controls and detoxified alcoholics for any of the above situations.

Overall performance of the groups from the first recall to the second recall was then compared. These within group comparisons utilize paired t-Tests with 8 degrees of freedom for the Korsakoff group and 16 degrees of freedom for the combined group of normal controls and detoxified alcoholics. Comparisons are one-tailed because, as explained earlier, the expectation is that there will be a decrease in performance from first to second recall. The combined group performed equally well on both recalls (t = -0.559, n.s.). The Korsakoff group, however, performed significantly better on the first recall than on the second recall(t = 2.982, p = .009). Examining performance of the Korsakoff group from first to second recall as to each type of story, revealed that they consistently performed better on the first recall than on the second recall. In other words,

GROUP	FIRST RECALL TYPE OF STORY			SECOND RECALL TYPE OF STORY		
	NEUTRAL	AGGRESSIVE	SEXUAL	NEUTRAL	AGGRESSIVE	SEXUAL
COMBINED	13.78	14.56	14.44	14.22	13.94	14.44
	(1.44)	(2.04)	(2.09)	(1.56)	(1.86)	(1.20)
KORSAKOFF	15.00	14.78	18.11	10.44	8.89	13.11
	(3.20)	(3.99)	(2.80)	(3.81)	(5.11)	(4.56)

TABLE VII. Mean percentage ratio scores - "Minus Three Case" (i.e. phrases #11, 12, & 13 omitted). Standard deviations given in parentheses.

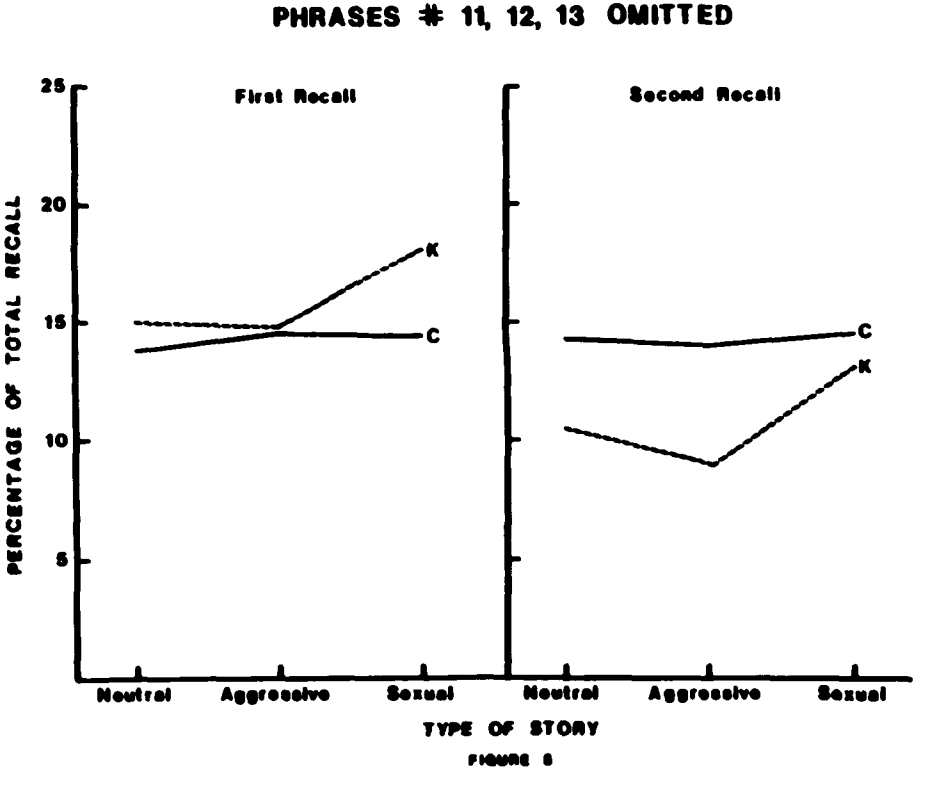
PHRASES # 11, 12, 13 OMITTED
First Recall
Second Recall
PERCENTAGE OF TOTAL RECALL
25
20
15
10
5
K
C
C
K
Neutral
Aggressive
Sexual
Neutral
Aggressive
Sexual
TYPE OF STORY

FIGURE 8

GROUP	FIRST RECALL TYPE OF STORY			SECOND RECALL TYPE OF STORY		
	NEUTRAL	AGGRESSIVE	SEXUAL	NEUTRAL	AGGRESSIVE	SEXUAL
COMBINED	12.78	13.39	13.17	13.33	13.06	13.33
	(1.56)	(1.79)	(1.92)	(1.85)	(1.83)	(1.57)
KORSAKOFF	13.44	13.67	16.67	9.78	7.78	12.22
	(2.88)	(4.06)	(2.96)	(3.38)	(4.30)	(4.15)

TABLE VIII. Mean percentage ratio scores - "Minus Five Case" (i.e. phrases #10, 11, 12, 13, 14 omitted). Standard deviations given in parentheses.

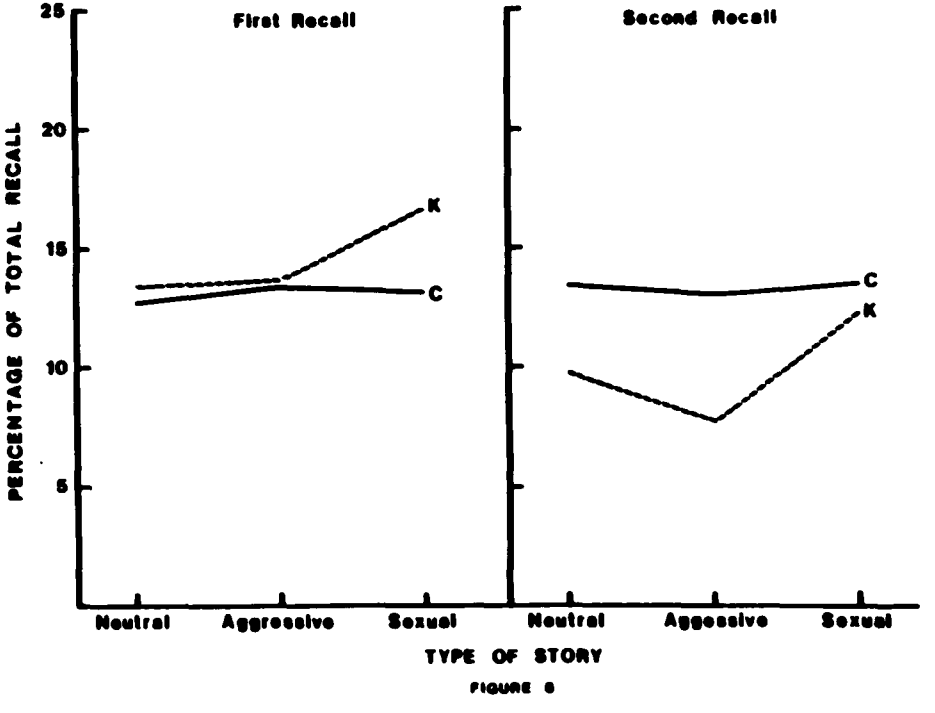
PHRASES # 10, 11, 12, 13, 14 OMITTED
First Recall
Second Recall
PERCENTAGE OF TOTAL RECALL
25
20
15
10
5
K
C
C
K
Neutral
Aggressive
Sexual
Neutral
Aggressive
Sexual
TYPE OF STORY

FIGURE 8

they performed better on the first recall under the sexual condition than on the second recall ($t = 2.985$, $p = .009$); likewise under the aggressive condition ($t = 2.073$, $p = .036$), and likewise under the neutral condition ($t = 3.135$, $p = .007$). (see fig. 7).

