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AFFECT AND MEMORY: AN EXPERIMENTAL INVESTIGATION

The Ohio State University

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PAPERS PRESENTED.


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CHAPTER ONE: INTRODUCTION

The Affect and Memory Relationship: Theory and Research

I: The Problem: Statement and Scope

The topic of this dissertation is a classic, controversial and yet unresolved problem of psychological research. The question of interest is: What is the influence of the affective quality of an experience on memory for that experience? For example, will a graduate student (for the purpose of anonymity, let us call her MRB) remember better the comments made on a dissertation draft by her adviser that are pleasant and complementary or ones that are unpleasant and caustic? Or, will she remember the extremely pleasant and unpleasant comments better than the more neutral ones?

For at least 70 years, various aspects of the basic problem of the affect/memory relationship have been of theoretical and empirical interest to clinical, social and experimental psychologists. However, reviews of the literature, (Meltzer, 1930; Rapaport, 1942; Holmes, 1974 and Erdelyi and Goldberg, 1979) expose a lack of theoretical diversity in the hypotheses generated and tested regarding the relationship of affect and memory, as well as methodological sophistication necessary to produce an unconfounded laboratory test of the relationship. Until recently, research activity was dominated almost exclusively by the psychoanalytic concept of repression - the view that unpleasant, ego-threatening information was less available in memory as a consequence of its relegation to the unconscious. Little attention was paid to cognitive, non-psychodynamic theories, like Bartlett's, which proposed that schemata determined the processing of affective information.

The more critical problem, however, has been the failure to design research in which operations involving affect are free of interpretive confounds. One common strategy was to use material that had previously
established affective values, for example, pleasant and unpleasant life experiences or words, names of liked and disliked people, etc. However, these affective items of information are tied to extraneous variables that may themselves produce differential memory for pleasant and unpleasant material. Further, the experimenter has no control over the initial learning, making it problematic to reach conclusions about memory for the information.

Another research strategy made use of stimuli devoid of affective value prior to the experimental session, allowing the researcher to experimentally manipulate the affective value of the stimuli for which memory was tested. However, this approach restricted the researcher to use stimuli (such as nonsense syllables) and affect induction procedures (such as shock), whose generalizability and ecological validity were questionable.

More recently, attention was brought to the affect/memory issue by (1) Matlin and Stang's (1978) review (which indicated that pleasant events are recalled more accurately than unpleasant or neutral ones, thus concluding that a "pollyanna principle" was operative in memory); (2) Dutta and Kanungo's (1975) monograph (which showed that both extremely pleasant and unpleasant trait adjectives are remembered better than neutral ones, thus supporting the intensity principle); (3) Holmes' (1979) review of the research literature on repression (in which he argued that nondefensive attentional processes, interference mechanisms and lack of control over initial learning were viable alternative explanations for the finding of "repression"; and, (4) Erdelyi and Goldberg's (1979) cognitive interpretation of the psychoanalytic concept of repression.

Furthermore, during the last decade, psychologists have been interested in the affect/cognition relationship (Zajonc, 1984; Lazarus, 1984) and social cognition research has begun to acknowledge that much of the richness of social information is due to its affective component (Clark and Fiske, 1982; Higgins, et al., 1981). However, the relationship between the intensity, valence and duration of the information and memory for it remains unanswered.
In the research to be reported in this dissertation, a method was devised that (1) was free of the confounds of previous research, and (2) allowed interpretation of the data in terms of established principles of memory. The methodology allowed a test of three hypotheses regarding the affect/memory relationship: (1) a hypothesis of "hedonic" memory - (also referred to as the affective quality hypothesis) - better memory for pleasant than unpleasant information; (2) a hypothesis of affective intensity - better memory for both pleasant and unpleasant than neutral information (also, better memory for intensely rather than moderately pleasant as well as unpleasant information) and (3) a hypothesis of schema assisted retrieval of affective information - better memory for schema-congruent or schema-incongruent information.
Table 1

The affect/memory relationship: Hypotheses and empirical predictions

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[+] Schema theory has not been used previously to understand the affect/memory relationship. We use the consistency and inconsistency hypotheses generated in the research on person memory and impression formation (Hastie, 1981; Srull, 1981) and prose comprehension (Graesser, 1981; Woll & Graesser, 1984) to generate hypotheses concerning the affect/memory relationship.
II: Early theoretical contributions

In this section, we review the theoretical contributions of three scientists whose views have substantially influenced the understanding and study of the affect and memory relationship.

A: Freud (1856-1939): Forgetting the unpleasant

The theoretical contribution of Sigmund Freud was clearly the most influential in provoking research on affect and memory, during the first half of the 20th century. Freud's ideas regarding the selective processing of affective material originated as a result of his observations of striking cases of errors of memory and related errors in speech and action. Besides numerous scattered discussions of these phenomena (Freud, 1925; 1959), The Psychopathology of Everyday Life (1914) contains an impressive array of examples of varied memory failures that were later incorporated into a better developed theory of memory.

What kind of information is repressed? Besides the well documented evidence of the role of motivated forgetting of affectively unpleasant information in the event of severe clinical pathologies, the Psychopathology of Everyday Life extended these discoveries to normal mental life.

As the following quotes reveal, what appears to be the common thread linking the forgotten material is that the information (either itself, or through its association to some other material) has come to be distressful, pain-evoking or ego-threatening to the individual.

*If I analyze the cases of the forgetting of names that I observe in myself, I almost always find
that the name which is withheld from me is related to a topic of close personal importance to me, and one which is capable of evoking in me strong and often distressing affects." (p. 22)

"The name of a town in Italy escaped the subject's memory as a consequence of its great similarity in sound to a woman's first name, with which a number of memories charged with affect were connected..." (p. 28)

"... the following passage in Darwin's autobiography... convincingly reflects his scientific honesty and his psychological acumen: 'I had, during many years, followed a golden rule, namely, that whenever a published fact, a new observation or thought came across me, which was opposed to my general results, to make a memorandum of it without fail and at once; for I had found that such facts and thoughts were far more apt to escape from the memory than favourable ones.'" (p. 148)

The mechanism of repression. The concept of repression, the "... foundation-stone on which the whole structure of psychoanalysis rests" (Freud, 1914/1957, p. 16), has been commonly interpreted (Osgood, 1953, p. 571-578; Hilgard, 1948; Rapaport, 1942/1971; Erdelyi and Goldberg, 1979) as follows: When an individual encounters an event that creates ego-anxiety, this information is rejected by the conscious component of the psyche into a "safer" unconscious store. This expulsion, commonly referred to as repression, serves the function of ego-preservation. However, the repressed material does not lie in dormant form in the unconscious - it constantly exerts pressure against the barrier of the unconscious and occasionally is successful in finding expression. The repressed material can either not gain entry into conscious memory at all (the information is "forgotten") or because of its threatening nature may find disguised expression (the information is prone to errors, such as distortions of meaning in slips of the tongue).

If the repression hypothesis is translated to state an empirical effect, the prediction would be that pleasant information is recalled better than unpleasant information. It is important to note in making this prediction, that the theory of repression is not in contradiction with other theories of the affect/memory relationship. For example, actions that receive positive reinforcement are likely to be repeated more often than unpleasant ones and therefore are more likely to be remembered. Or, pleasant experiences are rehearsed more often, both overtly as well as covertly, and therefore more accessible in memory than unpleasant ones. However, the theory of repression differs from other hypotheses regarding the affect/memory relationship in its theoretical interpretation of motivated retrieval failure.
Freud's associative explanation of memory. A point of interest in the present context is the suggestion in Freud's writings that the process of repression is accomplished through associative links between items of information.

Repression, it is argued, can achieve its ego-protective function when the forgotten information itself is unpleasant, or when otherwise neutral information is linked, through association, to an unpleasant event. This associative forgetting can be very powerful, leading to the forgetting of entire chains of information: "If in the attempt to recover a lost name other names closely connected with it are pursued, it frequently happens that these new names, which were to serve as stepping stones to the other one, disappear in just the same way. The forgetting thus jumps from one name to another, as if to prove the existence of an obstacle which cannot easily be surmounted." (p.42)

This associative basis of memory failure lends the theory a contemporary tone and allows for research directed at empirically testing the repression hypothesis (to be reviewed in Section IV of this chapter).

Recently, Erdelyi and Goldberg (1979) proposed that Freud's theory of repression could be directly interpreted in terms of current information processing models of memory. In reviewing Freud's ideas regarding the mechanisms involved in the selective forgetting of affectively simple information, this view seems quite appropriate. Developing a model of the Freudian theory of memory in current cognitive language may indeed be a profitable task.

B: Bartlett (1886-1969): Schemata determine memory

In 1932, when Bartlett published Remembering: A Study in Experimental and Social Psychology, its lack of enthusiastic reception was more than compensated by the overwhelming reaction to the work a few decades later. Few of the empirical investigations at the time of Bartlett's publication appear to have been influenced by his ideas on the role of schemas in understanding the affect/memory relation.
First, a brief review of Bartlett’s theory of memory, specifically his concept of schema and the reconstructive nature of remembering. Schema was defined as "an active organisation of past reactions, or of past experiences, which must always be supposed to be operating in any well adapted organic response" (p. 201). To elaborate further, pieces of incoming information are used to build up various organized systems of knowledge, each system having a connecting theme or "interest". These knowledge structures, or schemata, are critical in that "Determination by schemata is the most fundamental of all the ways in which we can be influenced by reactions and experiences which occurred sometime in the past" (p. 201).

For our purpose, the question that is of interest regarding Bartlett’s formulation is 'What does schematic processing tell us about affective processing?'. To quote Bartlett "An organism has somehow to acquire the capacity to turn round upon its own 'schemata' and to construct them afresh" (p. 206). This construction is determined by the individual's 'attitude'[1], a process by which the schema is put to use. It is the 'attitude' that allows the individual to disregard detail and rather to form some general impression of the object, event or situation. It is the 'attitude' that later enables the individual to remember the event in a manner that is consistent with the schema, at the expense of a great deal of distortion of the original information through reconstruction[2]. Most important is Bartlett’s comment regarding the nature of attitudes:

“Attitude names a complex psychological state or process which is very hard to describe in more elementary psychological terms. It is, however, as I have often indicated, very largely a matter of feeling, or affect. We say that it is characterised by doubt, hesitation, surprise, astonishment, confidence, dislike, repulsion and so on (p. 206-207; emphasis added).

Bartlett’s conclusions about affect and memory may be summarized in two statements: (1) affect facilitates information processing by providing "labels" to an otherwise complex cognitive world; likewise, in some situations, it leads to errors, because an affective organization does not allow detailed distinctions, and (2) information that is consistent with the schema (irrespective of whether it is pleasant or unpleasant) will be remembered better than information that is inconsistent
with the particular schema. It is important to note that Bartlett's schema theory does not predict differential memory for affective information because of its pleasantness or unpleasantness. Instead, schema-assisted constructive recall processes determine whether pleasant or unpleasant information will be remembered better.

C. Lewin (1890-1947) and his colleagues: The state of the tension system determines memory.

During the years 1924-1934, Kurt Lewin's basic concepts of field theory were put to empirical test in a series of approximately twenty reports, primarily in the doctoral dissertations of his students.

Dissatisfied with the then popular associationist explanations of psychological phenomena, Lewin (1917, 1922a, 1922b; also see Deutsch, 1968, p. 434-435 and Marrow, 1969, p. 32) argued that a tension system was always necessary for physical as well as mental activity. Tension, a form of psychological energy, exists within the individual in the service of satisfying a psychical need or intention (referred to as a quasi-need). Tension is discharged when the need intention is satisfied and the system returns to a state of equilibrium. It is the release of tension that is the cause of all activity. For example, a need to write a dissertation sets up a tension system which will be discharged when that activity is completed. [3]

Zeigarnik. The first and most influential experiment that offered laboratory confirmation of Lewin's concept of tension systems was conducted by Bluma Zeigarnik (1927; for a detailed description of the experiments see Pachauri, 1935). Subjects in Zeigarnik's original experiment were asked to perform a series of simple tasks (for example, straightening a wire, stringing beads, solving riddles, etc.). The experimental manipulation involved allowing subjects to complete half the number of tasks; for the other half, the experimenter interrupted the subject before completion of the task. Later during the experimental session, subjects were asked to recall as many of the tasks as they could remember.

The striking finding, now referred to as the Zeigarnik
effect, was that a greater number of unfinished than completed tasks were recalled. This clearly supported Lewin's assumption that the tension corresponding to the completed tasks was discharged when the task was completed; on the other hand, the tension system associated with the unfinished task is not discharged, leading to better memory for these tasks.

Zeigarnik also found that memory advantage for the completed tasks was evident when the experiment was set up as an examination, so that the uncompleted tasks were experienced as failure. This finding—contradictory to the Zeigarnik effect—was attributed by Lewinians, to a phenomena called "isolation". The explanation was that the tension systems relevant to the interrupted tasks in this particular variant of the task, were differentiated (isolated) from the rest of the field, leading to the better memory of the completed tasks. Zeigarnik likened this phenomenon to the Freudian concept of repression, and a few years later, Rosenzweig (1933) did a series of experiments that again demonstrated the phenomenon.

Another mediator of the Zeigarnik effect was an individual difference variable that had to do with the "emotionality" of the subject. Zeigarnik reported that "excitable" subjects (in her definition, those subjects who were easily upset) did not demonstrate the memory advantage for interrupted tasks shown by "normal" subjects. According to Zeigarnik, the explanation is that in excitable subjects the "boundaries of the tension system have less solidity than other subjects; thus, in these subjects the tension responsible for advantage in remembering decreases faster" (Rapaport, p.95). [4]

Birenbaum. Gita Birenbaum, also a student of Lewin, sought to study the relationship between tension systems and remembering to perform an act. She asked her subjects to sign their name upon completion of each of a series of matchstick problems. The signing of the sheet was the "intention" being tested, although subjects were not aware of this. Subjects appeared to remember to do this task. However, after a pause of five minutes when subjects were given a second set of different tasks, subjects forgot to sign the sheet. Control subjects who did not get this break between tasks did not show this failure to remember to sign the sheet.
The Lewinian experiments point to three factors that influence memory: (1) the state of tension systems at any given point in time: a task involving completion (i.e. discharged tension) will be less memorable than an unfinished task (i.e. undischarged tension); (2) the expectations or demands on the subject made by the experimental task: a task that involves failure or a threat to the ego (isolation of the relevant tension system from the rest of the field) be less memorable than a task involving success (ego-enhancing task); (3) individual differences in "emotional excitability": the emotional make-up of the individual influenced memory because of differential changes in the psychic needs and intentions of subjects.
Contrary to the impression that the role of affect has always been largely ignored in psychological research, there exists a large body of experimental research conducted during the first half of the century on the relationship between affect and memory. Reviews of the literature (Meltzer, 1930; Beebe-Center, 1932; Gilbert, 1938; Edwards, 1942; Rapaport, 1942) indicate that the affect/memory relationship was studied using a wide variety of (1) methods (for example, with sensory and verbal material, nonsense syllables, meaningful words and real life experiences, with manipulations of affective states and affective information), (2) subject samples of individuals (psychiatric patients and normal males and females, individuals differing on selected personality dimensions), and (3) theoretical orientations (psychoanalytic, behavioristic and cognitive). The purpose of presenting early experimental research is to trace the empirical roots of the present research.

The first published empirical study on memory for affective experiences was by Colgrove (1898) who simply asked his subjects: "Do you remember pleasant or unpleasant experiences better?" To researchers interested in the experimental study of affect and memory, Colgrove's study had little to offer, since it was not a test of memory but rather of what subjects opinion of their memory. It was apparent to subsequent researchers that experimental control of the original experience was crucial if memory for the affective experience was to be understood.

A: Memory for pleasant vs. unpleasant life experiences.

The study of affect and memory using everyday life experiences was undertaken for two purposes. First, an influential review of the literature by Meltzer, (1930) had expressed dissatisfaction with the use of less ecologically valid methods (such as, using nonsense syllables, or single words) to study the affect/memory...
the research that followed was to make use of the real, everyday life experiences of individuals, which researchers (Cason, 1932; Koch, 1930; Meltzer, 1930; Stagner, 1931, Waters and Leeper, 1936, Wohlgemuth, 1922) argued offered a rich source of affect-laden information.

Second, researchers (for example, Stagner, 1931) interested in experimentally studying the influence of affect on memory wished to direct their efforts toward developing an experimental test of the then recent and already controversial Freudian concept of repression. Since many of the researchers cited above were agreed that a valid study of repression should involve the use of ego-enhancing vs. ego-threatening material, pleasant and unpleasant life experiences with "real" consequences for the individual were considered appropriate.

Quality of affect is critical to memory. In the first review of the relevant literature, Meltzer (1930), concluded that a number of studies (Kowalewski, 1908; Henderson, 1911; Fluegel, 1925) using different methods, subject samples and different theoretical orientations, indicated as a whole the superiority in memory of pleasant over unpleasant and neutral events.

In his own studies, Meltzer asked his subjects to list all the experiences they could remember from Christmas vacation, soon after they arrived from Christmas break. Subjects were asked to rate each experience on an affective dimension of pleasantness as well as a vividness dimension. Six weeks later, subjects were asked to perform the same task. Meltzer used the difference in recall between the first and second recall as an indicator of memory. Meltzer’s data indicated that (1) a majority of subjects remember pleasant experiences better than unpleasant ones and unpleasant ones better than neutral memories, (2) no relationship existed between intelligence/achievement and memory for life experiences and (3) females tend to forget unpleasant experiences somewhat more than males.

Meltzer’s research made an important contribution by (1) studying memory for real life experiences under better controlled conditions than some of the previous work (such as Colgrove, 1898 and Kowalewski, 1908) (2) studying mediating factors such as gender (1932b), individual
Meltzer's review sparked off a series of studies by other researchers the most noteworthy of which were by Jersild (1931) and Stagner (1931). These studies were aimed at replicating his findings and introducing measures of intensity of affect as well as multiple recall tests. Jersild replicated Meltzer's finding of better memory for pleasant than unpleasant experiences, both immediately as well as after a delay. Jersild was unwilling, however, to propose an explanation of the data in terms of repression. Instead, he suggested that (1) "We forget the unpleasant in many cases simple because the event no longer is unpleasant ... it may even terminate in a definitely pleasant state" (p. 287); (2) the intensity of unpleasant experiences decreases faster than the intensity of pleasant experiences; (3) the unpleasant experiences are not rehearsed as much as pleasant experiences. This led to an interest in the variable of affective intensity, which experimental evidence demonstrated to be as important as that of affective quality.