In order to examine how emotionally charged stimuli affect the Korsakoff patients tendency to lose stored information over time, difference scores were derived and compared under the three experimental conditions (i.e. sexual, aggressive and neutral). This was accomplished by subtracting each Korsakoff's percentage ratio score on the second recall under each condition from each subject's respective score on the first recall, or, for example, the information lost under the sexual condition is equal to the sexual proportion on the first recall minus the sexual proportion on the second recall, and so on for the aggressive and neutral conditions. The ratio score thus formed is termed the "proportion forgotten" and is compared according to condition. These within group comparisons utilize paired t-Tests with 8 degrees of freedom and are one-tailed because the expectation is that the emotionally-charged stimuli will lead to lowered levels of information decay over time. It was, however, found that there were no significant differences in the proportion forgotten according to experimental condition. Thus, there were no differences between the sexual proportion forgotten and the aggressive proportion forgotten ($t = -0.616$, n.s.); no differences between sexual proportion forgotten and neutral proportion forgotten ($t = -1.047$, n.s.), and no differences between the aggressive proportion forgotten and the neutral proportion forgotten ($t = -0.251$, n.s.) (see fig. 8). These somewhat surprising results indicate that emotionally charged material decays from storage at the same rate as neutral material for the Korsakoff patients. Thus, even though the Korsakoff

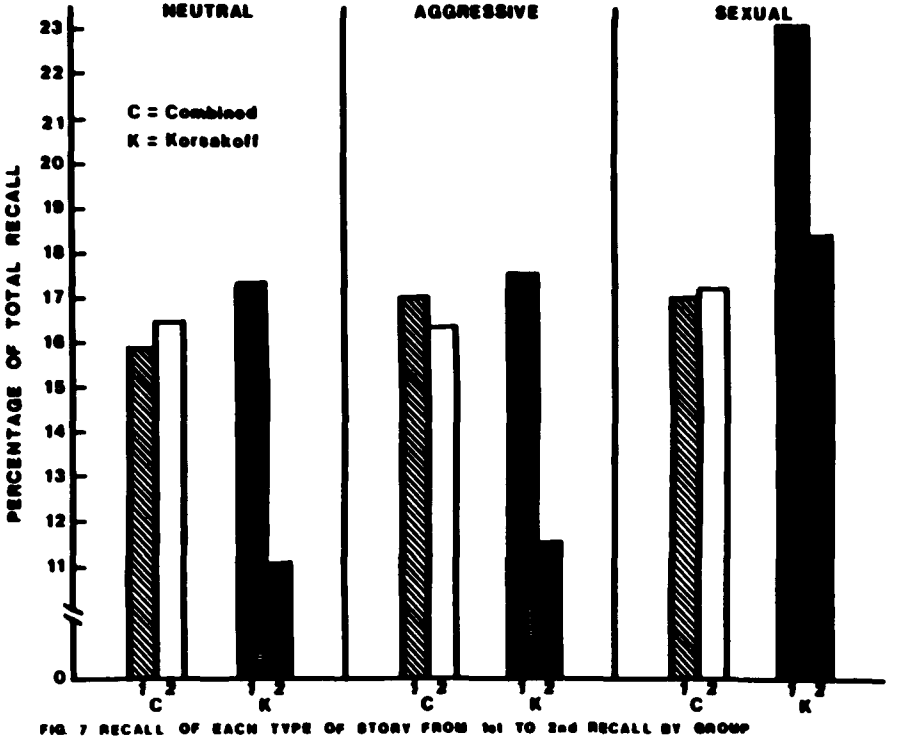

FIG. 7 RECALL OF EACH TYPE OF STORY FROM 1st TO 2nd RECALL BY GROUP

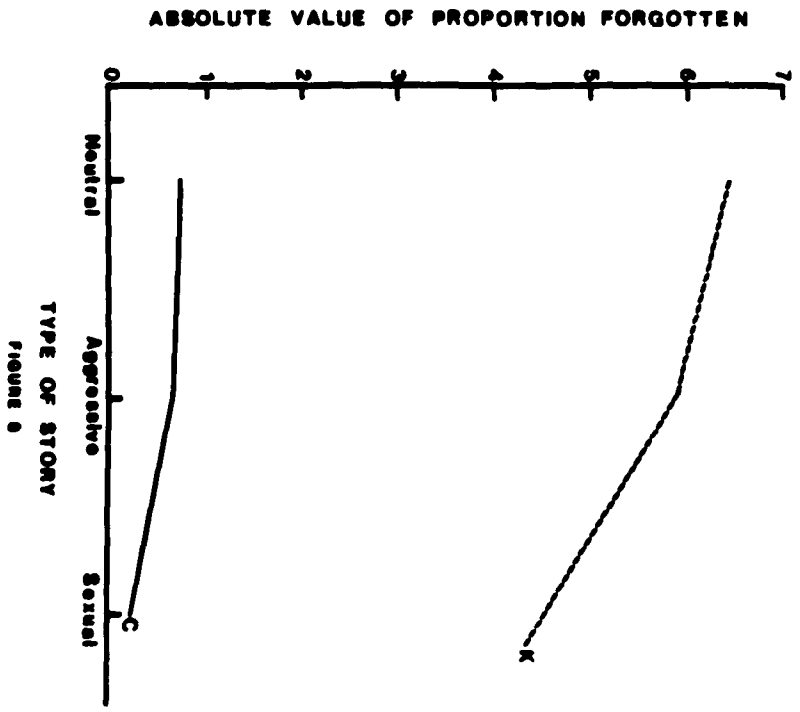
ABSOLUTE VALUE OF PROPORTION FORGOTTEN
0
1
2
3
4
5
6
7
Neutral
Aggressive
Sexual
TYPE OF STORY
C
K

FIGURE 8

patients do recall proportionately more of each story from the first to the second recall, and recall proportionately more of the sexual stories than either the aggressive or neutral stories on each recall taken individually, the actual proportion forgotten from first to second recall is the same regardless of experimental condition.

The above results then bring up the question as to whether the already noted heightened retention of sexual material is solely an attentional effect. If this were true, then there would be heightened recall only on the half of each sexual story that followed the sexual phrase on the first recall. The basis for this hypothesis is obvious, because until that middle phrase was read to the subject, the subject would have no reason to pay more attention to that particular story. In other words, the first half of each story under each condition on the first recall is affectively identical. To examine this hypothesis, each Korsakoff's performance on the first recall was examined both prior to the charged phrase (i.e. the first 11 phrases) and then after the charged phrase(i.e. the last 11 phrases) with performances on the charged phrase (i.e. the 12th phrase) not counted. Again these within group comparisons utilize paired t-Tests ($\nu = 8$) and are one-tailed. These comparisons revealed the following results:

1. For the first eleven phrases - significant differences between the s and a conditions ($t = 2.829$, $p = .011$) and no significant differences between either the s and n conditions ($t = 1.681$, n.s.) or the a and n conditions ($t = -0.088$, n.s.).

2. For the last eleven phrases - no significant differences between either the s and a conditions ($t = 1.671$, n.s.), the s and n conditions ($t = 0.906$, n.s.), or the a and n conditions ($t = 0.594$, n.s.).

The above results indicate that the heightened recall of the sexual stories is not confined solely to those parts of the story that follow the sexually charged phrase (see fig. 9).

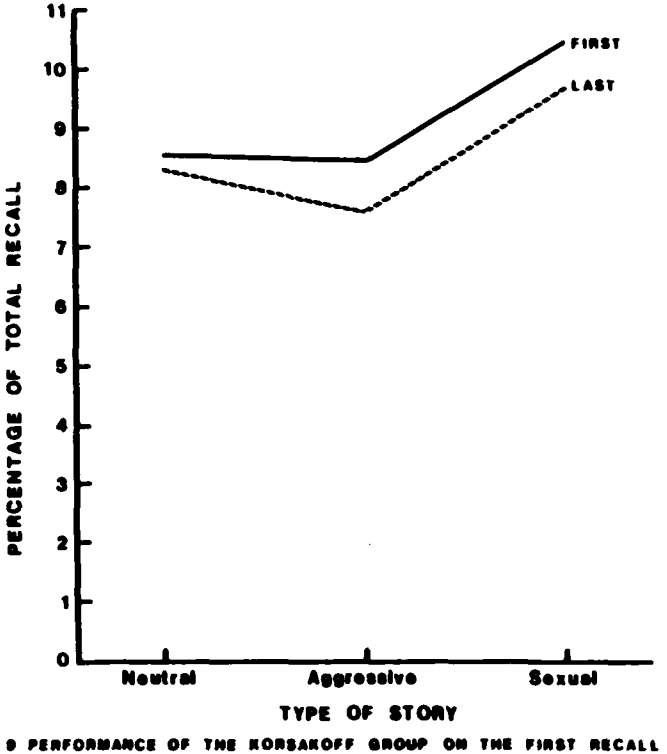

FIG. 9 PERFORMANCE OF THE KORSAKOFF GROUP ON THE FIRST RECALL FIRST ELEVEN PHRASES VS. LAST ELEVEN PHRASES

The results can then be summarized by reiterating the following seven points:

1. Both the normal controls and the detoxified alcoholics recall significantly more of each story overall than do the Korsakoffs.

2. The normal controls and the detoxified alcoholics do not differ between themselves as to amount recalled.

3. The normal controls and the detoxified alcoholics do not differ as to their recall of the three types of stories and they recall each type of story equally well.

4. The Korsakoffs remember proportionately more sexually charged stories than either aggressively charged or neutral stories. Furthermore, this enhanced recall is not confined solely to recall of the charged phrase (#12), but appears to include other parts of the story matrix as well. Thus, even when the subject's performance on as many as the middle five phrases (10th, 11th, 12th, 13th, 14th) is not counted in scoring, the sexual type of story is still remembered better than the other two types of stories.

5. The normal controls and detoxified alcoholics do not differ between themselves as to their overall performance from the first to second recall.

6. The Korsakoffs perform significantly less well on the second recall than on the first.

7. Although the Korsakoffs do recall proportionately more sexually charged stories than either aggressively charged or neutral stories, the proportion forgotten of each story from first to second recall is the same, regardless of emotional charge.

CHAPTER 5

DISCUSSION

The rationale for carrying out the present study was to define further the nature of the effect of emotionally-charged stimuli on the recall of verbal materials by alcoholic Korsakoff patients. Numerous investigators, beginning with Korsakoff's (1889/ 1955) own observations, have alluded to an emotional component to the psychopathology of the Korsakoff syndrome. Most recently, a number of researchers associated with the Boston group (e.g. Biber, Butters, Rosen, Gerstman, & Mattis, 1981; Oscar-Berman, 1973, 1980) have suggested that motivational anomalies could account for some aspects of the psychopathology. While it is clear that emotions influence motivation, and vice-versa (e.g. Arnold, 1960; Izard, 1978; Oscar-Berman, 1980), there has, until now, only been inferential evidence that these factors affect the retention of stimulus materials by alcoholic Korsakoff patients.

The results of the present study, in which the emotional characteristics of the stimuli presented to the subjects were experimentally manipulated, provide evidence that a direct relationship between the emotional valence of a stimulus and its retention by alcoholic Korsakoff patients does exist. In particular, the present findings demonstrate that through the use of highly emotional stimuli, in this case sexual, a higher level of motivation has been evoked which has resulted in increased learning and retention. When a sexual phrase was inserted in an essentially neutral story matrix, not only was that particular phrase remembered, but the entire story, including phrases both preceding and succeeding the sexual phrase, was recalled better by the alcoholic Korsakoff group. Such was not the case with stories containing either aggressive or neutral phrases. The fact that the heightened recall of the sexually charged story was not confined

solely to those portions of the story matrix following the sexual phrase indicated that this effect of increased retention cannot be ascribed merely to an effect of heightened attention, although heightened attention might be a contributing factor. Although the emotional valence of the story had no differential effect on the Korsakoff's rate of forgetting, significantly more of the sexual stories was still retained by them even following a period of verbal distraction. The normal controls and detoxified alcoholics did not evidence any differences between themselves, not did they evidence any of the effects described above; rather they remembered all stories equally well and did not demonstrate any forgetting over the period of the verbal distraction task.

The issue as to whether the emotional valence of a particular stimulus affects the Korsakoff's ability to retain that stimulus is a controversial one. Much of the controversy stems from Talland's (1965) assertion that emotionally charged material and neutral material are remembered equally poorly by the Korsakoffs. He bases his conclusions, however, on two studies - one by Hartmann (1930) and the other, his own (Talland and Ekdahl, 1959). As mentioned earlier, his own study was flawed because neither his emotionally-charged passage nor his neutral passage exceeded 5 bits of information - well within the normal sentence span of Korsakoff patients. Thus, when the Korsakoffs were asked for an immediate recall following the stimulus presentation, no differences in story recall could be expected. As to the earlier study by Hartmann, Talland (1965) maintains that it demonstrated that stories with emotional content and neutral stories are recalled equally well. Upon examining Hartmann's paper, it appears that he was attempting to study the differences in the way objectionable (i.e. graphically obscene) material, as opposed to non-objectionable material is recalled by Korsakoffs. In addition, none of Hartmann's stories are free from drive-related

content, so that there were no neutral passages available for comparison. Again, the expectation would be that all passages would be remembered to the same degree, as is confirmed by the experiment. Hartmann does demonstrate that graphically described sexual acts undergo transformations (through such processes as condensation, symbolization and repression) so as to render such descriptions less "objectionable." Talland's conclusion then, that affectively-charged passages and neutral passages are remembered no differently by Korsakoffs seems to rest on a less than firm foundation. Additionally, Talland, in his review of the literature, seems to seriously de-emphasize the notion that affective factors do play a role in the nature of the Korsakoff's amnesia. For example, he places Claparède's (1911/1951) study, which clearly demonstrated that highly affectively charged events can be recalled, in a section that focuses on the controversy over whether the Korsakoff's primary deficit is one of recall or of registration; Lidz's (1942) paper, with its explicit case history detailing the interaction of affect, motivation and memory in a Korsakoff patient is relegated to the section on cognitive derangement without mention of this important example. Talland's reluctance to merit affective components to the psychopathology is somewhat mitigated, however, for he ultimately ascribes the deficit to the conative or motivational sphere, and adds, unequivocally that the "processes involved in remembering are common to other cognitive functions and interdependent with the affective" (p. 262). The present study, which is, in actuality, little more than a systematic re-iteration of Hartmann and Betlheim's 1924 study, provides evidence that the emotional valence of a stimulus does affect the Korsakoff's retention. It is hoped that this evidence is sufficient to gain some degree of closure to the controversy which Talland fueled. The question remains, however, as to how it is that something as nebulous as emotional valence affects retention, as well as the question of why it does have such effects.

In attempting to answer these questions, it is necessary to examine a variety of viewpoints. First it is useful to recall the relevant neuropathology. The site of the lesion in alcoholic Korsakoffs has been reliably localized as involving subcortical limbic system structures (Victor, Adams and Collins, 1971), in all likelihood precipitated by a combination of alcoholism and nutritional (thiamine) deficiency. Specifically, histological analyses of the brains of Korsakoff patients have uncovered a marked atrophy of the dorsal medial nucleus of the thalamus, and in most cases, atrophy of the mammillary bodies, in addition. The behavioral correlates of these lesions have led researchers to a variety of speculations to explain the observed psychopathology. Rozin (1976) points out that both of these seeimingly critical lesions lie in Papez' circuit (Papez, 1937). This sequence of interconnected neuroanatomical structures to which a functional unity has repeatedly been attributed has often been hypothesized to be central in the mediation of emotional behavior (Arnold, 1960; MacLean, 1949; Papez, 1937). Rozin and other authors (e.g. Davidson, 1948; Talland, 1965) have attributed the characteristically flat affect, apathetic state, and lack of salient personality traits of the Korsakoff patient to interruptions in this circuit caused by the lesions in the mammillary bodies and dorsal medial nucleus of the thalamus. On the other hand, whatever role these particular structures play directly in memorial or emotional functions, it is known that the dorsal medial nucleus is more than just a major feeder of pathways into the limbic system. This nucleus has extensive projections both to and from the frontal cortex (Akert, 1964; Nauta, 1972). The thalamo-frontal system can be shown to be a part of a major ascending reticular activating system for the cortex. In addition, a recent study has shown that there are major projections of the mammillary bodies to the frontal cortex in monkeys (Jacobson, Butters and Tovsky, 1978). Therefore Oscar-Berman

(1980) and others (e.g. Biber, et al, 1981) feel that many of the amnesic effects in the Korsakoff syndrome can be better understood in terms of disturbances in arousal and attention. A third neuroanatomical approach, similar to Rozin's in acknowledging the lesions to Papez' circuit, focuses on the behavioral correlates to the interruption between hippocampus and cortex. Greenberg, Pearlman, Brooks, Mayer and Hartmann (1968) observed a disturbed sleep pattern in Korsakoff patients and noted that these patients dream reports were characteristically flat and affectless with pedestrian content. Noting that a similar lesion in cats (i.e. destruction of limbic afferent pathways via fornix or thalamus) produces a disconnection between hippocampus and cortex and results in a similar abnormal sleep cycle, the authors suggested that in the Korsakoff syndrome, the disruption of one of the principle efferent pathways from hippocampus to cortex causes an interference with the limbic contribution to the dream process and a disturbance in affective activation. They hypothesize that the lesion specifically results in a disconnection between primitive emotions (hippocampal) and elaborative imagery and associations (cortical). Examining these three neuroanatomical approaches, it can be seen that not only memory is implicated by the neuropathology, but affects, motivation, attention, arousal, imagery and associative processes are suspect as well. Lesions in these two structures then, provide a neuroanatomical basis for Oscar-Berman's (1980) assertion that all of the processes involved in the memory process (affects, attention, arousal, motivation, etc.) are all inextricably intertwined and deficits in one process affect all others interdependently. Greenberg, et al. went on to demonstrate that under nitrous oxide, two Korsakoff patients had very vivid, emotion-laden dreams which were well remembered. They hypothesized that the increase in emotion during the nitrous oxide administration overcame the hippocampal-cortical block with resultant improvement

in memory. The present study would seem to indicate that the use of highly emotional stimuli had analagous effects. While there is clear neuropathological damage which disrupts a number of critical neuroanatomical systems, parts of these systems are apparently intact. Thus, the use of highly emotional stimuli might result in an increase in limbic system activity sufficient to make use of undamaged cells in the mammillary bodies and in the dorsal medial nucleus of the thalamus or else alternative pathways might become available due to the increased activity or both. It can thus be surmised from the neuroanatomical arguments that the use of such emotionally salient stimulus material will result in increased retention for the Korsakoffs. The present study demonstrates this to be so.