Only two researchers argued that the studies that had shown better memory for pleasant than unpleasant experiences had severe methodological and/or statistical flaws. Research by Wohlgemuth (1922) and Gordon (1928) indicated no difference in memory for pleasant vs. unpleasant experiences and led them to conclude that "there is no difference whatever between the two feeling tones, pleasure and unpleasure in their influence upon memory" (Wohlgemuth, 1923, p. 416). Their results led Meltzer to comment: "[They] Profited by errors of previous investigators but [were] too interested in disproving Freud" (p. 129). It is evident in reviewing the early experimental research that investigators indicated their preference for or bias against the repression hypothesis, and their findings seemed to be in complete harmony with their theoretical perspective.

Intensity of affect is critical to memory. The research that was stimulated by Meltzer's work was
concerned with the effects of quality of affect - clearly a consequence of the influence of the theory of repression on experimental research on affect and memory - to the exclusion of intensity of affect.

Cason's (1932) study was the first to indicate that the intensity of pleasant and unpleasant experiences diminishes over time, with the effect being stronger for unpleasant experiences. Memory was also better for those experiences rated as more intense than those rated as neutral. This finding was replicated by Menzies (1935), who also pointed out a potential problem with the use of repeated memory measures of the same material: The first recall may be said to reflect the effects of the original experience. Subsequent recall of the same information may be a recall of the previous recall/s rather than of the original experience.

Waters and Leeper (1936) also found support for the role of intensity of affect in memory: "The retention of the experiences from daily life is unrelated to the qualitative character of their affective coloring but is positively related to the intensity or degree of such affective coloring" (p. 212). An attempt was made by some researchers to get an indicator of the frequency of the rehearsal of the affective experiences. Their method was unsatisfactory in that it involved asking subjects for a retrospective verbal report of estimated frequency.

B: Memory for pleasant vs. unpleasant words.

The discomfort of experimental psychologists with the method of using real life experiences arose primarily because of the lack of control over the original experience, making any interpretation regarding the status of the experiences in memory a difficult if not impossible task (see Barret, 1938). Rather, they believed that the affect/memory relationship could be studied more profitably by having subjects study and recall word lists that were composed of pleasant, unpleasant and neutral words.

Methodological Issues. In the absence of norms for pleasantness or emotionality of words for which memory was to be tested, a difficulty researchers had to contend with concerned the selection of the target words. The affective
quality and intensity of target words was determined in a variety of ways: (1) the experimenter (Tolman, 1917); (2) subjects themselves (Stagner, 1933); (3) independent judges (Chaney and Lauer, 1929; White and Ratcliff, 1934); and, (4) physiological correlates (Smith, 1921).

Most of the studies involved intentional learning, but some used incidental learning (White and Ratcliff, 1934; Barret, 1938) to make the task similar to real life learning situations (as well as to the experiments using real life experiences). The only measure of affective intensity that was used involved obtaining ratings from subjects individually. A few researchers controlled for primacy and recency effects (Stagner, 1933; Barret, 1938) and word frequency, word length and part of speech (Barret, 1938).

Results from studies that used lists of affective words indicated: (1) better memory for pleasant words than unpleasant words and better memory for both pleasant and unpleasant words than neutral words, using an incidental learning task (Tait, 1913; Tolman, 1917; Thomson, 1930; Lynch, 1932; Bunch and Wientge, 1933; White and Ratcliff, 1934); (2) better memory for affectively intense stimuli (pleasant as well as unpleasant) than for less intense and neutral stimuli (Carter et al., 1934; Barret, 1938); (3) more associates generated in response to pleasant than unpleasant words (Griffitt, 1920).

The major contribution of the experimental research involving a list learning approach to the study of affect and memory was that it demonstrated (1) that laboratory research involving some control over the original affect of the stimuli was valuable in studying affect and memory and (2) that "... the difference in recall between more and less intensely feeling-toned words, ... is much more significant than that between the recall of P[leasant] and U[npleasant] words" (Rapaport, 1942/1971, p. 82).

C: Criticisms of early experimental research on affect and memory.

Although researchers whose work was reviewed in Sections A and B usually concluded their work by favoring a particular affect/memory relationship, it is not clear that
these conclusions were warranted, because of the methodological flaws with the early experimental research on affect and memory (Turner and Barlow, 1951).

(1) Early investigations of affect and memory involved the use of a questionnaire method to obtain information regarding the subject’s estimate of the frequency of occurrence of pleasant and unpleasant experiences (Colgrove, 1898). The method is erroneous in that base rates of actual occurrence of affective experiences were not used.

(2) Later investigators (Meltzer, 1930), introduced the method of having subjects record experiences at time 1 with a recall test at time 2. However, testing memory for real life experiences themselves retained the confound of possible differential memory for affective experiences as a function of extraneous variables that influenced memory.

(3) When multiple recall measures were obtained from the same individual, interpretation was problematic because later recall was contaminated by previous recall. A between subjects design for the delay variable, would have eliminated this problem, but was not used.

(4) A number of experimenters using real life experiences asked subjects for memories from Christmas vacation - presumably a period for which a greater number of pleasant than unpleasant experiences are more easily available. No corresponding periods of time of predominantly unpleasant events (death, accidents, etc.) were used.

(5) There was no attention paid to the recall of new experiences on the second recall (i.e. those events not recalled during the first recall). Many studies reported that this occurred, but ignored these data.

(6) No content analyses were performed on the life experience data, to investigate differences other than affective quality that may influence recall (for example, length of event descriptions, number of other associates generated, etc.)
(7) There is no evidence of counterbalancing or randomizing the order in which pleasant and unpleasant information was generated or recalled. In the overwhelming number of cases, the pleasant experiences were asked to be generated and recalled before the unpleasant.

(8) Although many investigators using real life experiences intended to test the repression hypothesis, there was no discussion regarding the criteria that need to be met for an experimental demonstration of repression nor the validity of the experimental operations that were used.

(9) The research using word lists, although directed at introducing better controls on the material to be learned, used pleasant and unpleasant words which have associations outside the experimental situation.

(10) Most studies using word lists did not control for factors such as frequency, imagery, etc. that may have contributed to the differential recall of pleasant and unpleasant words.

(11) Often, the number of subjects used in the experiments was very small, and the problem was compounded by the lack of rigorous statistical tests. It was not uncommon to interpret small differences in recall percentages to mean statistically significant differences (without performing statistical tests).

Overall, the early experimental research on memory for affective information did not show any consistent results and suffered from several methodological flaws. After the 1940's, research on the topic of affect and memory was largely ignored, and benefit of the critical reviews, such as Turner and Barlow's was not translated into improved research.
More recent research on the affect/memory problem.

The experimental study of repression

During the 1950's and 1960's a series of studies directed at experimentally validating the concept of repression were published. The purpose of these studies was to explore and the original exposition of the concept, to discuss criteria to judge the adequacy of experimental operations, or suggest simpler alternative explanations for the phenomenon of motivated forgetting.

Properties of repression. It is commonly agreed that repression (1) is a strategy of defense that serves a ego-protective function for the individual, (2) involves motivated forgetting, rather than loss of memory through decay, interference, etc., (3) is accomplished through a process not under the conscious control of the individual, and (4) such motivated forgetting is potentially reversible.

Methods of experimentally studying repression.

(1) The most commonly used method to test repression was to test the recall of affectively neutral stimuli, such as nonsense syllables, following an ego-threatening experience on a related task. The original study was done by Zeller (1950a, 1950b) and was followed by others (Aborn, 1953; Merrill, 1954, Truax, 1957). (2) Another group of investigations, following in the tradition of the original Zeigarnik (1927) and Rosenzweig (1933) studies, used task interruption as a way of inducing failure (Alper, 1946; Gilmore, 1954; Coopersmith, 1960; Worche, 1957). (3) Yet another approach to the study of repression involved identifying information that was known to be threatening to the individual (Keet, 1948; Merrill, 1954; Worche, 1955; Wilkinson and Cargill, 1955).

Alternatives to repression. Although inferior memory for unpleasant information was often found in the studies reviewed above, other carefully designed studies were able
to demonstrate conditions under which the "repression effect" did not occur. For instance, Aborn found no evidence for repression when explicit instructions to learn were given. Other researchers (Russell, 1952) attributed the repression finding to motivational states of frustration or anxiety that lead to the "elicitation of competing tendencies". Holmes and Shallow (1969) advanced further support for an "interference" explanation, by demonstrating no difference in recall of subjects in an ego-threat vs. an interference condition. Non-defensive attentional processes and interference mechanisms have been proposed as the most viable alternative explanations to the repression hypothesis.

More recently, attention was re-directed to the phenomenon of repression by Erdelyi and Goldberg's (1979) bold and daring defense of the utility of the repression concept. They criticized mainstream cognitive psychology for its conspicuous silence about a process that deals with "mistranslating - or motivated information misprocessing", and embarked on a criticism of existing critiques (Bandura, 1969; Holmes, 1974) of the repression hypothesis. Erdelyi and Goldberg argue that Freud's approach to repression was cognitive, and an application of the computer metaphor to the study of repression and other psychodynamic principles would be valuable. Erdelyi (1974; 1985) has proposed such a processing-bias model and experiments that may provide a suitable test of repression.

B: More recent evidence for an intensity principle in memory. The most widely cited support for an intensity effect in memory comes from a series of experiments reported by Dutta and Kanungo (1975).

Dutta and Kanungo asked subjects to learn lists of pleasant and unpleasant traits adjectives attributed to their own group (low ego-involvement). One of their predictions was that the mean intensity ratings of adjectives recalled would be higher than the mean intensity of adjectives not recalled. Their data supported this finding and further demonstrated that intensity influences the original encoding as well as retrieval of the event.
V: Background and rationale of procedures used to study the affect and memory relationship

A: The procedure of the "second-generation" experiments.

The experimental task used to study the affect/memory relationship in this dissertation was suggested by a task used previously to study a self/memory effect. In this section, this task and its application to the study of the affect/memory problem is discussed.

Banaji, (1982; Greenwald and Banaji, 1985), reported a series of studies in which the superior mnemonic advantage of self-produced cues in the retrieval of associated information was established. In these experiments, subjects were asked to generate 10 names of friends and were also provided with 10 names that were generated by another subject. Subjects then constructed sentences, in each of which they used a name (self- or other-generated) and an experimenter-provided target noun. An incidental free recall was administered for the target nouns used in the sentences. Cued recall was measured by providing subjects with the names and asking for the recall of the target word linked to each name. The finding, that targets linked to self-generated cues were better remembered than targets linked to experimenter-provided cues, was termed the second-generation effect [6].

B: Application of the second-generation procedure to the study of affect and memory.

The second-generation experiments had made use of a procedure in which memory was tested for "neutral" information that was linked to critical information (such as the self-generated cues). This procedure appeared to be particularly suitable to test the affect/memory relationship. Specifically, the second-generation procedure seemed to provide an appropriate way of testing some affect/memory hypotheses, for instance, is affective
intensity critical to memory (i.e. better memory for both intensely pleasant as well as unpleasant events) or is affective quality a better predictor of memory (i.e. pleasant information is remembered better than unpleasant information)?

In the proposed research on affect and memory, subjects construct sentences in each of which they use an affectively neutral target word, which is embedded in an affective experience of varying quality and intensity. Specifically, subjects are given a set of 24 neutral target nouns, and for each of these subjects construct a sentence involving (1) themselves as the subject of the sentence (to ensure sufficient ego-involvement), (2) the affectively neutral target noun as the object of the sentence, (3) a hypothetical event that was pleasant, unpleasant or neutral with two levels of intensity (extreme or moderate).

The advantage of using this procedure is that the retrieval of neutral items cannot be attributed to extraneous variables (for example, the problem encountered in experiments that used real life experiences, or target words that were pleasant or unpleasant). At the same time, the experimental task of constructing sentences about affective events is not prone to the criticism directed at research involving less ecologically valid materials such as words or nonsense syllables.

If words used in affectively pleasant sentences are remembered better, this would be evidence for the "hedonic" memory hypothesis; on the other hand if words used in affectively pleasant or unpleasant sentences are both remembered better than affectively neutral sentences, this would be support for the affective intensity hypothesis. The affective intensity hypothesis would be supported further, if words in more intensely affective sentences were remembered better than words in sentences of moderate intensity. Other indicators, such as clustering in free recall by type of affect would suggest affective organization in memory.

As discussed in section I, clinical and social psychologists were convinced that understanding the nature of affective processes was critical to the understanding of other aspects of psychological functioning. However,
Experimental psychologists have avoided doing research on the affect/memory problem primarily because of the lack of availability of a theoretical framework not burdened by psychoanalytic concepts and methods of inquiry as well as the lack of a method that could produce an unconfounded test of the influence of affect on memory and at the same time possess ecological validity. By viewing the affect and memory relationship in the context of established principles of memory, this research contributes by proposing a method that allows an unconfounded test of the affect/memory relationship.
The influence of quality and intensity of affect on memory

The purpose of Experiments 1, 2 and 3 was to develop and refine a procedure to test the influence of the affective quality of information on memory for that information. Previous research designed to study the mediation of self-generated cues at retrieval, were critical in suggesting the experimental task to study the affect memory relationship and will be discussed briefly.

In the self and memory studies, subjects were asked to construct sentences in each of which they used (1) a self- or other-generated name and (2) a neutral target word. Memory tests for the target words consistently revealed almost twice as good recall for targets linked to self-generated names than to other-generated names. The assumption was that memory for the target words (themselves equally likely to be remembered) was influenced by the ease of retrieval of the self-generated names to which they were linked.

The idea underlying this procedure is that often it is not possible to directly test memory for information the researcher is interested in. For example, as the review of the early work on affect and memory indicated, there are several confounds associated with testing memory directly for the affective experiences themselves. A solution to this problem is to test memory for the critical information by embedding in it a neutral "tag" or "tracer" for which the memory test is administered. The virtue of this procedure is that affective information with all its natural richness can be used, but memory for the "tracer" embedded in this information makes the test free of the confounds of extraenous variables linked to the affective information. The use of an "affective tracer" underlied some of the early work on affect and memory (Stagner, 1931) and particularly in the experimental work on repression (Zeller, 1950a, 1950b) in which memory was tested for an unrelated task after repression had been induced.
It was possible that in the second-generation experiments, the memory enhancing role of self-generated items on memory may have been a function of using affectively pleasant names of friends, rather than the affectively neutral names of strangers. Two experiments were done in which subjects were asked to generate names of people they like as well as dislike. However, the names of liked and disliked persons, like real life experiences, had affective values attached to them prior to the experimental session. Therefore, differential memory for the affective information could be due to a number of variables that are linked to the affective stimuli; for example, liked persons may also be more imagable, and therefore lead to better recall, or, names of disliked persons may be harder to generate at encoding and retrieve at the time of recall.

To avoid the problems associated with the use of stimuli with existing affective values, the present set of experiments instructed subjects to use themselves as the subject of all their sentences. This procedure eliminates the use of item-specific cues (i.e. a different cue for each target word). Instead, an association is created between the affective context of each sentence about the self and the target noun by having subjects place the two items into a description of an imagined event that is either pleasant, unpleasant or neutral in affective quality. The affective quality of the imagined event is the critical distinguishing feature of this procedure.
Experiment 1: Establishing the procedure

The purpose of Experiment 1 was to develop the procedure to be used in future experiments to test the affect/memory relationship. The focus of interest was on the variable of "hedonistic memory", and the hypothesis to be put to the test was: Does the pleasantness, unpleasantness or neutralness of information determine memory for that information? As noted in the introduction, there are problems with testing memory for the affective information itself. Therefore, to avoid this problem, the manipulation of affective quality in these experiments occurred at the level of creating an affective context (a pleasant, unpleasant or neutral sentence) into which affectively neutral information (a word) was embedded. The assumption here was that memory for the neutral "tag" would give information about the influence of the affective context on memory.

Overview of the procedure.

Subjects, in groups of 4 to 8 per session, were presented with a series of short booklets. A task involving learning and recalling answers to trivia questions was presented as the major focus of the study. Actually, the trivia task served as a filler between the sentence construction (affective encoding) task and its unexpected recall test. Before doing the trivia, subjects were introduced to the task of creating sentences using some rules presented by the experimenter. Subjects constructed 24 sentences, in each of which they incorporated themselves as the subject of the sentence (i.e. sentence in first person) and a target noun which was to be involved in some way with an imagined future event of specified affective quality. They then studied answers to ten trivia questions, for which they expected a recall test later in the session. After studying the trivia, subjects were given recall tests, including most importantly, a free recall measure for the target nouns. The experiment concluded by asking the subject to retrieve answers to the
trivia questions.

Method

Subjects. Eighty three undergraduates in introductory psychology classes at Ohio State University participated in partial fulfillment of a course requirement.

Design. A 3 (quality of affect of the imagined event: pleasant vs. unpleasant vs. neutral) X 2 (scenario: instruction to construct a scenario vs. no instructions to construct a scenario) factorial was used. Quality of affect of the imagined event was a within subjects factor, whereas use of scenario in sentence construction was a between subjects factor.

Materials. A set of 24 concrete nouns were chosen from Battig and Montague’s (1969) investigation of 52 noun categories, with the following constraints: (1) no two nouns came from the same category, (2) all nouns were concrete nouns, and (3) no more than three nouns had the same initial letter (See Appendix A for the list of 24 nouns). The filler task consisted of 10 trivia questions. (See Appendix B for the list of trivia questions and answers).

Procedure

Affective encoding (sentence construction). After a brief description of the upcoming trivia learning task, subjects were asked to construct 24 sentences, one on each page of a booklet. (The sentence construction task was introduced to subjects by informing them that the experimenter was interested in sentence construction using some rules that were to be specified by the experimenter). Instructions such as the following appeared on each of the 24 pages:

Create a sentence about an imagined event involving
All pages of the booklet carried the same instruction with the exception that a different word appeared on each page. Subjects constructed 24 sentences, each of which incorporated: (1) The self - subjects were asked to use themselves as the main protagonist in the event described in each sentence (use of "I" "me" "my" "mine" "myself" were all permitted); (2) The target word - subjects were instructed to use the target word that appeared on the page in the sentence they constructed; (3) An imagined future event - each sentence had to describe an event that was affectively pleasant, unpleasant or neutral, indicated to the subject by a sign (+, 0, -) in the top right corner of each page.

Scenario variation. Thirty-eight subjects were asked to construct sentences about an imagined future event. The remaining forty-five subjects were given specific instructions to think of a future scenario involving themselves - for example, where they might be living, their family, their occupation, their interests, five to ten years from now. These subjects were asked to use the scenario as an aid to generate sentences about imagined future events. The scenario variation was introduced because it was hypothesized that allowing subjects to create an imagined scenario prior to constructing sentences would allow them to more easily construct sentences describing hypothetical events. Since the scenario variation did not have any effect on the dependent measure of free recall (F < 1), in other analyses the scenario variable was collapsed across the two conditions.