The results of the present study can also be understood through the levels of processing paradigm which suggests that the Korsakoff's inability to learn new information can be attributed to seriously impaired encoding capabilities (see, for example, Butters & Cermak, 1980). Biber, et. al. has shown that Korsakoff patients tend to spontaneously employ relatively shallow encoding strategies, but if they can be induced to utilize deeper encoding strategies, their memory performance will be improved. It will be recalled that shallow levels of processing are concerned with the analysis of physical or sensory features of stimuli (physical encoding), somewhat deeper levels are more concerned with pattern recognition (e.g. acoustic encoding) and the deepest levels of processing involve the extraction of meaning from stimulus materials and/or the elicitation of associations to that material (semantic encoding). Craik & Lockhart (1972) suggest that the reproduction of relatively complex verbal stimuli such as sentences or prose passages necessitates deep level or semantic processing by the subject. It can thus be assumed that each story was encoded semantically by the Korsakoff

patients; if the stories had not been so encoded, the Korsakoff's recall would have consisted of randomly remembered, unconnected words and this was not the case, for actual stories (albeit very forshortened) were reproduced. If all the stories were semantically encoded, as appears to be the case, the question then remains as to why the sexually charged story was retained so much more completely. One possible explanation lies in the notion that the sexually charged stories encouraged additional elaborative processing, possibly involving either additional or else, more personal, associations. This more extensive, more complex semantic analysis performed on the sexually charged story should then strengthen that story's representation in memory and consequently should lead to a more complete reproduction. The results of the Korsakoffs first recall of the stories in this study validates this notion, and corroborates Biber, et. al.'s findings, given the assumption of deeper levels of processing for the sexual stories. The problem with this explanation, however, lies in the fact that the sexual stories were forgotten at the same rate as both the neutral and the aggressive stories. The implication of the fact that there was no differential rate of forgetting for the sexual stories is that there is an affective/motivational component to the Korsakoff syndrome but this component appears to have its greatest impact on attentional processes, rather than memory. The emotional valence of the sexual stories seems to motivate the Korsakoff patient to attend to the stimulus materials better and encode more features of these particular stories semantically. This enhanced semantic encoding does not improve retention over time - it neither facilitates transfer from short-term memory to long-term memory nor does it facilitate retrieval. The sexual stories are, indeed reproduced more completely than the other types of stories on both repetitions by the Korsakoffs, but all stories decay from memory at the same rate, regardless of the valence

of that story. The critical component, then, is this initial processing of the story which leads to increased recall; once this critical, initial phase is passed, the valence of the story does not, any longer, have differential effects. This result, refutes the argument that the basis for the Korsakoffs memory deficit lies in their inability to spontaneously encode semantically for all stories were encoded semantically. It effectively separates the notion of an encoding memory-deficit into two distinct components - one attentional in nature, and the other retentional in nature. These results also suggest a method to help motivate Korsakoff patients to initially encode more features of presented materials semantically.

The aforementioned hypothesis, does not, however, explain one aspect of the results found in the present study. Extrapolations from the above hypothesis suggest that the sexual phrase itself serves as an attentional marker, which, once it is presented, encourages the Korsakoff to encode more features of the material that follows. It is expected then that on the first recall the first half of each story before the charged phrase should be recalled identically and differential recall would be indicated on the second half only. The results did not confirm this expectation. To understand why this expectation was not met, it is necessary to consider the nature of the stimulus materials. The vast majority of the recent data concerning the Korsakoffs memory disorder has derived from experiments involving lists of verbally unconnected material (i.e. single word lists) in much the same way as Ebbinghaus (1885/1913) first examined memory. Bartlett (1932) has pointed out that there are fundamental difficulties with any conception that treats the mind as a storehouse of discreet traces (see also Paul, 1959). He goes on to suggest that recall is an active process of construction based upon some 'dominant detail' that does persist. Perhaps even more important to Bartlett's notion is that the major component of this construction process is the attitude involved in the initial situation. According to Paul (1959),

> This attitude - broadly conceived - is the major determinant of the way the person reproduces the original situation. Bartlett showed how reproduction can be understood as an attempt to "justify" this attitude. The process of justification...points up what is active and functional in remembering, and what is integrative and constructive (p.5).

The present study, through the use of verbally connected prose passages asks the Korsakoff patient to, in effect, engage in this process of construction by asking him to reproduce the passage. If a random list of unconnected words had been used instead, with an emotionally valent word in the middle of the list, then the Korsakoffs would probably recall the first half of each list identically and only evidence differential learning on the second half according to the valence of that middle word, and the effect of that middle word as an attentional marker could have been demonstrated. Utilizing stories, however, asks the Korsakoff to construct a coherent reproduction. To do this, it appears that the Korsakoff does use the sexual phrase as an attentional marker and then constructs both halves of the story - that which led up to the sexual phrase, as well as that which follows. The fact that either more features of the sexually charged story were initially processed or else that it was processed at a deeper level evoking more associations, leads to a more elaborate construction - in effect, a more complete reproduction of the story. The critical effect then, that the sexual phrase has, appears to be attentional in nature and does seem to motivate the Korsakoff to encode the stimulus more completely.

It thus seems clear that, as with Paul's (1964) experiment, the results of this study, demonstrating that sexually charged content facilitated recall by the Korsakoffs, can be explained by the notion that this content "captured" attention. It appears that for the Korsakoffs, who are, by definition, in an altered state of consciousness, the sexual material was more vivid - that is, it did not require much voluntary expenditure of attention, but by its very

nature it motivated the Korsakoffs to attend to the stimulus more intently. In fact, this heightened level of motivation was not a voluntary act by the Korsakoffs, rather their attention was drawn by forces very much outside of the Korsakoff's jurisdiction.

It is perhaps not necessary to go further than to suggest that the sexually charged story differs from its aggressive and neutral counterparts with respect to the property of vividness. Given the Korsakoff's general sluggishness of most of their cognitive functions (especially attention, concentration and memory) and their general apathy and flat personality, it is evident that the variable of vividness comes to play an important role. Yet the question as to why the sexually charged material is more vivid than the aggressively charged or neutral material remains unanswered. Likewise, the issue of why such material should capture the Korsakoffs' attention is in question. This study had originally hypothesized that the Korsakoffs would remember the sexual and aggressive stories with equal clarity, and both would be recalled better than the neutral story. This hypothesis had derivations from psychoanalytic theory at its roots. According to these constructs, passages relating to instinctual drives should be most effective in eliciting differential levels of learning. In particular, when the relative autonomy of ego functions has either not yet developed (as in the case of the neonate) or has been impaired (as in the case of the Korsakoff patient), drives play an organizing role in cognitive functioning (Jacobson, 1964; Paul, 1964; Rapaport, 1951). Only when the individual has developed sufficiently, and is in a normal, wakeful, alert state-of-consciousness, can cognitive functions be independent from the influence of drives. It is clear then, that drive-related material should, by definition, attain a vividness capable of directing the deployment of attention cathexes and motivating higher levels of learning. It would appear then, that

there is a fundamental difference between aggresive content and sexual content, in that the latter seems to relate to primitive instinctual drives, while the former does not. It has been almost universally acknowledged that the sexual drive is, at the very least, a derivative of such primitive instincts (see for example, Freud, 1905/1953, 1940/1964). As stated earlier, the role of aggression is a much more nebulous matter. Some, such as Spitz (1965), assign a central role to the aggressive drive, noting that it "serves as the motor of every movement, of all activity, big and small, and ultimately of life itself" (p .106), and that it is present at birth (Jacobson, 1964) and that it is an essential motivating force in the process of developing self and object representations (Rudolph, 1981). Freud himself was not completely clear as to whether aggression was a drive derivative, although he did ultimately feel that the aggressive instinct was the derivative and main representative of the death instinct, which is found alongside of the life instinct and its derivatives (1930/1961). Yet there has been much controversy over the assignment of aggression to the realm of primitive drives. For example some current analytic thinkers view aggression as nothing more than a defense mechanism utilized to defend the individual from feelings of rejection (Balint, 1952; Kohut, 1977) or frustration (Dollard & Miller, 1939; Fine, 1979). Fine, in differentiating sexuality from aggression, underscores the biological fact that while sexuality is under hormonal control, aggression is not. He adds that aggression, unlike sexuality, has not been found to have any single physiological basis or source. Brenner (1971) in attempting to resolve this controversy over the nature of aggression, calls aggression a psychological drive, because, although it does evidence similarities to sexuality, it cannot be related to any physiological phenomenon other than brain functioning. In so doing, however, Brenner underscores a qualitative difference between sexuality and aggression. Arnold (1960)

presents the cogent argument that motivation is contained in the individual's unconscious assessment of whether some thing (e.g. object) is beneficial or harmful to the individual. Discharge of sexual feelings results in pleasure to the individual and continuation of the species and is thus assessed as beneficial. Discharge of aggressive feelings is associated with pain and hence judged as harmful. It would therefore seem that sexually related material could function as a motivating force whereas aggressive material might not. The results of the present study indicate that this notion has merit, for clearly, aggressive stories do not lead to increased attention and heightened learning. At the very least, these results appear to provide some experimental evidence in support of those theoreticians who view aggression as qualitatively different from drive derivatives such as sexuality. To confirm this notion it would be necessary to utilize stories with phrases that are related to other drives. For example, the notion that there exists a thanatic drive in conjunction with the life drive suggests the use of stimuli associated directly with aging, dying and death.

In conclusion then, the results of this study provide experimental evidence that there is an affectual/motivational component to the psychopathology of the Korsakoff syndrome. It has been demonstrated that drive-related stimuli evoke heightened attention and result in increased levels of learning. This result relates to the vividness that such drive-related material have for individuals in abnormal states of consciousness such as Korsakoff patients. This vividness captures attention and plays an organizing and selecting role in memorial functioning for these individuals. In terms of the encoding paradigm, this heightened attention ultimately leads the Korsakoff patient to semantically encode more features of the stimulus material. The rate of decay of information from memory shows no differential effects according to the valence of the stimulus. These

results then refute the argument that the basis for the Korsakoff's amnesia lies in their inability to encode semantically and instead, effectively divides the memory deficit into two distinct components - one attentional and the other retentional.

APPENDIX I

TEST MATERIALS

Some Materials for Studying the Way People Remember

Drive-Related Connected Verbal Material

By Donald A. Davidoff

Word List

1.	loudly shouted	N
2.	cruelly bruised	A
3.	sexually abused	S
4.	loudly spoken to	N
5.	cruelly beaten	A
6.	sexually raped	S
7.	whispered loudly	N
8.	cruelly battered	A
9.	sexually violated	S

Preamble

I want you to know that this is a test involving emotions and memory. I will administer several tests of memory and intellectual capacity to you in the next couple of hours. There are no risks and no discomfort involved in these tests, although I may ask you to repeat some verbal material that you may find vulgar or distasteful. Keep in mind that the results of these tests will be kept strictly confidential. You may ask questions about any or all of the procedures involved in these tests.

Statement of Informed Consent for Studies of Memory and Emotion

I, _____, voluntarily consent to be a research subject in a study of the effects of brain damage on emotions and memory, conducted by Dr. Butters and Mr. Davidoff. I understand that I will be administered tests of memory and intellectual capacity and that this testing will take about four or five hours. I understand that there are no risks or discomfort involved in this testing although I realize that some of the tests may involve repetition of verbal material that I might consider distasteful or vulgar. I also understand that the results of the testing will be kept confidential unless I ask that they be revealed to my doctor. I understand that I am free to ask questions about the procedures. I understand that I am free to withdraw my consent and to discontinue participation in the project at any time. If under treatment, my decision to withdraw my consent and to stop participating in the study will not jeopardize my future treatment.

_____ _____

Witness Signature

The order of administration

Subject #	1	2	3	4	5	6	7	8	9
Stories	A-1	C-5	E-9	G-4	I-8	B-3	D-7	F-2	H-6
	B-2	D-6	F-1	H-5	A-9	C-4	E-8	G-3	I-7
	C-3	E-7	G-2	I-6	B-1	D-5	F-9	H-4	A-8
	D-4	F-8	H-3	A-7	C-2	E-6	G-1	I-5	B-9
	E-5	G-9	I-4	B-8	D-3	F-7	H-2	A-6	C-1
	F-6	H-1	A-5	C-9	E-4	G-8	I-3	B-7	D-2
	G-7	I-2	B-6	D-1	F-5	H-9	A-4	C-8	E-3
	H-8	A-3	C-7	E-2	G-6	I-1	B-5	D-9	F-4
	I-9	B-4	D-8	F-3	H-7	A-2	C-6	E-1	G-5

The above rotations allow each word to be paired with each story as well as to alternate the type of word used to begin with. Thus the stories would begin with a neutral word for Subject #1, an aggressive word for Subject #2 and a sexual word for Subject #3, and so on (alternating N-A-S).

Instructions

I am going to read you a story. Later you'll be asked for your memory of it. I will ask you to recall the story as accurately as you possibly can. I will read the story to you just once and at my usual reading speed. Please do not ask any questions about what I read to you - first because this is a memory experiment and I wouldn't be able to tell you and second, because I don't want anything to interrupt your concentration.

The tape recorder is to record your responses. Please relax and try to concentrate on the story as I read it to you.

Do you have any questions before we begin?

Ready? Listen closely and remember this story:

STORY

Now, as accurately, completely and faithfully as you can, please tell me the story that I just read to you.

RECALL I

Any more?

Now, count backwards from 100 by 3's. (30 sec.)

COUNTING

Now, again, as accurately, completely and faithfully as you can, please tell me again the story that I just read to you.

RECALL II

Any more?

Does anything else occur to you about this story? Any stray fact or thought?

WM I B

The American/ liner/ New York/
struck a mine/ near Liverpool/
Monday/ evening/. In spite of a blinding/
snowstorm/ and darkness/ the sixty/
passengers including 18/ women/
were all rescued/ though the boats/
were tossed about/ like corks/
in the heavy sea/. They were brought
into port/ the next day/ by a British/
steamer/.

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struck a mine/ near Liverpool/
Monday/ evening/. In spite of a blinding/
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passengers including 18/ women/
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were tossed about/ like corks/
in the heavy sea/. They were brought
into port/ the next day/ by a British/
steamer/.

WM II A

Dogs/ are trained/ to find/
the wounded/ in war time/. Police dogs/
are also trained/ to rescue/
drowning people/. Instead of running/
down to the water/ and striking out/
they are taught/ to make/ a flying leap/
by which they save/ many swimming strokes/
and valuable/ seconds of time/.
The European sheep dog/ makes the best/
police/ dog/.

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the wounded/ in war time/. Police dogs/
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they are taught/ to make/ a flying leap/
by which they save/ many swimming strokes/
and valuable/ seconds of time/.
The European sheep dog/ makes the best/
police/ dog/.

Story "A"

Anna Thompson/ of South/ Boston/ employed
as a scrub woman/ in an office building/
reported/ at the City Hall/ Police Station/
that last night/ on State Street/ she had
been/ / and robbed/ of
fifteen dollars./ She had four/ little
children,/ the rent/ was due,/ and they
were hungry./ The officers/ touched by
her story/ took up a collection/ for her./

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as a scrub women/ in an office building/
reported/ at the City Hall/ Police Station/
that last night/ on State Street/ she had
been/ /and robbed/ of
fifteen dollars./ She had four/ little
children,/ the rent/ was due,/ and they
were hungry./ The officers/ touched by
her story/ took up a collection/ for her./

Story "B"

Betty Jones/ left her family/ in their
house/ to go shopping./ Her husband/
went upstairs,/ shut himself up/ in a
room/ with his daughter/ sat her/ on the
bed/ and / his
own child./ After the mother/ returned
home/ she cooked supper./ That evening/
the entire family/ sat down/ and discussed/
the incident/ while eating a meal/ of
roast beef./

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house/ to go shopping./ Her husband/
went upstairs,/ shut himself up/ in a
room/ with his daughter/ sat her/ on the
bed/ and / his
own child./ After the mother/ returned
home/ she cooked supper./ That evening/
the entire family/ sat down/ and discussed/
the incident/ while eating a meal/ of
roast beef./

Story "C"

Barbara Rhodes/ went out/ on a date/ with
her new boyfriend./ They had dinner/ in
a French restaurant/ and went dancing.
While driving home,/ her date/ stopped
the car/ by the roadside/ and her./
She was surprised/ by his actions./ Upon
reaching her house/ she decided/ that she
would/ not go out/ with him again/ and
would,/ in the future,/ choose her dates/
more carefully.