All subjects were informed that a pleasant sentence should be about an event that was happy, interesting, and/or exciting; an unpleasant sentence should be about something that was boring, depressing and/or unhappy; a neutral sentence should be about something that was neither pleasant or unpleasant - it should make one feel neither good nor bad. Subjects were given examples, as follows: "If the noun we provide you with is REFRIGERATOR, suitable sentences might be:

(+) Pleasant - I won a brand new refrigerator, with a
year's supply of food, in the Ohio State lottery.

(-) Unpleasant - I found cockroaches all over the refrigerator when I returned home from my vacation.
(0) Neutral - I open the refrigerator approximately seven times a day."

Different random orders of target words were constructed, and no more than 4 subjects received the same random order. A separate random order of the affect of the sentences was created for each subject with one constraint: No more than three sentences with the same affect were requested in succession.

Timed control of tasks. Subjects were allowed 40-45 seconds to construct each sentence. Pilot testing had indicated that this was sufficient time to construct each sentence. Subjects were instructed that if they had completed the sentence within that time, they were not to proceed to the next one until the experimenter so signaled. Likewise, if subjects had not completed the sentence when the experimenter signaled, they were nevertheless to proceed to the next. This timed procedure was used to prevent spending differential amounts of time constructing pleasant, unpleasant and neutral sentences.

Filler Task. Subjects returned the booklets on which they had constructed sentences, and were given a set of twenty trivia questions and answers, to be studied for five minutes. The following is a sample trivia item (for the entire list of trivia questions used, see Appendix B):

Q: Mickey Mouse is an aging rodent in his 50s. He made history in 1928, when he appeared in the first animated cartoon to use sound. What was it called?

A: Steamboat Willie

Subjects were informed that there would be a memory test for the answers to the trivia at a later time. (Note that subjects were told at the beginning of the experiment that memory for the trivia was the main focus of the experiment.)
Free Recall Test. On completion of their study of trivia, subjects were given a small booklet that contained 24 blank sheets. They were unexpectedly asked to remember as many as they could, and in any order, the target words that they had been instructed to incorporate in the sentences. Subjects were instructed to recall only one item per page, in order to minimize the possible role of interitem association in recall. A five minute period was allowed for this free recall task.

Hypotheticality rating. Subjects had been asked to use imagined events in constructing sentences. This constraint was instituted to avoid the problem of using "real" affective material that may be correlated with other extraneous variables. To obtain an indication of the success of this manipulation, subjects were provided with a 9 point scale on which they indicated the degree of "realness" of each sentence (1 = very real, 9 = completely imagined). Results of these data are presented in Appendix C.

Finally, subjects were given a recall test for the answers to the trivia questions, after which they were debriefed. During the debriefing, subjects were told that the trivia learning task was a filler task, and that the experiment was designed to answer questions about memory for affective information.

Results.

Free recall of target nouns. Free recall data were analyzed in a 2 (sentence construction procedure: scenario vs. no scenario) X 3 (affect of the sentence: pleasant, neutral and unpleasant) factorial design. The first was a between subjects factor, whereas the second was a within subjects factor.

Table 2 reports the mean recall of target words embedded in pleasant, unpleasant and neutral sentences. Free recall of targets embedded in pleasant and neutral sentences was better than recall of targets embedded in unpleasant sentences. The main effect of affective quality on recall was significant (F[2, 162] = 3.17, p < .04). A
Duncan's multiple range pair-wise comparison test indicated that this result was due to a difference in recall of targets embedded in neutral vs. unpleasant sentences (4.38 vs. 3.87, \( q = < .05 \)) and pleasant vs. unpleasant sentences (4.29 vs. 3.87, \( q = < .05 \)). There was no difference in recall of targets embedded in pleasant vs. neutral sentences (4.38 vs. 4.29, \( q = > .05 \)).

Analysis of clustering. Researchers interested in organization of information in memory have used the method of clustering to analyze free recall data. The particular measure of clustering used in this analysis was the "Adjusted Ratio of Clustering (ARC)", proposed by Roencker, Thompson and Brown (1971; also used by Ostrom, Pryor and Simpson, 1981; Pryor and Ostrom, 1981). For Experiment 1, the overall arc score was .01, indicating that clustering by affect was at chance level (\( t[82] = .32, q > .30 \)). Similarly, clustering analyses for subsequent experiments did not indicate organization by affective quality of the event and will not be reported. (For a report of further clustering analyses, see Appendix D).

Discussion

Results of Experiment 1 indicated that recall of targets linked to pleasant or neutral events was better than those embedded in unpleasant events. Can these data be interpreted to mean that pleasant (and neutral) information is better remembered than unpleasant information? It would be premature to make this claim since it is feasible that although the experimenter had manipulated affective quality, it was the degree of affective intensity that had influenced recall. For instance, it was possible that pleasant sentences were of a stronger intensity than unpleasant ones, thus leading to their superior recall.

One puzzling result was the superior memory for targets embedded in neutral sentences. The hedonic memory hypothesis and especially the intensity hypothesis would not have predicted this result. During debriefing subjects indicated that it was difficult for them to construct neutral sentences about hypothetical events. It is possible that this difficulty made these sentences more
memorable. However, at this point there is no clear explanation for this result.

It was clear that a measure of affective intensity was critical to the evaluation of the affect/memory relationship, and in Experiment 2, it was these additional data that were collected.
Table 2: Mean Free Recall of Target Nouns Embedded in Pleasant, Neutral and Unpleasant Sentences
(Experiment 1)

<table>
<thead>
<tr>
<th>Sentence Construction Instructions</th>
<th>Affect of the sentence</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unpleasant</td>
<td>Neutral</td>
<td>Pleasant</td>
<td></td>
</tr>
<tr>
<td>No Scenario (n = 38)</td>
<td>3.84 (1.42)</td>
<td>4.45 (1.38)</td>
<td>4.11 (1.53)</td>
<td></td>
</tr>
<tr>
<td>Scenario (n = 45)</td>
<td>3.91 (1.52)</td>
<td>4.33 (1.68)</td>
<td>4.44 (1.56)</td>
<td></td>
</tr>
<tr>
<td>Total (n = 83)</td>
<td>3.87 (1.47)</td>
<td>4.38 (1.54)</td>
<td>4.29 (1.55)</td>
<td></td>
</tr>
</tbody>
</table>
Experiment 2

Experiment 2 was performed to refine some of the procedures developed in Experiment 1. Specifically, it was noted that the words chosen from Battig and Montague (1969) were not all affectively neutral. Three independent judges were asked to score the target words for affective quality. Eleven of the 24 words (for example, DOG, BASEBALL, ROBIN) were judged to be pleasant, while the rest of the 13 target words (for example, ISLAND, ROOF, TRUCK) were rated as neutral. It was also noted that a large number of the sentences were not rated as 'imaginary'. Subjects reported difficulty in constructing sentences about events that had never happened to them. Finally, it was noted that a measure of affective intensity from subjects would be desirable. Experiment 2 was a replication of Experiment 1 with the exception that (1) a set of target words selected for affective neutrality were used, (2) a procedure intended to make construction of imagined events easier was adopted, and (3) a rating of affective intensity of the event described in the sentence was obtained.

Method

Subjects. Thirty-nine undergraduates from the same subject pool as before participated in the experiment.

Materials. Twenty-four words were chosen from Brown and Ure's (1969) list of words for which ratings of pleasantness were available. For the purpose of Experiment 2, words were chosen with the following constraints (See Appendix E): (1) all words had received a pleasantness rating between 3.5 and 4.5 (Brown and Ure used a seven point scale of pleasantness, with 4.0 as the midpoint); (2) all words were concrete nouns and (3) as far as possible, words that had strong gender associations (for example, soldier, doll) were not used. This was done to avoid any differential ease with which the words could be used in sentences about an imagined son vs. daughter.
Design and procedure. The procedure of Experiment 2 was the same as that of Experiment 1 except for the following changes. Subjects were asked to construct sentences using either an imagined son or daughter as the protagonist of the event described in each sentence. This was done so as to make it easier to construct sentences about imaginary events and yet be able to (1) maintain the subjects' ego-involvement in the events described in the sentences and, (2) avoid the problem of using names of known persons. (For instructions to subjects, see Appendix F). After the free recall data on target nouns were collected and before the "realness" ratings were collected a rating of affective intensity was obtained for each sentence. Subjects were given the booklet on which they had constructed sentences and were provided with a bipolar scale, ranging from -3 to +3 through a neutral 0 point. Subjects were instructed to use the scale to indicate their judgment regarding the overall affective intensity of the event they described in each sentence. The "realness" rating was modified such that subjects indicated by an "R", those sentences they had created that were "real" and not imaginary.

Results

Free recall of targets. The finding of most interest was free recall of target nouns in pleasant, unpleasant and neutral sentences. As the data (presented in Table 3) indicate, target nouns embedded in unpleasant sentences were recalled better (4.46) than targets embedded in either pleasant or neutral sentences (3.62 and 3.94 respectively). Results were first analyzed in a 2 (Subject of imagined event: son vs. daughter) X 3 (Affect of the event described in the sentence: pleasant, neutral, unpleasant) factorial. A one way ANOVA on free recall of target nouns was significant (F[2,76] = 3.74, p < .03). Pre-planned pairwise comparison tests, using the Duncan procedure, indicated that there was greater recall of target nouns embedded in unpleasant sentences than pleasant sentences (p < .05). No other significant differences were obtained. As expected, there were no differences in the pattern of data using son vs. daughter in sentence construction (E < 1).

Intensity ratings. Data from the intensity ratings were first scored for the distribution of the sentences among the possible intensity ratings on the 7 point bipolar
scale. These data, presented in Table 4, indicate that subjects created more extremely unpleasant sentences than moderately unpleasant ones (35% vs. 26%). On the other hand, for the pleasant sentences, many more moderately pleasant sentences were constructed than extremely pleasant ones (42% vs. 15%).

Table 3: Mean Recall of Target Nouns Embedded in Pleasant, Neutral and Unpleasant Sentences (Experiment 2).

<table>
<thead>
<tr>
<th>Affect of Sentence</th>
<th>Unpleasant</th>
<th>Neutral</th>
<th>Pleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4.46</td>
<td>3.94</td>
<td>3.62</td>
</tr>
<tr>
<td>SD</td>
<td>1.68</td>
<td>1.61</td>
<td>1.71</td>
</tr>
<tr>
<td>%</td>
<td>55.75</td>
<td>49.25</td>
<td>45.25</td>
</tr>
</tbody>
</table>

n = 39
Table 4: Frequency of Sentences Constructed for Assigned Affective Quality X Rated Affective Intensity (Experiment 2).

<table>
<thead>
<tr>
<th>Experimenter's Assignment of Affective Quality</th>
<th>Subjects' Ratings of Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-1</td>
</tr>
<tr>
<td>Pleasant</td>
<td>1</td>
</tr>
<tr>
<td>%</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Neutral</td>
<td>9</td>
</tr>
<tr>
<td>%</td>
<td>3</td>
</tr>
<tr>
<td>Unpleasant</td>
<td>81</td>
</tr>
<tr>
<td>%</td>
<td>26</td>
</tr>
</tbody>
</table>
Regression analyses were performed to examine the influence of experimenter-assigned affective quality and subject-rated affective intensity. A hierarchical multiple regression procedure was used in which predictors were entered in the following order: (1) Manipulated intensity of affect; (2) Square of manipulated intensity; (3) Rated intensity of affect, and (4) Square of rated intensity. The dependent measure in the regression analysis was recall.

Overall, the regression analyses revealed two main findings: First, it showed better memory for targets embedded in unpleasant than pleasant sentences. Second, it showed better memory for targets embedded in more intensely affective (both pleasant and unpleasant sentences) than less intensely affective ones.

Specifically, results indicated that manipulated intensity of affect was a significant predictor of recall, with targets in unpleasant sentences being recalled better than those in pleasant ones ($F[1,38] = 6.24, p < .01$). The quadratic trend for this variable was insignificant ($F[1,38] = .30, p > .56$). On the other hand, the linear trend for rated intensity was insignificant ($F[1,38] = .79, p > .36$). The quadratic trend for rated intensity of affect however, was significant, with better memory for targets embedded in intensely affective sentences than less intensely affective sentences ($F[1,38] = 5.28, p = .02$). (See Appendix G for hierarchical multiple regression the table to examine the contribution of all the predictors entered in the regression model).

Figure 1 graphs the percentage of recall in each category of rated affective intensity. The trend is a quadratic one, with fewer targets embedded in neutral and moderately affective sentences recalled than targets embedded in extremely affective sentences.
Figure 1: Percentage of free recall x Affective intensity ratings (Experiment 2).
Discussion

Contrary to Experiment 1, the present experiment indicated better free recall of targets embedded in unpleasant sentences than pleasant ones. The only critical difference in the procedures of the two experiments was the use of self (in Experiment 1) vs. an imagined son/daughter (in Experiment 2) as the subject of each sentence. This difference is potentially interesting in that it suggests that the affect/memory relationship may be mediated by the target person in relation to whom the information is processed. However, this is speculative, since these are results from different experiments and not directly comparable.

The significant quadratic trend of rated intensity of affect, on the other hand, seemed to be a promising finding, especially in light of the lack of a consistent "hedonistic" memory finding. Experiment 3 was conducted to explore further the variable of affective intensity.
Experiment 3

Experiment 1 had indicated better memory for targets embedded in pleasant and neutral than unpleasant sentences. There was no measure of affective intensity in this experiment, and therefore it was not possible to determine the potential effect of the intensity of affect on memory. In Experiment 2, this finding was reversed to reflect better memory for targets embedded in unpleasant than pleasant sentences. Further, when a rating of affective intensity was collected, this variable seemed to be a significant predictor of recall.

In Experiment 3 the variable of affective intensity continued to be explored, and an added cued recall measure of the affective event itself was obtained.

Method

Subjects. Thirty five undergraduates from the same pool as before participated in this study.

Design and Procedure. With two exceptions, the procedure of Experiment 3 was the same as that of Experiment 2. First, the sentence construction task involved using the subjects themselves as in Experiment 1 (rather than an imagined son or daughter as in Experiment 2). Second, an additional recall measure (described below) was added.

Pseudo cued recall. A measure of the availability of affective events themselves was devised, referred to as a pseudo cued recall measure. After subjects had completed the free recall of target nouns used in the sentences, they were given a booklet containing blank sheets of paper on which they were asked to remember any of the sentences they had constructed that had the word "the" in it. (It had been ascertained from the two previous experiments that
almost 100% of sentences constructed had used the word "the"). Subjects were given only two minutes to work on this task.

A direct test of recall (i.e. asking subjects to remember the pleasant, unpleasant and neutral sentences they had constructed) may not be a good indicator of what is most accessible in memory. Thus, providing subjects with a nonselective retrieval cue ("the"), it was hypothesized, would provide an indirect measure of spontaneous recall of the affective events. The cue "the" merely served to disguise the purpose of the retrieval that was of interest; hence, the name pseudo cued recall.

Results

Free recall of targets. The free recall data are summarized in Table 5. There was no difference in recall of target nouns linked to pleasant vs. neutral vs. unpleasant sentences (3.94 vs. 3.71 vs. 4.00, F[2, 68] = .44, p > .60).

Intensity ratings. Analyses on the intensity ratings were performed in a similar manner to Experiment 2. Data from the intensity ratings (by subjects themselves) were first scored for the distribution of the sentences among the possible intensity ratings on the 7 point bipolar scale. These data, presented in Table 6, indicate that, unlike Experiment 2, subjects created an approximately equal number of moderately and extremely pleasant and unpleasant sentences.

Regression analyses were performed to examine the influence of assigned affect (i.e. the affective quality designated to each sentence by the experimenter) and rated affect (the rating of intensity of affect given by subjects to each of the sentences) on recall. Predictors were entered in a manner similar to Experiment 2.

Overall, the regression analyses showed two main findings: First, assigned intensity of affect was not a significant predictor of recall and second, rated intensity of affect continued to be a significant predictor of recall.
(i.e. better memory for targets embedded in sentences rated as more intensely than less intensely affective.

Figure 2 graphs the percentage of recall in each category of rated affective intensity. As in Experiment 2, the trend is a quadratic one, with fewer targets embedded in neutral and moderately affective sentences recalled than targets embedded in extremely affective sentences ($F_{1,34} = 5.63, p = .02$). As in the previous experiment, the linear trend for this variable was insignificant ($F_{1,34} = 1.46, p = .22$). (See Appendix G, for the hierarchical multiple regression table that reports the contribution of all the variables entered in the regression model).

Table 5: Mean Recall of Target Nouns Embedded in Pleasant, Neutral and Unpleasant Sentences (Experiment 3).

<table>
<thead>
<tr>
<th>Affect of Sentence</th>
<th>Unpleasant</th>
<th>Neutral</th>
<th>Pleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4.00</td>
<td>3.71</td>
<td>3.94</td>
</tr>
<tr>
<td>SD</td>
<td>1.59</td>
<td>1.51</td>
<td>1.51</td>
</tr>
<tr>
<td>%</td>
<td>50.00</td>
<td>46.37</td>
<td>49.25</td>
</tr>
</tbody>
</table>

$n = 35$
Table 6: Frequency of Sentences Constructed for Assigned Affective Quality X Rated Affective Intensity (Experiment 3).

<table>
<thead>
<tr>
<th>Experimenters' Assignment of Affective Quality</th>
<th>Subjects' Ratings of Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>-2</td>
</tr>
<tr>
<td>Pleasant</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Neutral</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Unpleasant</td>
<td>Mean</td>
</tr>
<tr>
<td></td>
<td>%</td>
</tr>
</tbody>
</table>

n=34
Figure 2: Percentage of free recall X Affective intensity ratings (Experiment 3).
Pseudo cued recall. The pseudo cued recall test, in which subjects were asked to generate sentences that had the word "the" in it, showed, as Table 7 indicates, that subjects recalled more unpleasant sentences than pleasant or neutral sentences (41% vs. 25% vs. 34%, F[2,66] = 2.61, p = .07). The only significant difference was between recall of pleasant and unpleasant sentences (25% vs. 41%, t[33] = 2.39, p = .02). The affect of the first sentence generated in response to the pseudo cue showed the superiority of unpleasant events. Seventeen out of 34 subjects generated an unpleasant sentence as the first one, whereas only 6 generated a pleasant sentence and 11 generated a neutral one.

Discussion

The contribution of Experiment 3 was the replication of the affective intensity finding demonstrated originally in Experiment 2. This is an important finding because much of the early research showed support for the "hedonistic" memory, i.e. better memory for pleasant than unpleasant information. The hypothesis of hedonistic memory, did not receive any support in the three experiments reported here. Experiment 1 found better memory for pleasant than unpleasant information, Experiment 2 found better memory for unpleasant than pleasant information and Experiment 3 found no difference in memory for pleasant, unpleasant or neutral information.

On the other hand, Experiments 2 and 3 both demonstrated support for the finding that intensity of affect is a good predictor of memory.
Table 7: Mean Recall of Pleasant, Neutral and Unpleasant Sentences (Experiment 3).

<table>
<thead>
<tr>
<th>Affect of Sentence</th>
<th>Unpleasant</th>
<th>Neutral</th>
<th>Pleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>1.47</td>
<td>1.12</td>
<td>0.86</td>
</tr>
<tr>
<td>SD.</td>
<td>0.96</td>
<td>0.97</td>
<td>0.95</td>
</tr>
<tr>
<td>%</td>
<td>41.14</td>
<td>33.71</td>
<td>25.14</td>
</tr>
</tbody>
</table>

n = 34
Experiment 1A: An additional test of affective intensity

The results of Experiments 2 and 3 had shown support for the hypothesis of affective intensity. In both experiments, the quadratic function of rated intensity was a significant predictor of recall.

On the other hand, the hypothesis of hedonistic memory had not met with consistent support: Experiment 1 indicated better memory for targets in pleasant and neutral than unpleasant sentences. Experiment 2 (using an imagined son and daughter as the subject of the described event) showed that manipulated intensity was a significant predictor of memory with better memory for targets in unpleasant than pleasant or neutral sentences. Experiment 3 demonstrated that manipulated affect was not a significant predictor of recall, with no difference in memory for targets that were embedded in pleasant, neutral or unpleasant sentences.

Of the three experiments reported so far, Experiment 1 was the only study in which no data for rated affective intensity were collected. If data on rated affective intensity could be obtained for the sentences generated by subjects in Experiment 1, and the results were compatible with those of Experiments 2 and 3, then a clear picture of the influence of affective intensity on memory would emerge.

In Experiment 1A, subjects provided ratings of affective intensity on sentences created by other subjects in Experiment 1. Similar to previous experiments, subjects were given a free recall test of the targets in the sentences they had rated. The distinguishing feature of the method of the present experiment was that the subjects performing the rating and recall task were independent judges who had not created the sentences.
Method

Subjects. Eighty-three subjects (undergraduates students at Ohio State University and University of Washington) participated in partial fulfillment of a course requirement.

Materials. The sentences constructed by each subject in Experiment 1 were in a booklet consisting of 24 pages, with one sentence constructed per page.

Procedure. The procedure was the same as that of previous experiments, with the following exceptions:

(1) Each subject was given a randomly chosen booklet consisting of the sentences constructed by subjects in Experiment 1. They were asked to first read each sentence and underline the target word in it. Next, subjects were asked to rate each sentence on a 7 point scale (similar to Experiments 2 and 3).

(2) After the filler task, subjects were given a surprise free recall task in which they were asked to recall the target words used in the sentences they had rated. They were also instructed to recall the entire sentence in which the target was embedded, if they could, after having recalled the target word.

Results

The free recall data indicated that if subjects recalled the target word, they also recalled the sentence in which it was embedded. In very few cases was a target word recalled without the entire sentence (2.08%), making a separate analysis unnecessary.

First a description of the rated affective intensity and manipulated affective intensity data: The rated
affective intensity recall data (summarized in Table 8) show most clearly that the percentage of pleasant and unpleasant sentences recalled did not differ. Both affectively pleasant as well as unpleasant sentences were however recalled much better than neutral ones.

The recall data for manipulated affective intensity (Table 9) show that pleasant and unpleasant sentences are better remembered than neutral ones (45% and 33% vs. 24%).

A regression analysis was performed on the data of 78 subjects. Five subjects were excluded from the final analysis because they failed to follow the free recall instructions and recalled instead, questions and/or answers from the trivia items they had studied earlier.

Similar to Experiments 2 and 3, this analysis was performed to examine the influence of experimenter-assigned affective intensity and subject-rated affective intensity. In a hierarchical multiple regression procedure, predictors were entered in the order: (1) Manipulated intensity of affect; (2) Square of manipulated intensity of affect; (3) Rated intensity of affect, and (4) Square of rated intensity of affect. The dependent measure, as before was free recall.

Overall, the regression analyses revealed complementary findings: First, it showed a marginally significant curvilinear effect of manipulated affective intensity - better memory for sentences that were unpleasant as well as pleasant than neutral ones ($E[1, 77] = 4.53, q = .08$). Second, it showed a significant effect of rated affective intensity of affect - better memory for more intensely affective (both pleasant and unpleasant sentences) than less intensely affective sentences. The quadratic trend for the variable of rated affective intensity was highly significant ($E[1, 77] = 71.36, q = .0001$). There was an insignificant linear trend for manipulated affective intensity ($E[1, 77] = 1.01, q = .31$) as well as rated affective intensity ($E[1, 77] = .03, q = .87$).
Figure 3 graphs the percentage of recall in each category of rated affective intensity. As the figure indicates, the pattern of data reflects a clear quadratic trend, demonstrating better memory for the more intensely affective sentences than less intensely affective ones, with lowest recall for neutral sentences. (See Appendix H for the regression table).

Discussion

In Experiment 1A, data were collected from an independent group of subjects on the influence of the affective quality and intensity of sentences on memory for those sentences. These data strongly support the intensity hypothesis: Subjects remembered those sentences constructed by previous subjects that were pleasant or unpleasant in nature. Further, subjects remembered better those sentences rated by them as more intensely affective than less intensely affective.

Why was the affective intensity effect in Experiment 1A stronger than in Experiments 2 and 3? It is possible that in the previous experiments (in which subjects constructed the sentences from which they later recalled targets) recall was determined by factors other than just the intensity of the sentences. In Experiment 1A however, the only task subjects performed on the material they were later asked to remember was a rating of intensity task. At this point, we can only speculate that this may have contributed to the stronger intensity effect in Experiment 1A.

Another question at this point concerns the intensity rating measure itself employed in Experiments 2, 3 and 1A. Clearly this measure is not the most preferred way to measure the affective intensity hypothesis. This is because intensity was not a manipulated variable and ratings of intensity were collected after the recall measure. It is possible that recall influenced subjects ratings of intensity.

The three experiments (Experiment 2, 3 and 1A) together show consistent support for the affective
intensity hypothesis. However, in Experiment 4, several changes were made to improve the procedure (introduce intensity as a manipulated variable) and test a new hypothesis (based on schema theory) regarding the affect/memory relationship.
Table 8: Percentage recall of sentences of varying rated affective intensity (Experiment 1A).

<table>
<thead>
<tr>
<th></th>
<th>Unpleasant</th>
<th>Neutral</th>
<th>Pleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Recall</td>
<td>40</td>
<td>18</td>
<td>41</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>% Recall</th>
<th>+3</th>
<th>+2</th>
<th>+1</th>
<th>0</th>
<th>-1</th>
<th>-2</th>
<th>-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Recall</td>
<td>52</td>
<td>35</td>
<td>34</td>
<td>18</td>
<td>30</td>
<td>42</td>
<td>51</td>
</tr>
</tbody>
</table>

n=78
Table 9: Free recall of sentences of varying manipulated affective intensity

<table>
<thead>
<tr>
<th></th>
<th>Unpleasant</th>
<th>Neutral</th>
<th>Pleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Recall</td>
<td>45</td>
<td>26</td>
<td>33</td>
</tr>
</tbody>
</table>

n = 78
Figure 3: Percentage of free recall x affective intensity ratings (Experiment 1A).
A note on two experiments involving mood manipulations. In an effort to understand the role of an internal "affective context" on memory for affective information, two experiments were conducted in which the affective state of the subject was manipulated. The first of these two experiments used a happy vs. sad mood manipulation (Velten statements) while the second used a success vs. failure manipulation (a general knowledge test specifically developed for this experiment). Free recall and pseudo cued recall measures were obtained from subjects in neutral, positive and/or negative mood states.

The first of these experiments (Experiment 5) showed that subjects who were in a pleasant mood state remembered many more targets embedded in unpleasant sentences than pleasant sentences. This pattern was reflected in the pseudo cued recall test as well, in which subjects were asked to write down any one sentence that came to their mind that had the word "the" (the cue itself was different for each of the three pseudo cued recall tests). This pattern of data held up on a delayed recall test after 24 hours, but this may be due the confound that subjects were recalling the words they had recalled previously rather than the original information.

A second interesting result in Experiment 5 was the finding that when subjects constructed pleasant sentences they used themselves as the person responsible for the event (for example, "I made a dull ball of clay into a beautiful statue"). However, when constructing unpleasant sentences, subjects used themselves as the object of the event, with some other object or person portrayed as the responsible agent (for example, "The cork flew from the bottle as I held it and crashed through the stained glass"). In later experiments, subjects were given specific instructions to use themselves as the protagonist in every sentence.
The results of Experiments 5 and 6 although interesting, had used a complicated design involving mood manipulations and appear to detract from the main point of the dissertation. For this reason, the two experiments (Experiment 5 and 6), are presented in Appendix M, rather than at this point in the text.

Introduction

Experiment 4 was performed to test a specific hypothesis developed in Experiment 2 and 3. Specifically, it was noted that subjects' better memory for the unpleasant information may have been a result of processing the affective information (sentences) in relation to a schema consisting of predominantly positive information (creating scenarios of one's future self) that was activated. Experiment 4 was a replication of Experiment 3, with two exceptions: First, a personality measure (self-esteem) was introduced to test a specific hypothesis regarding the influence of a temporarily activated schema on the processing of affective information (to be developed further below). Second, recall measures were introduced at four delay intervals: Immediate recall (at the end of the experimental session); Same day recall (after approximately six to eight hours); Next day recall (after approximately 24 hours); 1 week delay recall. It had been noted in the discussion of Experiment 3 that a within subjects manipulation of multiple recall tests contaminated the later recall measures. An additional improvement in Experiment 4 was the introduction of delay before the dependent measures were administered as a between subjects variable.

A recapitulation of the processes hypothesized to be involved in the previous experiments will be useful at this point. Subjects activated a self-schema by constructing scenarios about their future self (and as data indicated, these scenarios contained highly positive information). Then, subjects were asked to construct sentences about imagined future events involving themselves that were presumably either pleasant, unpleasant or neutral. The pleasant sentences were congruent with the activated self-schema, whereas the unpleasant sentences were incongruent with the schema. Better memory for the unpleasant
sentences and targets in these sentences, it is suggested, is a function not of their negativity (although there is no concrete evidence for this in the present set of studies) but of their inconsistency with the evoked schema. Based on the findings of the present research and other previous findings (for example, a experiment conducted by Hastie, 1981) a related hypothesis was developed: If indeed subjects were recalling unpleasant information better because it was inconsistent with a temporarily activated self-schema which was positive, then subjects with high self-esteem should demonstrate this effect more than subjects with low self-esteem at immediate recall. The prediction for delayed recall, on the other hand, is that schema-assisted constructive recall processes will lead subjects with high self-esteem to remember more pleasant than unpleasant information.

Before this experiment is described, a review of some of the empirical findings demonstrating evidence for schematic processing are discussed.

A note on schemas.

Much current theorizing in cognitive psychology and social cognition involves the concept of schema. Inspite of several problems of definition and operationalization in experimental procedures (see Rumelhart and Ortony, 1977; Hastie, 1981), the consensus from the time of Bartlett (1932) and Piaget (1952) to the present (Anderson, 1977; Brewer and Nakumura, 1984; Fiske and Linville, 1980; Hastie, 1981; Minsky, 1975; Norman, 1975; Rumelhart, 1977, Rumelhart and Ortony, 1977) is that the concept is a very useful and powerful one.

Definition. For our purpose, it will suffice to restate some of the proposed definitions of the term. Schemata are data structures for representing information in meaningful units in memory, containing not only the elements of knowledge but also information about how this information is to be used (Rumelhart, 1977/1984). They have "... reference to a class of similar action sequences, these sequences of necessity being strong, bonded totalities in which the constituent behavioral elements are tightly interrelated (Piaget, 1952, p. 52)."
Empirical support for the notion of schema-assisted processing.

The studies reviewed here are relevant to the question: How does an abstract schema determine memory for specific concrete events that are related to it? (Hastie, 1981). An important finding in the early work on impression formation was that people form impressions of other persons fairly quickly and these impressions then serve to guide the interpretation of further incoming information (Asch, 1946).

Better memory for schema-consistent than inconsistent information. Several studies have explored the influence of schemas about roles, beliefs and intentions on information about subsequent behaviors that were schema-consistent, inconsistent or irrelevant. In a series of experiments, Zadny and Gerard (1974) manipulated subjects' beliefs regarding the target person's occupational role (academic major: science, music, etc.) or intentions (burglar, friend). Results showed that schema-congruent items were recalled better than schema-irrelevant items. The more important finding was that the effect was obtained only when the appropriate schema was activated before presentation of the information for which memory was to be tested. Similarly, Cohen (1977) and Rothbart, Evans and Fulero (1978) showed support for schema-congruent acts rather than incongruent acts.

It has been suggested that a schema facilitates the initial encoding of schema-related material by organizing the information and providing a background or context into which it can be easily accommodated (Cantor and Mischel, 1977; Taylor and Crocker, 1981).

Better memory for schema-inconsistent information. Often, the question of interest has concerned the influence of prior information (usually in the form of trait descriptions of persons) on the processing of subsequent related information (for example, making a judgment of the nature, "Would this person be a success as a social worker?").
One such program of research was conducted by Ostrom and his students (Lingle and Ostrom, 1979; Lingle, Dukerich and Ostrom, 1983). Using decision times as the dependent measure, Lingle, Dukerich and Ostrom demonstrated that subjects' retrieval strategies showed a search for disconfirming information rather than negative/positive information.

Hastie (1981, 1984; Hastie and Kumar, 1979) reported a set of influential studies in which he investigated the effects of an "expectancy" on the processing of subsequent information about a person. In a typical experiment, a subject was presented with a short description of a target person's personality (using trait adjectives) which served to set up an initial "expectancy". The subject was then presented with a series of behaviors that were attributed to the target person. The critical manipulation involved presenting subjects with target behaviors that were consistent, inconsistent or irrelevant to the initial expectancy.

In contrast to the schema-congruency effect, the finding of most interest was that the inconsistent behaviors were recalled better than the consistent ones which in turn were recalled better than the irrelevant ones. The effect was magnified as the set size of the inconsistent behaviors decreased compared to the set size of consistent behaviors. The basic finding has been reliably obtained with a variety of impression expectancies, with immediate and delayed recall tests and with written as well as other visual materials.

Hastie's finding was interpreted in terms of deeper or more elaborate processing of the inconsistent behaviors due to their greater information value regarding the target person's personality. To elaborate, when faced with an inconsistent behavior, the subject is faced with greater difficulty in incorporating this item with the expectancy information. As a result, (1) the inconsistent information is retained longer in working memory, (2) additional information in the form of old behaviors are retrieved and (3) this leads to greater interepisode linkages between the items of behavioral information.
More specifically, the better memory for the inconsistent items is a function of the paths emerging from inconsistent than consistent behaviors. Support for this interpretation has since been obtained by Srull (1981) in that if an irrelevant task takes up processing capacity, and disallows the formation of associative linkages, the memorial advantage for inconsistent items is reduced. More recently, Bargh (1985) has noted that the memory advantage for inconsistent items will exist only if the subject has sufficient processing resources available or has a severe load on processing but possesses an accessible category with which to process the input and relieve the strain on capacity.

The studies reviewed above (which represent only a small proportion of the literature on schema-based processing), have indicated that people have better memory for schema-congruent and under some conditions, for schema-incongruent information.

An interaction of memory for schema-consistent/inconsistent information and delay of memory test. There exists a set of studies done by Graesser and his colleagues that indicate better memory for script-irrelevant information at an immediate test and better memory for script-congruent information after approximately a 24 hour delay. Subjects in these experiments were presented with various scripts about "Jack", who visited the restaurant, took his dog to the vet, etc. and expected to be asked questions about Jack's personality at a later time. Following a filler task, subjects were given a recognition test for the actions presented in the script. Memory for atypical actions, such as "Jack put a pen in his pocket", was better than memory for typical actions such as "Jack paid the bill". In contrast, memory at a one-week delay was better for typical than atypical events.

The hypothesis proposed to explain this cross-over effect is the script pointer + tag hypothesis (Graesser, 1981; Woll and Graesser, 1984), which predicts that typical actions are interrelated and incorporated into the generic script at encoding. The atypical items, on the other hand, are distinct and stored separately, and linked to the generic script through a "tag", making their retrieval easier, if the memory test is within a short period of time.
In Experiment 4, five major changes were made. First, it was considered desirable to introduce level of affective intensity as a manipulated variable. In previous experiments (2 and 3) ratings of affective intensity were obtained after sentence construction and recall. In Experiment 4, subjects were asked to construct pleasant and unpleasant sentences differing in affective intensity (moderate and extreme).

Second, two personality measures (a self-esteem measure and the repression-sensitization scale) were introduced. The self-esteem measure was introduced to obtain an index of each subjects' self-esteem, which would be used to predict their memory for stimuli of varying affective type. The Repression-Sensitization test was used because (1) it could be predicted on the basis of this test that high repressors would remember fewer unpleasant sentences than pleasant ones; and, (2) there is known to be a high correlation between self-esteem and repression (as measured on the Byrne scale).

Third, the delayed free recall measures were introduced as a between subjects factor. This was done to test whether the intensity effect would continue to predict recall after a delay of time (with no prior recall).

Fourth, recall for the affective sentences themselves (rather than recall of targets embedded in them) was the main dependent measure. However, recall of target words has better methodological properties (as discussed in Chapter 1) and was used in the immediate recall condition. (In retrospect, it is noted that (1) free recall of targets should have been collected for all delay recall conditions, and (2) the recall procedure be kept the same, except for the delay variable, for all groups).

Fifth, before the sentence construction task, subjects were asked to write about their future, what their careers, family, etc. They were asked to use this scenario to later construct sentences about hypothetical events, using the information from the scenario they had constructed. This procedure was similar to that of Experiments 1 and 3, with
the exception that in Experiment 4 subjects were asked to initially write about these events. This was done to instantiate a schema about themselves, such that the affective sentences would be congruent or incongruent with the overall schema.
Method

Subjects. One hundred and forty five Ohio State University undergraduates participated in the experiment in partial fulfillment of a course requirement.

Personality measures. Two personality measures were used. The Rosenberg Self-esteem Inventory (Rosenberg, 1968) consisted of 10 items. Scoring was in the direction of high self-esteem, i.e. the higher the score on the test, the higher the assigned self-esteem of the subject. The lowest score obtained on the inventory was 10 and the highest was 40. The original version of the Repression-Sensitization Scale (Byrne, 1963; Byrne, Barry and Nelson, 1963;) contained over a hundred items, all of which were derived from various scales of the MMPI. The shorter version of the R-S Scale (66 items) used in this research was created by Epstein. (See Appendix J). The main difference in the two versions besides the length is that the Epstein version includes fewer anxiety items (the Byrne version correlates about .90 with measures of anxiety). The scoring for the Repression-Sensitization scale was in the direction of sensitization, with the higher the score, the lower the assigned repression.