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her new boyfriend./ They had dinner/ in
a French restaurant/ and went dancing./
While driving home,/ her date/ stopped
the car/ by the roadside/ and her./
She was surprised/ by his actions./ Upon
reaching her house/ she decided/ that she
would/ not go out/ with him again/ and
would,/ in the future,/ choose her dates/
more carefully.

Story "D"

John Thomas,/ a construction worker/ in
New York City/ was on trial/ in the Bronx
County/ Courthouse./ He had been charged/
with disorderly conduct/ after his girlfriend/
alleged that he/ was unruly/ and her./
The judge, however/ found no supporting
evidence/ and was forced/ to dismiss/ the
case./ In spite of/ the protests/ of the
District Attorney,/ John walked out/ of the
court/ a free man./

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New York City/ was on trial/ in the Bronx
County/ courthouse./ He had been charged/
with disorderly conduct/ after his girlfriend/
alleged that he/ was unruly/ and her./
The judge, however/ found no supporting
evidence/ and was forced/ to dismiss/ the
case./ In spite of/ the protests/ of the
District Attorney,/ John walked out/ of the
court/ a free man./

Story "E"

Samuel Washburn/ realized that/ he was late/
for his appointment/ with his psychiatrist./
He had thought/ all day/ about a dream/ that
had occurred/ the previous night/ in which he/
/his sister./ Upon
arriving/ at the doctor's office/ he lay
down/ on the couch/ and related his dream./
The eminent analyst/ helped him/ to understand/
its meaning and/ feel better.

Samuel Washburn/ realized that/ he was late/
for his appointment/ with his psychiatrist./
He had thought/ all day/ about a dream/ that
had occurred/ the previous night/ in which he/
/ his sister./ Upon
arriving/ at the doctor's office/ he lay
down/ on the couch/ and related his dream./
The eminent analyst/ helped him/ to understand/
its meaning and/ feel better./

Story "F"

Karen Boyles/ a native New Yorker/ entered/
Central Park/ late one night/ to take/
a short cut/ to her house./ Off in the
shadows/ she saw two men/ who appeared
to be/ /a woman./ Although
she was/ too far away/ to see what/ was
actually occurring,/ she became frightened/
and ran speedily/ from the park./ Safely
at home,/ she told her roommate/ about
the incident.

Karen Boyles. a native New Yorker/ entered/
Central Park/ late one night/ to take/
a short cut/ to her house./ Off in the
shadows/ she saw two men/ who appeared
to be/ /a woman./ Although
she was/ too far away/ to see what/ was
actually occurring,/ she became frightened/
and ran speedily/ from the park./ Safely
at home,/ she told her roommate/ about
the incident.

Story "G"

Michael Sorel/ often went/ to the library/
to stare/ at the blond-haired librarian./
One day/ he encountered her/ amongst the
book shelves/ and overcome/ by his desires/
and frustrations,/ he her./
Both of them/ were shocked/ by Michael's
behavior./ In spite of/ her outrage/ he
persuaded her/ not to report him/ and also
promised/ that he would/ never again come/
to that library.

Michael Sorel/ often went/ to the library/
to stare/ at the blond-haired librarian./
One day/ he encountered her/ amongst the
book shelves/ and overcome/ by his desires/
and frustrations,/ he her./
Both of them/ were shocked/ by Michael's
behavior./ In spite of/ her outrage/ he
persuaded her/ not to report him/ and also
promised/ that he would/ never again come/
to that library.

Story "H"

Carl Weatherbee/ took his girlfriend/ out
in the boat/ one grey stormy day./ They
became frightened/ and she began/ to
quietly weep/ when they lost sight/ of dry
land./ In a fit/ of despair/ he her/
as the boat/ was rocked/ by the waves./ She
was dismayed/ by his actions/ and became
impassive/ to the howling winds./ Two hours
later/ the sun appeared/ and they were
rescued/ by the Coast Guard.

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in his boat/ one grey stormy day./ They
became frightened/ and she began/ to
quietly weep/ when they lost sight/ of dry
land./ In a fit/ of despair/ he her/
as the boat/ was rocked/ by the waves./ She
was dismayed/ by his actions/ and became
impassive/ to the howling winds./ Two hours
later/ the sun appeared/ and they were
rescued/ by the Coast Guard.

Story "I"

Marilyn Gilbert/ nervously thought about/ the rumors concerning/ the new director's/ unusual methods/ as she paused/ outside the studio door./ While unlocking it/ she heard sounds/ and imagined/ that the director was/ / the female star./ She bravely threw open/ the door/ and almost fainted/ with relief/ when she saw nobody/ in the studio/ and realized/ that the noise/ was only due to/ a noisy fan.

Marilyn Gilbert/ nervously thought about/ the rumors concerning/ the new director's/ unusual methods/ as she paused/ outside the studio door./ While unlocking it/ she heard sounds/ and imagined/ that the director was/ / the female star./ She bravely threw open/ the door/ and almost fainted/ with relief/ when she saw nobody/ in the studio/ and realized/ that the noise/ was only due to/ a noisy fan.

APPENDIX II

THE CHRONIC ALCOHOLIC KORSAKOFF SYNDROME

Nosology

Six years prior to Korsakoff's first paper, Carl Wernicke described a neurological syndrome whose primary symptoms included ophthalmoplegia, ataxia and a global confusional state (Wernicke, 1881). As evidenced from his writings, Korsakoff seemed unaware of the relationship between the mental and neuritic symptoms which he described, with those characteristic of what is now called Wernicke's encephalopathy, in spite of the fact that both symptom complexes often occurred successively in the same patient. Current literature often combines the two diseases in an entity known as the Wernicke-Korsakoff syndrome, identifying an acute transitory phase (Wernicke's encephalopathy) and a more stable, chronic phase (chronic Korsakoff syndrome).

The global confusional state of the acute phase makes it difficult to accurately assess memorial function in these patients. The focus of the current study, therefore, is on the chronic phase of the disease, in which patients have a clear sensorium with relatively stable (albeit deficient) memorial processes. The acute or Wernicke's phase is discussed only as it has a bearing on the chronic condition. Thus the terminology "alcoholic Korsakoff syndrome" refers only to the chronic phase, and the words 'acute' or 'Wernicke's' will be used to specify the encephalopathy characterized by Wernicke.

Clinical Description

The most well-documented symptoms of alcoholic Korsakoff syndrome are severe inabilities to either learn new information or to recall data from the near past. So striking is this disability that the disease is often referred to in

the literature as "the amnestic syndrome" (Lewis, 1961). This loss of memory was first noted by S.S. Korsakoff and his description which, to this date contains one of the most lucid and direct statements concerning the symptomatology of the syndrome, includes the following account of the amnesia (Korsakoff, 1889/1955):

> Nearly always a profound disorder of memory is observed... (it) manifests itself in an extraordinarily peculiar amnesia in which the memory of recent events, those which just happened, is chiefly disturbed, whereas the remote past is remembered fairly well. (p. 397-8)

This anterograde amnesia manifests itself practically as a profound difficulty in learning even the simplest new facts. Even after months on a ward, Korsakoff patients may not recall the names of their doctors, nurses or fellow patients. Cases of such patients wandering the corridors in search of the location of their beds are not uncommon. Experimentally, the anterograde problem is exemplified by the trouble that the Korsakoff patient has in learning even short lists of word pairs (e.g., Ryan, Butters, Montgomery, Adinolfi, & Didorio, 1980).

While it is generally acknowledged that the alcoholic Korsakoff patient has difficulty in retrieving information from long term storage, the exact nature and extent of this retrograde amnesia has been the subject of controversy. Ribot, when discussing pathological memory conditions, was the first to suggest that the oldest memories were the memories least well preserved in cases of amnesia (Ribot, 1881/1882). Korsakoff's observations, as noted in the quote above, that memories from the remote past (e.g., childhood) were intact, agreed with Ribot's theories. Korsakoff further elucidated the amnestic problem by stating that:

> In such cases...present events disappear from the patient's memory instantly, and instead some events of decades ago are recollected - as a result the patient confuses old recollections with the present impressions. Thus, they believe themselves to be in the setting in which they were some thirty years ago, and mistake persons around them now for people who were around them at the time. (p. 398)

This often manifests itself clinically during interviews, when the Korsakoff patient will respond to questions about current events with answers that are, indeed, thirty years out of date (e.g., Q: 'Is the United States currently engaged in a war?' A: 'No, I think we have that Korean thing just about wrapped up.'). Yet these same patients are often able to give lucid and detailed accounts of their own experiences in World War II or to clearly recollect childhood events. In spite of this clinical evidence, Warrington and her associates have asserted that Korsakoff patients have equal difficulty in recalling remote events as they do more recent events (e.g., immediately prior to onset of the disease) (Sanders and Warrington, 1971). Other researchers have now proven conclusively that temporal gradients do exist in retrograde memory deficits of alcoholic Korsakoff patients (Albert, Butters and Levin, 1979), thus providing experimental evidence for an observation that Korsakoff had made 90 years earlier. (In fact, only a few points of significance concerning the etiology and the neuropathology of the syndrome are lacking in the original description.)