Procedure. Subjects were randomly assigned to one of four recall conditions. The four conditions were: Group 1: immediate free recall (subjects were given recall tests during the experimental session); Group 2: same day free recall (subjects were given recall tests later the same day - 6 to 8 hours after the experimental session); Group 3: next day free recall (subjects were given the recall test approximately 24 hours after the experimental session) and Group 4: one week free recall (subjects were given the recall test one week later). The main reason for introducing the delay variable as a between subjects factor was to avoid the confounding of the second delayed recall measure as a result of obtaining the first measure.
Group 1. As in previous experiments, subjects were introduced to the trivia as the main focus of the experiment. Subjects then wrote about an imagined future (see Appendix I for instructions) for approximately 5 minutes. Following this, they constructed sentences as before, for which the experimenter had assigned values of affective quality and intensity. Also, as in Experiments 1 and 3, subjects were asked to use themselves as the "actor" in each sentence. Next, subjects studied answers to 10 trivia questions for three minutes, after which they were given the first pseudo cued recall test in response to the cue 'the/a'. Following this, subjects were given the Rosenberg self-esteem inventory and the Repression-Sensitization scale (order of the scale was counterbalanced). After completing the personality inventories, subjects were given the second pseudo cued recall test, using the cue 'I, me, my'. Then subjects were given a free recall test of sentences followed by a free recall of targets. Before leaving, subjects were informed that the experimenter was interested in collecting a delayed measure of memory for the trivia and subjects' phone numbers were obtained on this pretext.

Groups 2, 3 and 4. The procedure for subjects in Groups 2, 3 and 4 was similar except that no recall tests were obtained during the experimental session. Instead, subjects answered both personality inventories (order counterbalanced for each group) after the sentence construction task and this marked the end of the experimental session. Phone numbers were collected in a manner similar to Group 1.

At the delayed test, subjects were first asked to recall answers to three trivia questions. Then subjects were asked for a free recall of the sentences they had constructed during the experimental session. Following this, subjects were asked to remember any target words for which they may not remember the sentence. If subjects recalled such target words, they were then asked to try to remember the sentence associated with the word.
Table 10: Design of delayed recall measures

<table>
<thead>
<tr>
<th>Delay</th>
<th>Approx. 15 min.</th>
<th>Approx. 6-8 hrs.</th>
<th>Approx. 24 hrs.</th>
<th>Approx. 7 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate</td>
<td>FRT[*]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Next Day</td>
<td>FRT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Same Day</td>
<td>FRT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Week</td>
<td>FRT</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[*] FRT = Time of first recall test
Results.

The free recall data indicated that subjects who were given their first recall test after a week showed very poor recall performance (Mean recall = 3%; see Table 16 in Appendix K). For this reason, these data were excluded from any further analyses. Also, 8 subjects from the immediate recall condition, 14 from the same day recall condition and 12 from the next day condition could not be recontacted, leaving 91 subjects for all further analyses.

Sentence Recall. Results were first analyzed in a 3 (Delay of recall test: Immediate, Same day, Next day) X 5 (Affect of the sentence: Extremely pleasant and unpleasant, moderately pleasant and unpleasant and neutral) factorial. The first factor, delay of recall test, was a between subjects factor whereas the second, affect of the sentence, was a within subjects factor.

As the data in Figure 4 (see Table 17 in Appendix K for data) indicate, there was a difference in recall of sentences as a function of the time of recall (Immediate = .32, Same day = .18, Next day = .14, E (1, 88) = 40.11, p = .0001). There was also an overall effect of affect on percentage of sentences recalled (Extremely pleasant = 28, moderately pleasant = 19, neutral = 17, moderately unpleasant = 19, extremely unpleasant = 26; E[4,352] = 4.47, p = .002). There was also a significant interaction effect of delay of recall test and affect of the sentence (E[8,352] = 2.07, p = .04).

Regression analyses were performed to examine the influence of affective intensity vs. quality. A significant effect of the linear component would indicate support for the asymmetry hypothesis (i.e. better recall of pleasant or unpleasant sentences, depending on the direction of the slope), whereas a significant quadratic effect would lend support to the hypothesis of affective symmetry, i.e. better memory for both extremely pleasant and unpleasant sentences than affectively moderate or neutral sentences (a U-shaped curve), or vice versa (an inverted-U shaped curve).
Figure 4: Percentage of free recall of sentences for subjects in the immediate, same day and next day recall condition as a function of affective intensity and quality (Experiment 4).
The general form of the regression analyses performed in Experiment 4 differs slightly from those of Experiments 2, 3 and 1A. In Experiment 4, for the first time, level of affective intensity (5 levels) was a manipulated variable. In previous experiments, ratings of affective intensity were collected after recall (Experiments 2 and 3) or on sentences created by other subjects (Experiment 1A). In Experiment 4, a hierarchical analysis was used in which predictors were entered in the order: (1) Manipulated affective intensity, and (2) Square of manipulated affective intensity. Regression tables are reported in Appendix L.

First, an overall analysis of the data (collapsed across delay conditions and self-esteem scores) showed that more intensely affective sentences were recalled better than less intensely affective ones. This was reflected in a significant quadratic trend in the data ($E_{1,90} = 18.30, p = .0001$).

A median split on the self-esteem scores (separately within each delay condition) categorized subjects into high or moderate self-esteem groups. The overall mean self-esteem score of subjects in the high self-esteem condition was 35.70 whereas that for moderate self-esteem subjects was 29.83. The latter group is more appropriately titled a "moderate" (rather than "low") self-esteem group because of the range of scores. One subject in the immediate recall condition did not complete the self-esteem scale and was not included in any analysis that separately viewed high and moderate self-esteem groups.

Separate regression analyses performed on the data for high and moderate self-esteem subjects (collapsed across delay conditions) showed that both the high and moderate self-esteem groups showed better memory for more intensely affective than less intensely affective sentences. This was reflected in significant quadratic trends for both groups (High self-esteem: $E_{1,48} = 8.93, p = .003$; Moderate self-esteem: $E_{1,41} = 9.63$, $p < .002$).

Next, analyses were performed separately for each of the three delay conditions (See Figures 5, 6 and 7; for data see Table 18 in Appendix K) which included the self-
Immediate free recall of sentences. Two factors were involved in this analysis: Self-esteem of the subject (High and Moderate) and affect of the sentence (5 levels). The first factor was a between subjects factor and the second was a within subjects factor. As Figure 5 indicates, high and low self-esteem subjects did not differ in overall recall, and the main effect for self-esteem was not significant ($F[1,32] = .06, p < .81$). There was, however, a difference in recall of extremely pleasant vs. extremely unpleasant sentences (32.5% vs. 43.5%), leading to a significant effect of the affective quality of the sentence on recall ($F[4,128] = 4.43, p < .002$). There was also a significant interaction effect of self-esteem and sentence affect ($F[4,128] = 4.46, p = .002$).

The overall regression analysis showed better memory for more intensely than less intensely affective sentences. This was illustrated by significant quadratic trend ($F[1,33] = 8.90, p < .003$). Separate analyses were also performed on the high and moderate self-esteem groups, and results indicated a difference in the pattern of the data for high and moderate self-esteem. The moderate self-esteem subjects showed a significant quadratic trend ($F[1,15] = 10.40, p < .002$), indicating better memory for more intensely affective than less intensely affective sentences. The high self esteem subjects, on the other hand, showed better memory for affectively unpleasant than neutral or pleasant information. This appeared as a significant linear trend in the data for high self-esteem subjects ($F[1,17] = 22.51, p < .0001$). The quadratic trend for the recall data of high self-esteem subjects was not significant ($F[1,17] = 1.31, p = .26$).
Figure 5: Percentage of free recall of sentences for subjects in the immediate recall condition as a function of affective intensity and quality (Experiment 4).
Figure 6: Percentage of free recall of sentences for subjects in the same day recall condition as a function of affective intensity and quality (Experiment 4).
Figure 7: Percentage of free recall of sentences for subjects in the next day recall condition as a function of affective intensity and quality (Experiment 4).
Figure 8: Percentage of free recall of targets as a function of affective intensity and quality of sentences for subjects in the immediate recall condition (Experiment 4).
Free recall of targets. Subjects in the immediate recall condition were the only one of the four recall groups to have received a test of free recall of targets. This was done so as to keep the procedure for the immediate recall group similar to Experiments 2 and 3 (in which recall for targets and not for the sentence was collected).

The data were analyzed in a 2 (Self-esteem: High, moderate) X 5 (Affect of sentence: 5 levels) factorial (See Figure 8 data are reported in Table 19 in Appendix K). Similar to the free recall of sentence data, both high and moderate self-esteem groups recalled an overall equal number of sentences (EE[1.32] = 0.00, q > .95).

A regression analysis (collapsed across high and low self-esteem) showed that subjects recalled more targets embedded in more intensely affective than moderately affective or neutral sentences. The quadratic trend for the recall data showed a highly significant effect (EE[1.33] = 11.21, q < .001).

Pseudo cued recall. The pseudo cued recall (recall in response to a pseudo cue of "the" or "a") data did not reflect the same pattern as the free recall of sentence data. As Table 20 (see Appendix K) indicates, a total of 26 pleasant sentences were recalled, compared to a total of 23 neutral sentences and 19 unpleasant ones.

Same day free recall of sentences. In an analysis similar to the one for immediate recall, the data of subjects in the same day recall condition showed a slightly different pattern (see Figure 6). First, similar to the previous analysis, there was no effect of self-esteem on overall recall, i.e. high and low self-esteem subjects recalled an equal amount of information (High self-esteem = 17%, moderate self-esteem = 20%, EE[1.26] = .44, q > .50). Further, there was no effect on recall of sentence affect on recall, i.e. there was no difference in recall of pleasant vs. neutral vs. unpleasant sentences (EE[4,104] = .44, q > .22). Finally, there was no significant interaction of self-esteem and sentence affect (EE[4,104] = .56, q > .68).
Similar to the Immediate recall group, overall recall after a 6-8 hour delay also showed a significant quadratic trend ($E[1,27] = 4.10, p = .04$). This effect was carried by the high self-esteem group ($E[1,14] = 5.42, p < .02$), which showed better memory for more intensely than less intensely affective sentences. There was no significant quadratic or linear effect for the moderate self-esteem group ($E[1,12] = .23, p > .63$).

Next day free recall of sentences. The analysis of variance procedure on the data of subjects in the next day recall condition indicated that there was no effect of self-esteem on overall recall, with both high and moderate self-esteem groups recalling an equal number of sentences ($E[1,27] = .39, p > .53$). Interestingly, unlike the same-day recall condition, subjects in the next-day recall condition remembered a slightly greater proportion of pleasant than unpleasant sentences, reflected in the marginally significant linear trend of the recall data ($E[4,108]=3.65, p < .008$). The interaction between self-esteem and sentence affect was not significant ($E[4,108] = .90, p > .45$).

As Figure 7 demonstrates, the quadratic trend for recall showed better memory for more intensely than less intensely affective sentences. The quadratic trend was highly significant ($E[1,28] = 9.99, p < .002$). This effect was supported in the data for moderate self-esteem subjects ($E[1,12] = 5.96, p < .01$) as well as high self-esteem subjects ($E[1,13] = 4.19, p < .04$).

Recall x Repression-Sensitization scores. As noted earlier, the Repression-Sensitization scale was included in Experiment 4 because it is known to correlate with self-esteem (Mischel, Ebbesen and Zeiss, 1973) and to examine the relationship between the personality variable of repression and recall of unpleasant information.

First, the overall correlation between self-esteem and repression-sensitization was not as high as expected. In this experiment, the correlation between self-esteem and repression-sensitization was -.25, which is in the predicted direction. The Rosenberg self-esteem scale is scored in the direction of high self-esteem, i.e., the
higher the score on the scale the higher the assigned self-esteem. The repression-sensitization scale is scored in the direction of sensitization, i.e. the lower the score, the higher the assigned repression.

Overall, the quadratic trend in the data, supporting the intensity hypothesis was evident for both high ($E[1,44] = 6.70, \ p = .01$) and low repressors ($E[1,45] = 11.63, \ p = .001$). The linear trend was insignificant for both groups. Table 21 in Appendix K reports recall percentages. When the data were analyzed separately for each of the delay conditions, the same quadratic trend emerged most consistently.

There were, however, some exceptions to the finding of an affective intensity effect. The interesting exception was that in the next day recall group, high repressors showed better recall for pleasant than unpleasant sentences. The linear trend was marginally significant ($E[14] = 3.29, \ p = .07$). This is in keeping with the prediction that high repressors would show better memory for pleasant than unpleasant information.

**Discussion**

In Experiment 4, the main dependent measure was a recall test for the affective sentences themselves rather than the target nouns embedded in them. The sentence recall data supported three hypotheses.

**The affective intensity hypothesis.** In all three delay conditions, subjects showed a strong quadratic recall trend in the form of better memory for extremely unpleasant as well as pleasant sentences than moderately affective ones. The support for an intensity effect in memory in Experiment 1A, 2 and 3 as well as in Experiment 4 is an important finding. As noted in Chapter 1, the majority of early studies gave support to the hypothesis of "headonistic" memory, and the few studies that tested for an intensity hypothesis often lacked the experimental controls necessary to draw any conclusion. The finding of an intensity effect consistently in these studies is
support for this hypothesis that is free of interpretive confounds.

In discussing the results of Experiment 1A, it was noted that the procedure of using ratings of affective intensity (after the recall measure) was undesirable. Experiment 4 used a manipulation of affective intensity, i.e. subjects were asked to construct sentences at two levels of intensity, moderate and extreme. The pattern of data from Experiment 4 are in keeping with previous experiments in their support of the intensity principle.

The finding of an intensity effect in memory was qualified by the self-esteem factor in immediate and same day recall. However, these effects are based on a small n (15-17 subjects) and as a result may be unstable. More data are needed before these results are interpreted.

Delay X Affective Quality. In the previous experiments (Experiment 3; Experiments 5 and 6, see Appendix M) delay was introduced as a within subjects factor and the delayed recall reflected a pattern similar to the original one. The between subjects delayed recall in the present experiment was a decided asset in interpreting the recall data. Although the intensity effect occurred after a delay, there was a shift in the pattern of the data, with better memory for pleasant sentences at delay than during immediate recall.

Schematic processing of affective information. The notion that memory for information is influenced by the schema in relation to which it is processed was applied in this experiment to the processing of affective information. Support was found for the hypothesis that high self-esteem individuals (whose self schemas presumably contain positive self knowledge) would remember affectively unpleasant sentences better because of their incongruency with the schema.

An explanation for this type of finding in the person memory area is that incongruent items are processed more elaboratively at encoding (Hastie, 1981; see introduction to this chapter). In the immediate recall condition of the present experiment, subjects supposedly processed the
unpleasant sentences more elaborately at encoding (if they had a positive self-schema). However, it is possible that there was a re-activation of this schema at the time of retrieval. Subjects in the immediate test condition, it is recalled, filled out a self-esteem personality inventory after the sentence construction task and immediately prior to recall. It is possible that the items on the Rosenberg self-esteem scale made information about the self more salient in memory and that this influenced recall of sentences.

The interaction of self-esteem and memory for affective information is a potentially important finding and needs to be replicated and explored further.
CHAPTER FOUR: DISCUSSION

The objective of this dissertation was to seek and answer to a classic and yet unresolved problem of psychological research. The question that was posed at the outset was "What is the influence of the affective quality of an experience on memory for that experience?" Experiments 1, 2, 3, 4 and IA together provide some important and consistent evidence to answer this question. We first review the contribution of the experimental procedures employed in the research, and then discuss the empirical findings and a framework for interpretation.

The contribution of the experimental procedure.

As noted in the introduction to the dissertation, several of the early studies on the affect/memory relationship showed significantly better memory for pleasant as well as unpleasant than neutral experiences (Barlow, 1955; Cason, 1932; Chaney and Lauer, 1929; Dutta & Kanumgo, 1975; Menzies, 1933; Turner and Barlow, 1951). There were however, several methodological problems with this research, making it difficult to interpret them, especially in light of other research findings supporting an alternative "hedonistic" memory hypothesis (Meltzer, 1930; Zeller, 1950). A major monograph that reported a series of studies in support of the intensity effect, by Dutta and Kanungo (1975), continued to test for memory of affective information itself (pleasant and unpleasant trait words) and failed to offer a satisfactory explanation of why intensity leads to better memory.

In the experiments reported in this dissertation, memory was tested for affectively neutral "tracers" embedded in information of varying affective quality and intensity. By testing memory for affectively neutral information, this procedure combined the advantages of producing an unconfounded test of the affect/memory relationship without sacrificing the desirable property of ecological validity.
An overview of the empirical findings.

An affective intensity effect in memory. Support for an affective intensity effect in immediate recall emerged clearly and consistently when the methodological of earlier studies were eliminated. The important finding in Experiment 2, 3, 4 and 1A was that more intensely affective information was remembered better than moderately affective or neutral information. The finding was obtained in four experiments under varying conditions.

First, affective intensity was a significant predictor of recall when the intensity measure was (1) a post-recall rating of intensity by subjects themselves for the affective sentences they had constructed (Experiment 2 and 3); (2) a rating by an independent group of subjects, (i.e. subjects who rated previously constructed affective sentences and then performed a recall test) as in Experiment 1A; and (3) an experimental manipulation of level of intensity as in Experiment 4.

Further, the intensity effect was found when (1) memory was tested for neutral target items ("tracers") embedded in sentences of varying affective intensity (Experiments 1A, 2 and 3) as well as when memory for the affective sentences themselves was tested (Experiment 4).

Finally, the intensity hypothesis was supported when immediate recall tests were administered (i.e., at the end of the experimental session) as in Experiments 2, 3 and 1A, as well as when subjects were tested for the first time after a delay (Experiment 4). In addition to the significant intensity effect on the delayed free recall test in Experiment 4, there was also evidence for slightly better memory for pleasant than unpleasant information. Although this finding needs to be replicated, it points to the interesting possibility that the simple conclusion of better memory for affectively intense information may be changed when a delay measure is introduced.

Unlike the "hedonistic" memory hypothesis, the intensity hypothesis has not been given much theoretical attention. The argument has been made (Kanouse and
Hanson, 1988) that this may have been because of the popularity of the theoretical basis of the "positivity" hypothesis.

Why is it that information that is intensely affective is remembered better than affectively more neutral information? Although there is no firm answer to this question at the present, it is possible that we remember better the more affectively intense information because it is functional. If our affective judgments of events are important, then we may have learned that making judgments at the ends of the affect scale (i.e. extremely pleasant and unpleasant) are necessary. The cognitive system may have learned to pay special attention to affectively intense information, because it possibly provides more information about events that may be critical. We continue a discussion of the intensity hypothesis after describing a second empirical finding from these experiments.