The tendency of Korsakoff patients to confabulate, or fill in the gaps in their memories with accounts of past or unreal events, has often been considered to be the benchmark of the global confusional state which accompanies the Wernicke phase, but it is not the case in the more stable chronic phase (e.g., Butters and Cermak, 1980; Talland, 1965.) Confabulized stories can be elicited from chronic Korsakoff patients, usually in response to specific questions which they cannot answer (e.g., when asked if they have met the doctor before, they are apt to respond that the two of them had been to the ball game only last week and go on to describe the game in detail), but this tendency to confabulate is neither a constant nor permanent feature of the syndrome, and is subject to marked individual differences.

In spite of the profound memory deficits inherent in the alcoholic Korsakoff syndrome, intellectual functioning, as measured by standardized IQ tests such as the Wechsler Adult Intelligence Scale (WAIS), remains intact. The only significant deficit on the WAIS is revealed on the Digit Symbol subtest, a test involving copying the appropriate symbol into a series of numbered boxes (Butters and Cermak, 1975). Scores on the Digit Span subtest, a measure of immediate memory, are within normal limits. Only when the amount of information to be recalled becomes too large for the working memory, do the memory deficits become psychometrically noticeable. Thus, performance on the Wechsler Memory Scale (WMS) which tests a variety of memorial processes, is characteristically poor. The typical pattern revealed by a Korsakoff patient is a normal IQ with an MQ (memory quotient), 20-30 points below the IQ score (the WMS has been normalized to yield an MQ approximately equal to an individual's IQ, unless that individual has a memory problem).

In the cognitive sphere, Korsakoff patients reveal no primary deficits, aside from the memory problems, but do demonstrate a variety of subtle secondary deficits. The most common deficits involve visuoperceptive and visuospatial functions. They are severely impaired on digit-symbol and symbol-digit substitution tasks (Glosser, Butters, and Kaplan, 1977; Kapur and Butters, 1977; Talland, 1965), and on tests requiring the sorting and discrimination of complex visual stimuli (Oscar-Berman, 1973; Oscar-Berman & Samuels, 1977). Poor performance on divided-attention tasks, disjunctive-reaction tasks, and cancellation problems (e.g., crossing out all the small letters bordering on empty spaces in a written passage) (Talland, 1965); perseveration on inappropriate problem solving hypotheses (Oscar-Berman, 1973; Pick, 1915; Talland, 1965); and deficits in attention shifting, perseveration and set inflexibility (Grünthal, 1924; Talland, 1965) have also been noted in alcoholic Korsakoff patients.

Of particular significance to the current study on motivational/emotional aspects of the syndrome is the Korsakoff patient's personality functioning. Patient histories, most often gleaned from family members, reveal a pre-morbid personality given to impulsivity and aggressive outbursts. Drinking seemed to have been a central organizing theme for these patients and to have provided a setting for interpersonal contact of the "drinking buddy" variety. Many patients had married at some point, but these marriages, while often yielding off-spring, usually ended in a divorce which was often precipitated by events connected to the patients chronic alcoholism (e.g., violent and/or abusive attacks on the spouse, petty crimes to support the alcohol addiction) (Butters and Cermak, 1980). This psychopathic personality pattern undergoes a marked change following onset of the disease. Once the patient has passed through the confusional state of the acute phase with its concommitant agitation, anxiety and fear, he enters into a state of apathy and listlessness, which has been commented on by virtually every author writing about the syndrome, from Korsakoff through Butters and Cermak. The typical alcoholic Korsakoff patients, in this chronic phase, presents clinically with virtually no affect or motivation. He appears to be uninterested in either the physical components of his environment or in any interpersonal contact (friendship for him consists of little more than a head nod to his roommate). He seems to have lost all spontaneity (for example, Talland assembled a small group of Korsakoff patients together in one room; once beyond the exchange of simple pleasantries, they all reverted to silence which Talland, himself, was the only one to break). The alcoholic Korsakoff patient appears unable to formulate, organize or initiate any plans on his own and so seems content to sit for hours staring at the same page in a newspaper or at a blank television screen.

So implacable is the patient, that his only response to being physically assaulted by another patient is transient puzzlement. Similarly, he is totally uninterested in either sex or alcohol. The only affect that they seem to spontaneously generate is when responding to questions about their early family life, which they seem to recall somewhat nostalgically (Talland, 1965). Most have developed some awareness of their hospitalization and some minimal insight into their diminished memorial capacities (e.g., in response to queries as to where they are and why, they might respond "in a hospital because my memory ain't what it use to be."). They uniformly make little or no demands on hospital personnel and obey all requests in a compliantly indifferent manner. It has been argued that these noted personality changes are the result of institutionalization. On the contrary, they seem to occur invariably, even if the patient is cared for at home. As with the other symptoms of this syndrome, the alcoholic Korsakoff's personality style is subject to individual differences - it is possible for example, to find a patient who still retains a sense of humor (even here, however, since he cannot recall that he has told a joke, he is quite apt to repeat it, often), but the salient personality features can invariably be characterized as apathetic, affectless and compliant.

There are a variety of symptoms and/or characteristics of the alcoholic Korsakoff syndrome that have not been discussed above. Some, such as the impairment of olfactory discrimination (Jones, Moskewitz, and Butters, 1975) seem to be of tertiary importance; others, such as the loss of chronognosy (time-sense) (Huppert & Piercy, 1976; van der Horst, 1932), the tendency toward reduplicative paramnesia (Pick, 1912) and the loss of personal reference in a sequential time-stream (Claparède, 1911/1951) seem derivative of the more primary amnestic/personality deficits.

Finally, to summarize the clinical description of the alcoholic Korsakoff patient discussed in this study: The patient is in the chronic phase of the disease and demonstrates the following symptomatology;

1. profound anterograde amnesia,
2. retrograde amnesia with a decreasing temporal gradient,
3. little or no spontaneous confabulation,
4. intact intellectual functioning,
5. secondary cognitive deficits, mostly of a visuoperceptive and visuospatial nature, although sequencing and problem-solving abilities are implicated as well,
6. profound characterological changes resulting in a personality style characterized by apathy, compliance and lack of affectual expression.

Neuropathology

Korsakoff's writings do not include a description of the pathologic changes in the brain, and to this date the exact nature of the lesions implicated in alcoholic Korsakoff syndrome remains an open question. The current reviews of the neuropathological changes that occur in the Wernicke-Korsakoff syndrome (Brierley, 1977; Victor, Adams & Collins, 1971) conclude that the neurological symptoms of the acute or Wernicke's stage of the syndrome are related to lesions of the brain stem and cerebellum, whereas the symptoms associated with the chronic or Korsakoff phase are related to lesions of several thalamic and hypothalamic structures surrounding the third ventricle of the brain. Most neuroanatomical studies implicate the mammillary bodies and/or the dorsomedial nucleus of the thalamus as the specific structures involved (e.g., Adams, Collins & Victor, 1962; Gamper, 1928; Riggs &Boles, 1944) (see Fig. A).