**Schema-assisted processing of affective information.**

Experiment 4 tested and found support for a hypothesis of schema-assisted constructive recall processing of affective information. Specifically, the hypothesis was that memory for affective information, like other types of information, for instance attitude statements (see Judd and Kulik, 1980) or person information, (see Hastie, 1980) is determined by the nature of the schema in relation to which it is processed.

To state the main finding of Experiment 4, high self-esteem subjects recalled extremely unpleasant sentences better than pleasant ones at an immediate recall test. A similar linear trend was not evident for moderate self-esteem subjects. Further, when subjects were tested after a 24 hour delay (without any prior recall test), they showed marginally better recall for pleasant than unpleasant sentences, as well as a strong intensity effect.

An analogy is derived that may aid in clarifying the mechanism underlying the proposed process of schema-assisted recall. Suppose that a person (X) receives information (for instance, a manuscript) on an unfamiliar topic. X. briefly scans the paper and decides to save it for future reference. In searching for an appropriate
folder to file it away, X. finds however, that no suitable folder is currently available. X. leaves it on the work desk, expecting to find a place for it sooner or later. During the next few days, everytime X. searches the table for some information, the paper is continually "found". However, after some time has elapsed, and new, more recently and continually used material has accumulated on the desk, the doomed manuscript is relinquished to the bottom, and is now difficult if not impossible to find. [7]

In terms of schema theory, high self-esteem subjects have a positive self-schema, and the unpleasant (negative) information about themselves does not easily "fit" or find a place in the existing schema. Therefore, when an immediate recall test was given, these subjects recalled best the unpleasant sentences that had not been integrated into the memory structure.

It appears that little effort has been made to explain empirical findings about affective information in terms of well-established principles of memory. The two main findings of this dissertation (1) an affective intensity effect in memory and (2) schema-assisted constructive recall of affective information are best interpreted by appealing to some general principles of schema theory.

An interpretation based on schema theory.

Existing schema based models of knowledge representation may serve as a framework within which to view the two empirical findings. One question that a schema theory must deal with is the way in which encoding and later retrieval occurs in a given context. The specific question of interest that was posed by Hastie (1980) was: "What is the influence of a schema (once it is activated) on memory for subsequent related information?" (A similar question was asked in this dissertation about the affect/memory relationship).

Several lines of research have been directed at answering the above question, albeit with different research goals (Bower, Black and Turner, 1979; Graesser, Woll, Kowalski and Smith, 1980; Smith and Graesser, 1981; Hastie, 1980;). A model that was proposed by Graesser and
his colleagues, called a script-pointer + tag model serves as a particularly good example for our purpose of an account of schema-assisted knowledge representation.

In the research of Graesser and his colleagues, subjects heard stories about scripted activities (for example, eating in a restaurant), and were later tested for memory of the actions comprising the script. The actions varied in typicality, such that there were some actions that were very typical ("Jack paid the bill") and others were atypical ("Jack put a pen in his pocket"). Both recall and recognition memory indicated better memory for the atypical actions than the typical ones after a short retention interval. However, after a delay, memory for the typical items was better.

The SP + T model predicts that (1) memory discrimination should be greater for actions that are atypical rather than typical since each of these is encoded with a unique "tag", and (2) after a retention interval, memory will be guided by the generic script, leading to better retrieval of typical actions.

As the affect/memory experiments demonstrate, and some schema models predict, it may not be appropriate to draw conclusions about memory for schema-consistent vs. inconsistent events (actions) without taking into account the retention interval. The recall data for pleasant and unpleasant information in Experiment 4 showed that although the intensity effect did exist after a delay, there was the additional finding of somewhat better memory for pleasant information. This pattern is very different from the pattern at immediate recall.

Related findings in social and cognitive psychology.

Social psychologists have for a long time been interested in how individuals judge, process and retrieve social information. In research on the schematic processing of attitudes, Judd and Kulik (1980), reported two findings that are relevant to the affect/memory issue. First, they found that information that was highly consistent as well as contradictory to one's attitude was more likely to be recalled than was information that was only moderately consistent or contradictory. In addition to
the schema-assisted memory effect, they also found that the more extreme attitude items (both pro and anti) were recalled better than items that were more moderate. They concluded that "... there are probably two sorts of items that are easy to process and recall for any subject: Items that are either very agreeable or disagreeable and items that advocate extreme positions".

The present experiments found related effects in the affect/memory domain. First, subjects recalled extremely affective items better than less affective or neutral ones. Second, the type of items recalled were influenced by the schema in relation to which they were processed, with better memory for schema inconsistent items at immediate recall.

The finding that atypical vs. typical information is remembered better is a well-known finding in cognitive psychology, commonly referred to as the von Restorff effect (von Restorff, 1933, Wallace, 1965). For example, if subjects were given the following list of words to study, Cow, Pig, Horse, Elephant, Chair, Dog, Rabbit, memory for the word "chair" would be superior to the recall of the other items on the list. This phenomenon has been replicated in the area of verbal learning (Wallace, 1965).

Bower, Black and Turner (1979), in a study specifically directed at the study of events that were congruent, irrelevant or incongruent with a script (for example, about eating in a restaurant), found best recall for incongruent items (such as, the waiter bringing a wrong dish or a menu in a foreign language). These have been called "obstacles, errors and distractions" (Schank and Abelson, 1977) and they serve the function of creating a break in the normal "flow" of the script. Importantly, recall was next best for the congruent items and worst for the irrelevant ones. Other findings that showed best recall for schema incongruant information and worst memory for schema irrelevant information (for example, Hastie, 1980 were reviewed the introduction to Chapter 3).

An important and interesting question concerns the implication of the finding of schema-assisted recall of
affective information for the repression hypothesis. It has been argued before (Holmes, 1974) that simpler, cognitive explanations are more parsimonious explanations of the finding previously labeled repression. The finding of in Experiment 4 lends further support to this view and proposes an alternative for selective memory for pleasant/unpleasant information in terms of the schema in relation to which the information is processed. Specifically, better memory for pleasant information on a delayed recall test occurs because most people have a positive self schema, which guides recall.

An alternative to the interaction of delay X affective quality.

Depth-of-processing. It should be recalled that Hastie (1980; Hastie and Kumar, 1979) obtained better memory for items inconsistent with an "expectancy" about a person than items consistent with the impression. The finding was explained in terms of deeper or more elaborate processing of a of the inconsistent behaviors due to their greater information value regarding the target person's personality. To elaborate, when faced with an inconsistent behavior, the subject is faced with greater difficulty in incorporating this item with the expectancy information. As a result, (a) the inconsistent information is retained longer in working memory, (b) additional information in the form of old behaviors are retrieved, (c) this leads to greater inter-episode linkages between the items of behavioral information.

However, Hastie predicted that since the inconsistent behaviors were more elaborately processed, they would be remembered better even after a delay. His data (as well as those of Srull, 1981) support this; even after a week long delay, subjects remembered more inconsistent behaviors. It is possible that this delayed recall finding occurs because the information that is being tested is about a hypothetical person, the only knowledge about whom is the information learned during the experiment. When the information to be tested is sampled from a larger domain (such as the self, or other complex events), better memory for inconsistent items may not hold up.
Concluding Remarks.

Based on the findings of this research, a hypothetical pattern of data is presented in Figure 9 that predicts the relationship of affect and memory over time. Recall tests that are administered early will show better memory for items that are "atypical", those that stand out in memory because they do not "fit" the existing expectations based on previous knowledge. After a period of time has elapsed, and memory for the event is determined by the nature of the schema itself, information that is "typical" will be remembered better.

In the context of affective information, the hypothesis developed on the basis of these experiments, predicts that unpleasant events, for most people, (but especially for high self-esteem individuals) are inconsistent with the existing self-schema and thus remembered better. On the delayed recall test, when memory is influenced more by the overall quality of the relevant schema, better recall for pleasant information will be evident.

One line of future research would be to conduct experiments (similar to Experiment 4) on a population of depressives. The prediction would be that these subjects should show better memory for pleasant self-relevant information at immediate recall and negative or unpleasant self-relevant information after a delay.

Further, it is a potentially interesting finding that unpleasant information will be lost in memory at a faster rate than pleasant information. More research is needed to test the interaction of affective quality (pleasant vs. unpleasant) and retention delay.
AFFECTIVE QUALITY AND INTENSITY OF SENTENCE

Figure 9: Prediction of affect/memory relationship X delay of recall task

Immediate Recall
Short Delay
Long Delay
Footnotes

[1] According to Rapaport (1942/1971) the concept is only a distant relative of the term attitude as used by social psychologists.

[2] Bartlett may be credited with attributing to schemas the function of memory reconstruction (as opposed to memory reproduction). He argued that the notion of "literal recall" was not important to the study of memory since schemas always determine memory for stored information - "the influence of 'schemata' is influence by the past" - with the more recent information having the greater impact on reconstruction.

[3] Later, Stagner (1931) in his experimental study of memory for pleasant and unpleasant events offered an explanation that supported Lewin's notion of tension systems. He noted that unpleasant events involved setting up a tension - for instance, receiving a bad check or a notice from the Dean - "about which something must be done" (p. 467). The pleasant events, on the other hand, involved release from tension - for instance, a job well done, listening to an orchestra, seeing a movie - "about which nothing need to be done" (p. 467).

[4] Zeigarnik also developed techniques for artificially inducing affective states in her subjects. When the experimenter induced positive affect by talking to each subject about his or her personal interests, a marked decline in the uncompleted/completed task ratio was found. Similarly, when the anger or annoyance of subjects was aroused, the ratio of memory of uncompleted to completed tasks was markedly reduced.

[6] Partially because of its relation to the finding of a generation effect in memory (Slamecka and Graf, 1978) and also because it was the added or "second" generation of the self-generated cue that produced the highest recall, the effect is titled the "second-generation effect".

[7] I thank Tony Greenwald for suggesting this analogy. To be sure, he was aided in constructing it by his personal experience with "searching" expeditions on his office desk.
REFERENCES


APPENDIX A

Target words from Experiment 1
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<table>
<thead>
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</tr>
<tr>
<td>3</td>
<td>SPOON</td>
</tr>
<tr>
<td>4</td>
<td>ROOF</td>
</tr>
<tr>
<td>5</td>
<td>DAISY</td>
</tr>
<tr>
<td>6</td>
<td>HOUSE</td>
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<td>ISLAND</td>
</tr>
<tr>
<td>8</td>
<td>DOG</td>
</tr>
<tr>
<td>9</td>
<td>WALTZ</td>
</tr>
<tr>
<td>10</td>
<td>ROBIN</td>
</tr>
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<td>13</td>
<td>SHOES</td>
</tr>
<tr>
<td>14</td>
<td>MAGAZINE</td>
</tr>
<tr>
<td>15</td>
<td>BEETLE</td>
</tr>
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</tr>
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<td>20</td>
<td>BEER</td>
</tr>
<tr>
<td>21</td>
<td>BASEBALL</td>
</tr>
<tr>
<td>22</td>
<td>TROUT</td>
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<tr>
<td>23</td>
<td>MAPLE</td>
</tr>
<tr>
<td>24</td>
<td>APPLE</td>
</tr>
</tbody>
</table>
APPENDIX B

Trivia questions and answers used as the filler task in Experiments 1-4 and 1A
The following are the trivia questions and answers we told you about earlier. Read each question and answer and memorize the answers as best as you can for a later recall test.

1. The forced resignation of former president Richard Nixon came about as a result of the Watergate break-in. What was the name of the guard who first discovered the break-in?

Frank Willis

2. In 1957, the Soviet Sputnik 2 went into orbit around the world with a dog aboard. What was the name of this dog who make space history?

Laika

3. "See It Now" was a popular TV series during the early 1950's. Who was its well-known host?

Edward R. Murrow

4. Everyone has heard of the San Francisco earthquake of 1906. But a far stronger and much more severe quake shook the country in 1811, and was felt over an area of two-thirds of the United States - 200 million square miles. Where was this earthquake centered?

New Madrid, Missouri

5. Every four years, as the presidential election nears, regular TV programming is pre-empted for live coverage of the political conventions of the two major parties. In which year were these conventions televised for the first time?

1940

6. "The Son of Sam" created terror in the hearts of many New York women through his senseless murders. Who was finally captured and identified as the "The Son of Sam"?

David Berkowitz

7. In 1941, RCA presented the first commercial television program. What was it, and who sponsored it?

Time and Weather Report, Bulova Watch Co.
8. Every year, members of the Pulitzer Prize committee meet to select the awards in journalism and literature. Where does the committee traditionally meet to decide the awards?

Columbia University

9. The Civil Rights Movement got its start when a tired, quiet black lady refused to give up her seat on a bus to a white man. She was arrested by the city police and Martin Luther King initiated a black boycott of the city bus system to protest the injustice of her arrest. Who was the lady?

Rosa Parks

10. Today Buddhism has more than 250 million followers. Its founder was given the honorary title of Buddha or Enlightened One. What was Buddha’s name before he became enlightened?

Siddhartha Gautama
APPENDIX C

Realness Ratings
"Realness" ratings and sentence length. Ratings of "realness" of the constructed sentences are presented in Table 3. Analyses were performed on the total number of sentences that were rated by subjects. The data indicate that although subjects were able to construct a large number of sentences about imagined events, this procedure of having subjects use an imagined scenario did not ensure this. The problem of subjects not constructing sentences about imagined events seemed especially true for neutral sentences, which to a greater extent than the pleasant or unpleasant ones were given a rating of 1 (very real).

Table 11: Percentage Recall of Sentences as a Function of "Realness" Ratings (Experiment 1).

<table>
<thead>
<tr>
<th>Ratings of Realness (1=very real; 9=completely imagined)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affective quality of sentence</td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9 T</td>
</tr>
<tr>
<td>Pleasent 31 39 35 35 27 23 31 38 35 294</td>
</tr>
<tr>
<td>Neutral 46 37 35 24 41 25 23 23 30 284</td>
</tr>
<tr>
<td>Unpleasant 23 24 30 41 32 52 46 39 35 322</td>
</tr>
</tbody>
</table>
| Total 100 100 100 100 100 100 100 100 100 900
APPENDIX D

Formula for computing ARC
Additional clustering data for Experiment 1
The formula for ARC is:

\[
\text{ARC} = \frac{R - E(R)}{\text{MaxR} - E(R)}
\]

where, \( R \) equals the total number of observed category repetitions (a repetition occurs when any two items from the same category are recalled in a contiguous fashion), \( E(R) \) equals the expected number of chance repetitions where \( n \) is the number of instances recalled in a category \( k \) and \( N \) is the total number of instances recalled, \( \text{MaxR} \) equals the maximum number of category repetitions (\( \text{MaxR} = N - k \)), where \( k \) = the number of recalled categories.

Although there was no significant clustering by affect in Experiment 1, it was possible that subjects were clustering items from one category (for example, pleasant ones) more than other categories (for example, neutral or negative). Three separate two-category ARC analyses were performed. As can be seen in Table 4, the first analysis consisted of comparing the clustering of targets in pleasant sentences to the other two categories (neutral and unpleasant). In the second analysis, the clustering of targets in neutral sentences was compared to the rest of the targets, and in the third analysis, the clustering of targets in unpleasant sentences was analyzed. These data were analyzed in a one factor, repeated measures design. Results showed that there was no difference in the clustering scores of the three types of affect (\( \text{E}[2,164] = .01, p > .98 \) ).
Table 12: An example of the scoring of free recall data to compute ARC scores for each level of affect (Experiment 1).

<table>
<thead>
<tr>
<th>PATTERN OF CLUSTERING</th>
<th>ARC</th>
</tr>
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<tbody>
<tr>
<td>UPPPNNNUNNPNNP [ASTERISK]</td>
<td>.34</td>
</tr>
<tr>
<td>XPPPXXXXXXPPPXX</td>
<td>.56</td>
</tr>
<tr>
<td>XXXXNNXNNXXXXN</td>
<td>.19</td>
</tr>
<tr>
<td>UXXUXUXUXUXXX</td>
<td>-.05</td>
</tr>
</tbody>
</table>

[ASTERISK] P = Targets embedded in pleasant sentences  
N = Targets embedded in neutral sentences  
U = Targets embedded in unpleasant sentences
APPENDIX E

List of target words used in Experiments 2, 3, 4 and 1A.
1. PAMPHLET
2. ENGINE
3. FOOT
4. CLAY
5. DOOR
6. BOWL
7. KEY
8. STOOL
9. SCISSORS
10. WAGON
11. KEROSENE
12. THERMOMETER
13. GINGER
14. OFFICE
15. HAT
16. MONKEY
17. STATUE
18. RIDDLE
19. TRUNK
20. INK
21. TRUMPET
22. CORK
23. BAG
24. MUSEUM
APPENDIX F

Instructions for sentence construction task in Experiment 2
These instructions were given to subjects who constructed sentences with "imagined daughter" as the protagonist of each event. The same instructions, with the exception of "imagined son" were presented to subjects who constructed sentences with an imagined son as the protagonist of the event.

We would like you to construct some sentences, one on each page of this booklet. Remember that anything you express in this experiment is completely confidential and that you are not identified in any way with what you have written.

1) On each page of the booklet in front of you, you will see a word in CAPITAL letters (for example for the work REFRIGERATOR). This word must be used in the sentence you construct.

2) It is important that you should construct sentences about imagined events, ones that have not really happened. Imagine that you have a daughter. Each sentence will be about something done by or happening to your imagined daughter and the sentence must use the object word we will provide you with. Remember to construct each sentence so that both your imagined daughter and the object word (for example, REFRIGERATOR) are actively involved with each other. For example, do not say something like "My daughter has a blue refrigerator". Instead, a more suitable sentence is "My daughter painted her refrigerator blue". In other words, do not just describe a scene in which you see your imagined daughter and the object. Rather, have your daughter doing something with the object. (Let's try one).

3) Now, another important part of your task is to make each sentence be about something that is either pleasant (+), unpleasant (-), or neutral (0) in nature. In a pleasant sentence you may talk about something that is happy, interesting, exciting - anything that would make you feel good. For example, if the noun we provide you with is REFRIGERATOR, suitable pleasant sentences might be "My daughter looks for ice cream in the refrigerator", or "My daughter made a nice drawing of a refrigerator". In an unpleasant sentence, you may refer to something that is depressing, boring, unhappy - anything that would make your feel bad. Suitable sentences are "My daughter fell off the
refrigerator, and hurt herself", or "In trying to fix the refrigerator, my daughter broke it even more". A neutral sentence refers to something that is neither pleasant nor unpleasant - it make you feel neither good nor bad. For example, "My daughter painted the refrigerator blue", or, "My daughter opens the refrigerator seven times a day".

Although we are asking you to make up sentences about events that are imagined and not real, we do not want you to write about events that could not possibly occur. Try to make your sentences describe events that could happen in normal everyday life - they should be plausible, even though they have not already happened in your life.