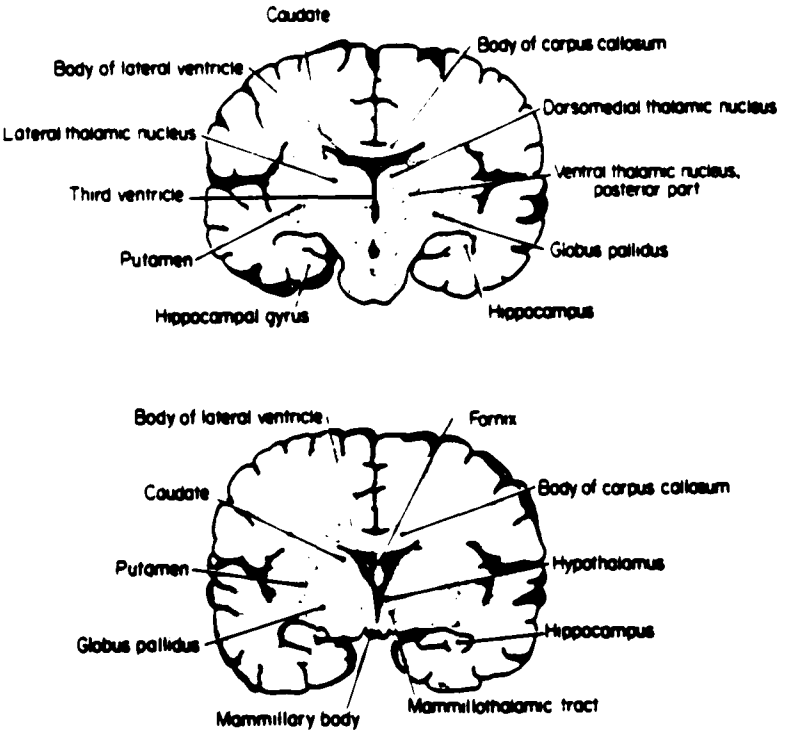

FIGURE A. Coronal sections through the brain illustrating the dorsomedial nucleus of the thalamus (top section) and the mammillary bodies (bottom section).

In perhaps the most comprehensive neuropathological study to date, Victor, Adams and Collins (1971) examined the brains of 82 Wernicke-Korsakoff patients who had a clearly and carefully documented history of their symptomatology. They examined 43 of these brains for lesions in the dorsomedial nucleus of the thalamus and discovered signs of atrophy of this structure in 38 of them. The remaining 5 cases, which showed no atrophy of the dorsomedial nucleus of the thalamus, had not exhibited lasting amnesic symptoms. All 43 cases, however, did evidence lesions in the mammillary bodies. Victor, et al. concluded that the lesion most closely associated with the amnesic symptoms is to the dorsomedial nucleus of the thalamus, and not the mammillary bodies as some earlier studies had suggested (e.g., Brierly, 1966; Delay, Brion & Elissalde, 1958a,b). Butters and Cermak, however, provide an alternative interpretation for the data of Victor, et. al. They point out that "because all 38 cases with amnesia had lesions in both the mammillary bodies and the dorsomedial nucleus of the thalamus, it is possible that this combined thalamic-hypothalamic lesion is the one that is both necessary and sufficient to produce Korsakoff's amnesia." (Butters & Cermak, 1980, p. 13). They correctly add that in order to demonstrate the primacy of the thalamic lesion, it would have been necessary to examine amnesic cases with atrophy limited to the dorsomedial nucleus; Victor, et al. did not report any such cases.

While the exact neuropathology of the alcoholic Korsakoff syndrome remains to be demonstrated conclusively, studies of the vast array of amnesic syndromes, in general, have yielded certain noteworthy neuroanatomical commonalities. It appears that despite the various etiologies involved in these syndromes (e.g., anoxia, trauma, avitaminosis, intercranial infection, etc.), the great majority, of what seem to be critical lesions, involve structures that lie in Papez circuit

(Papez, 1937).[1] This sequence of interconnected neuroanatomic structures, a part of the limbic system, has been hypothesized to be central in the mediation of emotional behavior (Arnold, 1960; MacLean, 1949; Papez, 1937). Although Rozin (1976) suggests that bilateral damage to any of a variety of points along this circuit is sufficient for the generation of an amnesic syndrome, the five cases examined by Victor, et. al. and referred to above (i.e., those with mammillary body lesions, no thalamic lesions and no evidence of a memory disorder) seem to militate for such damage being a necessary rather than a sufficient condition for an amnesic syndrome to develop. While the focus of the present study is not to elucidate a common neuroanatomic substrate for both the amnestic symptoms and the emotional disorder evidenced in alcoholic Korsakoff syndrome, the finding that both memory and emotions are vitally implicated in Papez circuit provides additional impetus for the examination of the inter-relationship between emotions and memory in this disease.

Etiology

As Korsakoff's clinical description remains entirely appropriate today, it now appears that his notions regarding the etiology of the disease can be favorably reassessed. Most neurological texts regard the lack of thiamine

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[1]This circuit consists of the following principal components: from the mamillary bodies via the mammillothalamic tract to the anterior nuclear group of the dorsal thalamus; then via thalamo-cortical radiations to the cingulate gyrus; then to the hippocampal gyrus via short association bundles to the hippocampus and amygdala; and from the hippocampus, via the fimbria fornix system to the septum and the mammillary bodies. Connections between the amygdala and hypothalamus may also be considered to be part of this syttem (Kahn & Crosby, 1972).

(vitamin B_1) in the alcoholics diet as causal to the development of the Wernicke-Korsakoff syndrome. Such a concept of deprivation in the etiology of disease - the notion that a disease may arise from a lack of a specific nutritional substance rather than from an excess of some deleterious substance - had not yet gained credence in the medical thought of Korsakoff's time (Victor & Yakolov, 1955). Korsakoff thus concluded that the causes of the disease had to do with "an accumulation in the blood of toxic substances which poison the central nervous system - in some cases peripheral, in others central, and most frequently both" (Korsakoff, 1889/1955, p. 402) and decided to call the disease "toxemic cerebropathy" (cerebropathia psychica toxemica).

Some writers, including Korsakoff and Kräeplin (1900) had already commented on the differences between acute and chronic pathology with-in the context of the Korsakoff syndrome, but it remained for Carl Wernicke to make the connection between 'his' encephalopathy and Korsakoff's syndrome explicit. In writing about the recovery of encephalopathic patients, he noted that if the patient did not die, the neurological symptoms soon cleared leaving in its place what he termed "inanition psychosis"; which he then equated to Korsakoff's psychosis (Wernicke, 1900).

Since Korsakoff's time, considerable evidence has been gathered suggesting that avitaminosis is the primary factor in the development of Wernicke-Korsakoff syndrome (for reviews see Brierley, 1977; Victor, Adams and Collins, 1971). Malnutrition is a common accompaniment to chronic alcohol abuse, as the alcoholic's sole source of calories is usually the alcoholic beverage. Not only does alcohol itself offer no vitamins, but because it is high in carbohydrates, it increases the body's need for thiamine for its own metabolic processes. According to this

nutritional theory, the diencephalon, the brainstem and the cerebellum are particularly sensitive to thiamine deficiencies and either atrophy or become prone to hemorrhagic lesions.

The administration of massive doses of thiamine to those patients with Wernicke's encephalopathy results in a drastic reversal of the symptoms endemic to this phase of the disease. Thus, the global confusion clears, the ataxia lessens, and the ophthalmoplegia ceases to be a problem. The patient, however, is left with an amnesia and a personality that is characteristic of the chronic Korsakoff phase and which is resistant to further amelioration through thiamine therapy. Victor, et al. explain this by suggesting that the Wernicke's stage is due to biochemical abnormalities while the chronic Korsakoff phase involves serious structural damage. Additional evidence for this nutritional theory is found by the fact that Wernicke's symptoms develop in diseases which involve a disturbance in nutrition and or metabolism (e.g., prolonged vomiting, carcinoma of the stomach, etc.) and also that such symptoms can be induced in animals through the deprivation of thiamine in their diet. In both aforementioned instances, administration of thiamine alleviates the symptoms and no permanent damage results (Butters & Cermak, 1980).

Recent animal studies, on the other hand, have shown that irreversible brain damage and significant learning impairment does result from the long-term ingestion of alcohol, even when accompanied by adequate nutrition (Freund, 1970; Freund & Walker, 1971; Walker & Freund, 1971). This and other recent evidence that prolonged alcohol ingestion has a direct toxic effect on the brain (Riley & Walker, 1978) suggested to Butters and Cermak that a re-evaluation of the etiology of the Wernicke-Korsakoff syndrome was necessary. They concluded that avitaminosis is indeed, closely linked to Wernicke's encephalopathy.

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that the amnesic/personality symptoms of the chronic Korsakoff phase may be a result of the interaction of the thiamine deficiency with the direct neurotoxic effects of alcohol (Butters and Cermak, 1980). Recent studies demonstrating that chronic long-term alcoholics without Korsakoff syndrome suffer from subtle information-processing deficits that impair their ability to learn and remember efficiently (Brandt, Butters, Ryan & Bayog, 1983; Ryan & Butters, 1980a,b; Ryan, Butters, Montgomery, Adinolfi & Didario, 1980), lend additional support to this "new" theory (which, in turn, clearly confirms Korsakoff's own notions regarding a toxemic etiology, first hypothesized ninety years ago).

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