Let me repeat what you should do:

1) Construct a sentence about an event that involves your imagined daughter and an object that we will provide you with (in CAPITAL letters).

2) Each sentence should be about something that your imagined daughter is doing. It should be a description of a scene in which your daughter is doing something.

3) The event that the sentence describes must be either pleasant, unpleasant or neutral in nature, depending on the indicator on each page.
APPENDIX G

Regression analyses for Experiments 2 and 3
Table 13: Hierarchical Multiple Regression Analysis (Experiment 2).

Order of variables: Subject variable, Assigned intensity of affect, square of assigned intensity, rated intensity of affect, and square of rated intensity of affect.

<table>
<thead>
<tr>
<th>SOURCE</th>
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<th>SS</th>
<th>F VALUE</th>
<th>P VALUE</th>
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<td>1.46</td>
<td>6.24</td>
<td>.0217</td>
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<td>ASSIGNAF*ASSIGNAF</td>
<td>1</td>
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<td>1.24</td>
<td>5.28</td>
<td>.0219</td>
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</table>
Table 14: Hierarchical Multiple Regression Analysis
(Experiment 3).

Order of variables: Subject variable, Assigned intensity of affect, square of assigned intensity, rated intensity of affect, and square of rated intensity of affect. Dependent variable was recall.

<table>
<thead>
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<td>0.00</td>
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<td>1.51</td>
<td>.2200</td>
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<tr>
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<td>1.46</td>
<td>.2274</td>
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<tr>
<td>RATEDAF*RATEDAF</td>
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<td>1.36</td>
<td>5.63</td>
<td>.0179</td>
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</tbody>
</table>
APPENDIX H

Regression analysis for Experiment 1A
Table 15: Hierarchical Multiple Regression Analysis (Experiment 1A)

Input order of variables: Subject variable, Assigned intensity of affect, square of assigned intensity, rated intensity of affect, and square of rated intensity of affect. Dependent variable was recall.

<table>
<thead>
<tr>
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<td>14.66</td>
<td>71.36</td>
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</table>
APPENDIX I

Sentence construction instructions for Experiment 4.
You should know that anything you express in this experiment is completely confidential, and that you are not identified in any way with what you have written.

In this experiment, we would like you to construct some sentences, one on each page of the booklet in front of you. These sentences should be constructed according to the following 4 rules.

1) The first rule is that you should construct sentences about imagined events; ones that have not really happened in your life. To enable you to do this, we would like you to imagine yourself 5 to 10 years from now. You are no longer a student, you have a job and perhaps a family (wife or husband and children).

Here is what two previous persons wrote in describing an imagined future. "I am a college professor. My husband is an engineer and has his own company. We have three children. I am very happy with my job. I like teaching economics. The town we live in is not very large, but that's what I always wanted anyway. My husband and I have a very comfortable relationship - he encourages me to find satisfaction in my work and this is very good. My oldest child is 7 years old and seems to be doing very well in school. She hates sports, though, and is really gawky. Next summer we are planning to go to Mexico for a vacation. Our house is real nice - it's got four bedrooms, but it's not too large so that I can take care of it. We divide up all the responsibilities around the house, including cooking! " Another scenario went something like this: "I am a pediatrician and I live by myself. I never did want to marry and have managed to escape it until now. I have lots of friends and I party a lot. I live in an apartment complex just outside New York city, where mostly other singles live. I like being out of the city and yet having access to all the wonderful things NYC can offer - I see a lot of plays and movies. Someday I think I will make a movie. I also like being with children - I think I would enjoy adopting one. I am working hard at the hospital right now, but once I've established myself, I'll probably start my own business."

Take a few minutes to imagine a scenario for yourself - make use of the ideas you already have about what you
want to be, and what you would like to be doing in the future. On the blank sheet in front of you, titled IMAGINED FUTURE SELF make some notes to yourself to later aid you in constructing sentences. Remember, the only purpose in doing this is to construct sentences later about imagined events rather than ones that have already happened. Also, there is nothing like a right or wrong scenario, so feel free to say anything you really believe.

2) On each page of the booklet in front of you, you will see a word in CAPITAL letters (for example, the word REFRIGERATOR). The second rule is that this word must be used in the sentence you construct. So, each sentence you construct should involve you imagined future self and the word you will see in CAPITALS on each page.

3) Now, another important part of your task is to make each sentence be about something that is either extremely pleasant (++) moderately pleasant (+) neutral (0) moderately unpleasant (-) or extremely unpleasant (--) in nature. Look at the scale below.

```
| ++ | + | 0 | - | -- |
```

The scale goes from extremely pleasant (++) on the right through a neutral point (0) in the middle to extremely negative (--) on the end. In a pleasant sentence you may talk about something that is happy, interesting, exciting - anything that would make you feel good. In an unpleasant sentence, you may refer to something that is depressing, boring, unhappy - anything that would make you feel bad. A neutral sentence refers to something that is neither pleasant nor unpleasant - it makes you feel neither good nor bad.

To give you a few examples of sentences that other subjects have written, let’s read some. Subjects were asked to construct these sentences involving themselves and the word REFRIGERATOR.
++ (Extremely pleasant):

I purchased a new refrigerator with part of my winnings from the Ohio State lottery. On a TV quiz show, I won a brand new refrigerator with a year's supply of food. My family is going to be very happy with the refrigerator I won on 'Wheel of Fortune' - it has an automatic ice cream maker.

+ (Moderately pleasant):

I mounted a picture of my girlfriend on the refrigerator door. I was glad to see how much food the new refrigerator could hold. I taped pictures of my family on my refrigerator. Last time I opened my refrigerator I was surprised to find some ice-cream. I'm chilling my favorite jello pudding dessert in the refrigerator.

0 (Neutral)

I stuck the magnetized can opener on my refrigerator. I open my refrigerator everyday. I put the milk in the refrigerator. I put coupons on top of my refrigerator. I replaced the ketchup and mayonnaise in the refrigerator.

- (Moderately unpleasant)

I left a head of lettuce in my refrigerator and it began to rot. After the party, I spilled the leftover guacamole dip all over the refrigerator. I opened the refrigerator and caught a smell of spoiled milk. I had to spend a beautiful Saturday morning cleaning and defrosting the refrigerator.

-- (Extremely unpleasant)

When I got back from my vacation I discovered rotten meat in the refrigerator and had to air it out for 6 days. When I opened the refrigerator, I spotted a dozen cockroaches wandering around my food.
When trying to move my refrigerator, I dropped it on my foot and it smashed all the bones in my foot. Ouch!

4) Finally, we should construct your sentences such that you are actively involved with the object you are writing about. Do not construct sentences in which another person or an object is responsible for the action (such as "My neighbor's son pushed the refrigerator on my foot; or 'My mother gave me a refrigerator for Christmas'). Instead, write each sentence such that you are the person performing the behavior and that you are responsible for the action that is taking place in your sentence.

Although we are asking you to make up sentences that are about imagined events we do not want you to write about events that could not possibly occur. Try to make your sentences describe events that could happen in normal everyday life - they should be plausible, even though they have not already happened in your life.

Let me repeat what you should do:

1) Construct a sentence about an event that involves your imagined future self and includes an object word that we will provide you with on each page (in CAPITAL letters).

2) Each sentence should be about something that you are actively doing. I should not be a mere description of a scene. It should involve you as the doer or the person responsible for the action.

3) The event that the sentence describes must be extremely pleasant (++), moderately pleasant (+), neutral (0), moderately unpleasant (-) or extremely unpleasant (--) depending on the indicator on each page.
APPENDIX J

Personality Scales
PLEASE NOTE:

Copyrighted materials in this document have not been filmed at the request of the author. They are available for consultation, however, in the author's university library.

These consist of pages:

Appendix J, pages 129-132

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APPENDIX K

Tables 16-21 from Experiment 4
Table 16: Free Recall of Sentences of Subjects in the 1 Week Delay Condition

<table>
<thead>
<tr>
<th>SUBJECT</th>
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<th>--</th>
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<th>++</th>
<th>+</th>
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<td>0</td>
<td>0</td>
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<tr>
<td>2.</td>
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<tr>
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<td>0</td>
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<tr>
<td>12.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>14.</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16.</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>17.</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>18.</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>19.</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>20.</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

MEAN .15 .25 .35 .25 0
Table 17: Percentage of Pleasant, Neutral and Unpleasant Sentences, at Immediate, Same Day and Next Day Recall

| Affect of the sentence | Moderate | Extreme | Pleasant | | Moderate | Extreme | Pleasant | | Moderate | Extreme | Pleasant |
|------------------------|----------|---------|----------| |----------|---------|----------| |----------|---------|----------|
| **Unpleasant**          |          |         |          | |          |         |          | |          |         |          |
| Delay of Recall tests   | P    | SD   | P    | SD   | P    | SD   | P    | SD   | P    | SD   |
| **Immediate**           | 34   | (24) | 44   | (20) | 23   | (14) | 32   | (23) | 30   | (22) | n=34
| **Same Day**            | 14   | (20) | 19   | (22) | 15   | (13) | 26   | (23) | 17   | (23) | n=28
| **Next Day**            | 09   | (13) | 16   | (20) | 12   | (15) | 25   | (25) | 10   | (13) | n=29
Table 18: Percentage of Pleasant, Neutral and Unpleasant Sentences as a Function of Self-Esteem, at Immediate, Same Day and Next Day Recall.

<table>
<thead>
<tr>
<th></th>
<th>Unpleasant</th>
<th>Neutral</th>
<th>Pleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Moderate</td>
<td>Extreme</td>
<td>Moderate</td>
</tr>
<tr>
<td>Delay of Recall tests</td>
<td>P</td>
<td>SD</td>
<td>P</td>
</tr>
<tr>
<td>Immediate</td>
<td>n=34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hi S-E</td>
<td>41 (23)</td>
<td>48 (18)</td>
<td>27 (14)</td>
</tr>
<tr>
<td>(n=18)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo S-E</td>
<td>26 (24)</td>
<td>39 (22)</td>
<td>18 (14)</td>
</tr>
<tr>
<td>(n=16)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Same Day</td>
<td>n=28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hi S-E</td>
<td>10 (16)</td>
<td>18 (24)</td>
<td>11 (11)</td>
</tr>
<tr>
<td>(n=15)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo S-E</td>
<td>19 (23)</td>
<td>19 (21)</td>
<td>18 (14)</td>
</tr>
<tr>
<td>(n=13)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Next Day</td>
<td>n=29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hi S-E</td>
<td>08 (12)</td>
<td>20 (22)</td>
<td>13 (15)</td>
</tr>
<tr>
<td>(n=16)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lo S-E</td>
<td>08 (15)</td>
<td>13 (19)</td>
<td>11 (14)</td>
</tr>
<tr>
<td>(n=13)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 19: Percentage Free Recall of Targets Embedded in Pleasant, Neutral and Unpleasant Sentences by High and Low Self-Esteem Subjects in the Immediate Recall Condition

<table>
<thead>
<tr>
<th>Affect of the sentence</th>
<th>Unpleasant</th>
<th>Neutral</th>
<th>Pleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Moderate</td>
<td>Extreme</td>
<td>Moderate</td>
</tr>
<tr>
<td>Delay of Recall tests</td>
<td>P</td>
<td>SD</td>
<td>P</td>
</tr>
<tr>
<td>Immediate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hi S-E</td>
<td>35a</td>
<td>(24)</td>
<td>39a</td>
</tr>
<tr>
<td>Mod S-E</td>
<td>22c</td>
<td>(20)</td>
<td>45a</td>
</tr>
</tbody>
</table>

Scores with the same letters do not significantly differ from each other. These comparisons are valid for scores within each level of self-esteem (i.e. row comparisons).

Number of high and moderate self-esteem subjects in each of the delay conditions are reported in Table 18.
Table 20: Pseudo cued recall of sentences for subjects in the immediate recall condition.

<table>
<thead>
<tr>
<th>Recall</th>
<th>Unpleasant</th>
<th>Neutral</th>
<th>Pleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extreme</td>
<td>Moderate</td>
<td>Extreme</td>
</tr>
<tr>
<td>Recall 1</td>
<td>8</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Recall 2</td>
<td>3</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
<td>8</td>
<td>23</td>
</tr>
</tbody>
</table>

Note: Subjects were asked to recall any one sentence in response to the cue. The scores reflect the number of subjects in each category. The pool of sentences available for pseudo cued recall was a total of 8 for the neutral category and 4 for each of the pleasant and unpleasant categories.
Table 21: Percentage Free Recall of Sentences of High and Low Repressors in the Immediate, Same Day and Next Day Recall Condition

<table>
<thead>
<tr>
<th>Delay of Recall tests</th>
<th>Pleasant</th>
<th></th>
<th>Unpleasant</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Moderate</td>
<td>Extreme</td>
<td>Neutral</td>
<td>Extreme</td>
</tr>
<tr>
<td>Immediate</td>
<td>P</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>n=34</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Repressors</td>
<td>32</td>
<td>39</td>
<td>24</td>
<td>25</td>
</tr>
<tr>
<td>Low Repressors</td>
<td>36</td>
<td>48</td>
<td>23</td>
<td>38</td>
</tr>
<tr>
<td>Same Day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=28</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Repressors</td>
<td>13</td>
<td>22</td>
<td>9</td>
<td>15</td>
</tr>
<tr>
<td>Low Repressors</td>
<td>15</td>
<td>15</td>
<td>21</td>
<td>38</td>
</tr>
<tr>
<td>Next Day</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=29</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Repressors</td>
<td>3</td>
<td>15</td>
<td>11</td>
<td>31</td>
</tr>
<tr>
<td>Low Repressors</td>
<td>11</td>
<td>17</td>
<td>12</td>
<td>24</td>
</tr>
</tbody>
</table>
APPENDIX L

Regression Tables (22-33) for Experiment 4

140
Table 22: Regression analysis collapsed across delay conditions and esteem scores (Experiment 4).

Order of input of independent variables: Subject variable, manipulated intensity of affect, square of manipulated intensity of affect. Dependent variable is recall.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>DF</th>
<th>SS</th>
<th>F VALUE</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNUM</td>
<td>90</td>
<td>6.63</td>
<td>1.82</td>
<td>.0001</td>
</tr>
<tr>
<td>MANIPAF</td>
<td>1</td>
<td>0.00</td>
<td>0.00</td>
<td>1.0000</td>
</tr>
<tr>
<td>MANIPFAF*MANIPAF</td>
<td>1</td>
<td>0.74</td>
<td>18.30</td>
<td>.0001</td>
</tr>
</tbody>
</table>
Table 23: Regression analysis for moderate self-esteem subjects collapsed across delay conditions (Experiment 4).

Order of input of independent variables: Subject variable manipulated intensity of affect, square of manipulated intensity of affect. Dependent variable is recall.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>DF</th>
<th>SS</th>
<th>F VALUE</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNUM</td>
<td>41</td>
<td>3.14</td>
<td>1.87</td>
<td>.003</td>
</tr>
<tr>
<td>MANIPAF</td>
<td>1</td>
<td>.13</td>
<td>3.26</td>
<td>.073</td>
</tr>
<tr>
<td>MANIPFAF*MANIPAF</td>
<td>1</td>
<td>.40</td>
<td>9.63</td>
<td>.002</td>
</tr>
</tbody>
</table>
Table 24: Regression analysis for high self-esteem subjects collapsed across delay conditions (Experiment 4).

Order of input of independent variables: Subject variable, manipulated intensity of affect, square of manipulated intensity of affect. Dependent variable is recall.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>DF</th>
<th>SS</th>
<th>F VALUE</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNUM</td>
<td>48</td>
<td>3.47</td>
<td>1.85</td>
<td>.001</td>
</tr>
<tr>
<td>MANIPAF</td>
<td>1</td>
<td>.12</td>
<td>2.93</td>
<td>.08</td>
</tr>
<tr>
<td>MANIPFAF*MANIPAF</td>
<td>1</td>
<td>.35</td>
<td>8.93</td>
<td>.003</td>
</tr>
</tbody>
</table>
Table 25: Regression analysis collapsed across self-esteem scores for the immediate recall condition. (Experiment 4).

Order of input of independent variables: Subject variable, manipulated intensity of affect, square of manipulated intensity of affect. Dependent variable is recall.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>DF</th>
<th>SS</th>
<th>F VALUE</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNUM</td>
<td>33</td>
<td>1.16</td>
<td>0.74</td>
<td>.84</td>
</tr>
<tr>
<td>MANIPAF</td>
<td>1</td>
<td>.27</td>
<td>5.54</td>
<td>.02</td>
</tr>
<tr>
<td>MANIPFAF*MANIPAF</td>
<td>1</td>
<td>.43</td>
<td>8.90</td>
<td>.003</td>
</tr>
</tbody>
</table>
Table 26: Regression analysis for moderate self-esteem subjects in the immediate recall condition. (Experiment 4).

Order of input of independent variables: Subject variable, manipulated intensity of affect, square of manipulated intensity of affect. Dependent variable is recall.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>DF</th>
<th>SS</th>
<th>F VALUE</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNUM</td>
<td>15</td>
<td>.66</td>
<td>.89</td>
<td>.58</td>
</tr>
<tr>
<td>MANIPAF</td>
<td>1</td>
<td>.05</td>
<td>.95</td>
<td>.33</td>
</tr>
<tr>
<td>MANIPFAF*MANIPAF</td>
<td>1</td>
<td>.51</td>
<td>10.40</td>
<td>.002</td>
</tr>
</tbody>
</table>
Table 27: Regression analysis for high self-esteem subjects in the immediate recall condition. (Experiment 4).

Order of input of independent variables: Subject variable, manipulated intensity of affect, square of manipulated intensity of affect. Dependent variable is recall.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>DF</th>
<th>SS</th>
<th>F VALUE</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNUM</td>
<td>17</td>
<td>.49</td>
<td>.79</td>
<td>.69</td>
</tr>
<tr>
<td>MANIPAF</td>
<td>1</td>
<td>.83</td>
<td>22.51</td>
<td>.001</td>
</tr>
<tr>
<td>MANIPFAF*MANIPAF</td>
<td>1</td>
<td>.05</td>
<td>1.31</td>
<td>.26</td>
</tr>
</tbody>
</table>
Table 28: Regression analysis collapsed across self-esteem scores for the same day recall condition (Experiment 4).

Order of input of independent variables: Subject variable, manipulated intensity of affect, square of manipulated intensity of affect. Dependent variable is recall.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>DF</th>
<th>SS</th>
<th>F VALUE</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNUM</td>
<td>27</td>
<td>1.63</td>
<td>1.62</td>
<td>.04</td>
</tr>
<tr>
<td>MANIPAF</td>
<td>1</td>
<td>.09</td>
<td>2.39</td>
<td>.12</td>
</tr>
<tr>
<td>MANIPFAF*MANIPAF</td>
<td>1</td>
<td>.15</td>
<td>4.10</td>
<td>.04</td>
</tr>
</tbody>
</table>
Table 29: Regression analysis for moderate self-esteem subjects in the same day recall condition (Experiment 4).

Order of input of independent variables: Subject variable, manipulated intensity of affect, square of manipulated intensity of affect. Dependent variable is recall.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>DF</th>
<th>SS</th>
<th>F VALUE</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNUM</td>
<td>12</td>
<td>.73</td>
<td>1.63</td>
<td>.11</td>
</tr>
<tr>
<td>MANIPAF</td>
<td>1</td>
<td>.00</td>
<td>.21</td>
<td>.65</td>
</tr>
<tr>
<td>MANIPFAF*MANIPAF</td>
<td>1</td>
<td>.00</td>
<td>.23</td>
<td>.63</td>
</tr>
</tbody>
</table>
Table 30: Regression analysis for high self-esteem subjects in the same day recall condition (Experiment 4).

Order of input of independent variables: Subject variable, manipulated intensity of affect, square of manipulated intensity of affect. Dependent variable is recall.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>DF</th>
<th>SS</th>
<th>F VALUE</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNUM</td>
<td>14</td>
<td>.87</td>
<td>1.67</td>
<td>.08</td>
</tr>
<tr>
<td>MANIPAF</td>
<td>1</td>
<td>.10</td>
<td>2.87</td>
<td>.09</td>
</tr>
<tr>
<td>MANIPFAMANIPAF</td>
<td>1</td>
<td>.20</td>
<td>5.42</td>
<td>.02</td>
</tr>
</tbody>
</table>
Table 31: Regression analysis collapsed across self-esteem scores in the next day recall condition (Experiment 4).

Order of input of independent variables: Subject variable, manipulated intensity of affect, square of manipulated intensity of affect. Dependent variable is recall.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>DF</th>
<th>SS</th>
<th>F VALUE</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNUM</td>
<td>28</td>
<td>.65</td>
<td>.69</td>
<td>.87</td>
</tr>
<tr>
<td>MANIPAF</td>
<td>1</td>
<td>.10</td>
<td>3.06</td>
<td>.08</td>
</tr>
<tr>
<td>MANIPFAF*MANIPAF</td>
<td>1</td>
<td>.34</td>
<td>9.99</td>
<td>.002</td>
</tr>
</tbody>
</table>
Table 32: Regression analysis for moderate self-esteem subjects in the next day recall condition (Experiment 4).

Order of input of independent variables: Subject variable, manipulated intensity of affect, square of manipulated intensity of affect. Dependent variable is recall.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>DF</th>
<th>SS</th>
<th>F VALUE</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNUM</td>
<td>12</td>
<td>.45</td>
<td>1.03</td>
<td>.43</td>
</tr>
<tr>
<td>MANIPAF</td>
<td>1</td>
<td>.17</td>
<td>4.82</td>
<td>.03</td>
</tr>
<tr>
<td>MANIPFAF*MANIPAF</td>
<td>1</td>
<td>.21</td>
<td>5.96</td>
<td>.01</td>
</tr>
</tbody>
</table>
Table 33: Regression analysis for high self-esteem subjects in the next day recall condition (Experiment 4).

Order of input of independent variables: Subject variable, manipulated intensity of affect, square of manipulated intensity of affect. Dependent variable is recall.

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>DF</th>
<th>SS</th>
<th>F VALUE</th>
<th>P VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNUM</td>
<td>15</td>
<td>.19</td>
<td>.38</td>
<td>.97</td>
</tr>
<tr>
<td>MANIPAF</td>
<td>1</td>
<td>.003</td>
<td>.11</td>
<td>.74</td>
</tr>
<tr>
<td>MANIPFAF*MANIPAF</td>
<td>1</td>
<td>.13</td>
<td>4.19</td>
<td>.04</td>
</tr>
</tbody>
</table>
APPENDIX M

Experiments 5 and 6: Affective States and Memory
EXPERIMENTS 5 AND 6

Affective States and Memory

Introduction.

The research reviewed in the introductory chapter was concerned with memory for information differing in affective quality and intensity. Research interest focused on the affective value of the information for which memory was being tested. More recently, researchers have begun to pay attention to another aspect of the affect and memory relationship - the influence of an individual's mood on memory. Research on this topic has focused on the relationship between the quality of an individual's mood (pleasant, unpleasant, neutral) and the quality of the information for which memory is tested (pleasant, unpleasant, neutral). In Experiments 5 and 6, mood manipulations were introduced to study the effect of affect as an internal context on retrieval of pleasant unpleasant and neutral information. In the existing mood/memory literature, there appears to be empirical support for three distinct hypotheses regarding the influence of mood on memory.

State dependent memory. A mood-congruency hypothesis was advanced by some researchers (Bower, Monteiro and Gilligan, 1978; Weingartner, Miller and Murphy, 1977) regarding the mood/memory relationship, i.e. memory for information learned during a specific mood state is best when the same mood state is prevalent at the time of recall. The Bower, et al. (1978) studies involved learning a word-list while subjects were in a hypnotic state (happy or sad). Retrieval mood state was manipulated such that it was either congruent or incongruent with the mood state present at encoding. No mood-congruency effect was found in this experiment. However, when subjects were made to learn two lists (one while in a sad mood, the other in a happy mood) and then recall each list in a mood congruent vs. mood incongruent state, a powerful congruency effect was found. Bower, et al. concluded that mood at the time of learning "provided a helpful retrieval cue and differentiating context only in multi-list circumstances.
where conclusions and interference among memories would otherwise obtain". Teasdale, Taylor and Forgarty (1980) also reported better memory for positive information as well as negative information when subjects were in congruent mood states.

The Bower, et al. finding was supported in a study by Eioh and Birnbaum (1982) in which they reported the absence of a state-dependency effect when subjects were provided with repetitions of the information at encoding and cuing (by providing the category name) at retrieval.

An Encoding Effect. Research by Bower, Gilligan and Monteiro (1981) involved the study of memory for text (about a happy or sad character), was related to the mood state (happy or sad) of the subject at the time of learning. Using variations of the same basic procedure, they reported that (i) happy and sad readers remembered more information about the character in the same mood as themselves, (ii) this effect did not occur when a happy or sad mood was induced only at retrieval, (iii) the mood-congruency effect occurred when recall of life events (happy vs. sad) about the same fictional character was measured, (iv) this effect occurred only when the mood state was induced at the time of learning and not at the time of retrieval.

Nasby and Yando (1982) using 10 year olds as subjects, demonstrated that a happy mood at encoding facilitated the learning of pleasant information, whereas a sad encoding mood disrupted the recall of pleasant information. They also reported a retrieval effect for pleasant information, i.e. better memory for pleasant information when subjects were placed in a happy mood state at retrieval.

Retrieval Effects. Isen, Shalker, Clark and Karp (1978) reported a failure to find the state dependent learning effect. In their study, subjects who succeeded at a computer game (i.e. in a positive mood state) at the time of retrieval, recalled a greater number of positive words. Other studies (Laird, et al., 1981; Nasby and Yando, 1982) have also replicated the retrieval effect, albeit only for positive mood states.
A resolution of the Bower, et al. (1981) results (i.e. an encoding effect of mood/memory) and the Isen, et al. results (i.e. a retrieval effect of mood/memory) was provided by Teasdale and Russell (1983). These authors report finding a retrieval effect for both positive and negative mood states, and suggest interpretation of this effect as a type of state-dependent-learning effect. They argue that trait adjectives (used as stimuli in the studies that report a retrieval effect), are closely associated with events in one’s life experiences; for example, the trait word "kind" may elicit information about instances in which one performed a kind act. Further, since these events are associated to mood states that were present at the time they occurred (i.e. performing a kind act makes one feel good), the retrieval effects are really a state-dependent-learning effect. The authors provide no empirical support for these two claims.

Interpretations of the mood/memory effects. Each of the studies reviewed above can be classed as supporting either a view of affective symmetry (i.e. similar memory effects for positive and negative mood states, Bower et al., 1981; Teasdale and Russell, 1983) or affective asymmetry (i.e. not the same memory effects for positive and negative mood states; Isen, et al., 1978; Nashby and Yando, 1982).

The following is a brief summary of the interpretations for the mood/memory effects suggested by various researchers: (1) Mood congruent information is more memorable because it increases mood intensity at the time of encoding (Bower, et al., 1981); (2) Mood congruent information promotes learning by making accessible other similar experiences (Bower, et al., 1981); (3) a positive mood state at the time of retrieval, enhances the retrieval of positive material by making it more easily accessible, (Isen, et al. 1978; Nashby and Yando, 1982); (4) Based on the cognitive model of depression proposed by Beck et al. (1979), Teasdale and Russell (1983) proposed that a negative mood state made negative thoughts and experiences more accessible; (5) a negative mood state leads to (a) a reduction in the amount of task-relevant processing and (b) differential allocation of resources leading to normal processing of a relatively easy task, but poorer performance on a task requiring greater elaboration of encoding (Ellis, Thomas and Rodriguez, 1984).
In Experiment 5 an affect manipulation (happy vs. sad mood state) was introduced at the time of retrieval to study the influence of affective states on memory for information that was pleasant, unpleasant and neutral. Does a pleasant mood lead to better recall of pleasant information? If this is so, there should be better memory for the pleasant sentences than the unpleasant or neutral ones.

Is the influence of affective states symmetric? If this is true, we should expect better memory for pleasant information when subjects were in a pleasant state and similarly, better memory for unpleasant sentences when subjects were in an unpleasant mood state. If a negative mood state disrupts recall, this should be evident in the overall lower recall after a negative mood state. In Experiment V, an affect manipulation (success vs. failure) was developed and tested.

**Method.**

**Subjects.** Forty-one Ohio State University undergraduates participated in partial fulfillment of a requirement of their introductory psychology course.

**Materials.**

**Affect induction procedure.** The affect induction was accomplished by using the technique developed by Velten (1968), a procedure that has been successfully used in other research involving mood manipulations (Leight and Ellis, 1981; Teasdale and Russell, 1983, etc.). The Velten procedure of mood induction involves reading of self-referent statements that reflect a particular mood. The statements for positive and negative mood induction increase in the intensity of the mood to be induced. For example, the first positive mood induction statement is "Today is neither better nor worse than any other day" and the last statement is "This is great - I really do feel good - I am elated about things". Similarly, the first negative mood induction statement read, "I've had daydreams in which my mistakes kept occurring to me - sometimes I wish I could start over again", and the last one was "I want to go to sleep and never wake up". There were a total of 50
statements in each of the positive and negative mood induction procedures. These statements were presented to subjects in the form of a booklet, which they read at their own pace.

**Filler Task.** Three sets of ten trivia items each were developed. The trivia items that subjects studied before a positive mood induction, were selected to be about "happy" events. For example, "Who was the famous American humorist who attended Ohio State University?" (James Thurber). In the negative mood induction, subjects studied trivia that were appropriately chosen to be about depressing or sad events. For example, "What is the name of a suicide drug, stored by the CIA, that blocks the absorption of oxygen and causes death rapidly by asphyxiation?" (Cyanide). The neutral trivia consisted of questions such as "What is the name of the New Zealand bird that cannot fly?" (Kiwi).

**Recognition Test.** A recognition test was constructed by generating a set of 24 distractor items. These items were generated such that for each of the 24 target nouns used in the experiment, there was a semantically related distractor. This procedure was used since prior experience with the sentence generation encoding task (in the second-generation experiments) had indicated that the task produced very high recognition memory, regardless of the experimental condition the subject was in. It was assumed that a more sensitive recognition test could be developed if the distractor items were related in meaning to the target items. Thus for some of the words, distractors were complementary terms (for example, target word: foot; distractor word: hand); or, distractors were similar in meaning (for example, target word: trunk; distractor word: suitcase). The distractor words were randomly mixed with the 24 target nouns, creating a set of 48 words. Subjects were instructed to circle only those words that they had used in the sentence construction task.

**Procedure.** The main difference in the procedure of Experiment 5 compared to the previous experiments consisted in the introduction of the affect manipulation. The procedures used in previous experiments are described briefly and the new affect manipulations are described in greater detail.
Sentence Construction. Subjects were introduced to the trivia as the main focus of the experiment. Then, subjects imagined a scenario involving their future self and used this information to construct sentences that were either pleasant, unpleasant or neutral, involving themselves and a target noun. After this, subjects studied the neutral trivia for five minutes, following which they were given the first pseudo cued recall test, using the cue "the/a".

Mood Induction Procedure and Pseudo Cued Recall Measure. Approximately half the subjects were given the happy trivia to study for five minutes. The rest of the subjects were given the sad trivia to study for five minutes. This manipulation was introduced to counterbalance the order of the mood manipulations for the pseudo cued recall task and to create a between subjects design for the final free recall of target nouns. Following the study of the trivia, subjects who had received the happy trivia read the happy Velten statements at their own pace. Similarly, subjects who had received the sad trivia read the sad Velten statements at their own pace. Following the mood manipulation (happy vs. sad), subjects were given a second pseudo cued recall test, using the same cue ("the/a") as before. Subjects were instructed to recall a sentence other than the one they had produced before in response to the first pseudo cue.

Subjects who had studied the happy trivia and read the happy Velten statements were given the sad trivia to study, followed by the sad Velten statements to read. Likewise, subjects who had studied the sad trivia and read the sad Velten statements were given the happy trivia to learn, followed by the happy Velten statements to read. The mood induction was followed, as before, by a third pseudo cued recall test, using the same cue as before.

Free Recall of Targets and Recognition Tests. All subjects (half of whom were in a happy mood state and half of whom were in a sad mood state) were given a free recall test of the target words used in sentence construction. Subjects worked on this task for five minutes. Finally, all subjects were given a recognition task for the target words used in the sentences (see section on Recognition above). This task was self-paced.
Before leaving the experiment, subjects were informed that the experimenter was interested in testing memory for the trivia after a 24 hour delay. Ostensibly for this purpose, subjects were requested to give the experimenter their phone number and a time that was convenient to call. All subjects (except one, who did not have a phone) obliged.

Memory measures after a 24-hour delay. After approximately 24-hours following the experimental session, subjects were called and recall and recognition measures were collected. First, subjects were asked to answer three trivia questions, to lend credibility to the purpose of the phone call. Next, they were asked to recall as many as possible of the sentences they had constructed the previous day. Then, subjects were asked to remember target words, even though they may not recall the sentences they had constructed for these words. Finally, the 48 words used in the recognition test (24 targets and 24 distractors) were read to the subject. For each word, subjects was asked to give a yes/no response ("yes" indicating that they remembered using the word in a sentence, and "no" indicating that they remembered not using the word in a sentence).

Results.

Free Recall of Targets. The design of the experiment was a 3 (Affect of the event described in the sentence: Pleasant, unpleasant, neutral) X 2 (Time of free recall of target nouns: Immediate vs. delayed) X 2 (Order of mood manipulation: happy/sad [condition 1] vs. sad/happy [condition 2]) factorial. The first two factors were within-subject factors, and the last one was a between subjects factor. Since only 14 of the 20 subjects in condition 1 and 16 out of 21 subjects in condition 2 could be contacted after a 24 hour delay, the overall analysis is based on the data of the 30 subjects.

All tables for Experiments 5 and 6 are available at the end of Appendix M. As Table 34 indicates, overall free recall of targets did not differ as a function of the mood of the subject at the time of recall (Immediate free recall: happy subjects = 9.18 vs. sad subjects = 8.28;
Delayed free recall: happy subjects (at the time of first retrieval) = 6.13 vs. sad subjects = 5.06. An analysis of variance procedure indicated that there was no main effect for mood ($E[1, 28] = 1.12, \eta^2 = .042$). There was also no difference in overall recall of target words embedded in pleasant vs. neutral vs. unpleasant sentences (Immediate recall: 5.56 vs. 5.77 vs. 6.13; Delayed Recall: 3.97 vs. 3.27 vs. 3.95). The main effect for affect of the sentence was statistically insignificant ($E[2, 56] = .43, \eta^2 = .06$).

Not surprisingly, there was overall higher recall of targets in the immediate test vs. the delayed test ($E[1, 28] = 36.24, \eta^2 = .0001$).

Of particular significance, was the interaction effect of quality of affect of the material and the mood of the subject. Note that subjects in Condition 1 had received the happy mood manipulation first, and the sad mood manipulation later. Therefore, at the time of free recall of targets, these subjects were in a sad mood state. On the other hand, subjects in Condition 2 had received the sad mood manipulation first, followed by the happy mood manipulation. At the time of free recall of the target nouns, these subjects were in a sad mood state. As Table 34 indicates, there appears to be higher recall of target nouns in pleasant sentences when subjects were in a negative mood state and vice versa. The interaction effect is statistically significant ($E[1, 28] = 3.37, \eta^2 = .04$).

Immediate vs. delayed free recall of targets. To explore this finding further, separate analyses were performed on the immediate vs. delayed free recall tests for target nouns. Each of these data sets were first analyzed in a 2 (mood of the subject at the time of retrieval: happy vs. sad) X 3 (affect of the event described in the sentence: pleasant vs. neutral vs. unpleasant). As Table 35 shows, for the immediate recall test, there was no difference in the overall recall when subjects were in a happy vs. sad mood ($E[1, 39] = .78, \eta^2 = .038$). There was also no main effect of the affective quality of the information ($E[2, 78] = .48, \eta^2 = .06$). The interaction effect of mood X quality of affect of the information was marginally significant ($E[2, 78] = 2.79, \eta^2 = .07$). Pre-planned pair-wise comparison tests, using the Duncan procedure, indicated that when subjects were in a positive mood state at the time of recall, there was better memory for target words in unpleasant sentences than targets in pleasant sentences (3.62 vs. 2.71, $\eta^2 < .01$).
None of the other comparisons of means (in either condition 1 or 2) were even close to being significant. An independent samples t test indicated that mean recall for target nouns embedded in unpleasant sentences was greater for subjects in a happy mood state than a sad mood state at retrieval (3.62 vs 2.65, $t[39] = 2.36$, $p = .02$).

Recall of targets in the delayed free recall test (after approximately 24 hours) followed some similar patterns (see Table 34 for delayed free recall data). Preplanned pair-wise comparisons indicated that subjects in a sad mood at the time of retrieval (24 hours earlier) recalled more targets in pleasant sentences than targets in neutral sentences (2.28 vs. 1.14, $q < .05$), and more targets embedded in unpleasant than neutral sentences (1.64 vs. 1.14, $q = .05$). An independent samples t test indicated a marginally significant difference in the recall of targets embedded in neutral sentences for subjects in a happy vs. sad mood at the time of immediate recall (2.13 vs. 1.14, $t[28] = 2.19$, $q < .10$). No other differences in free recall of target nouns after a 24 hour delay were significant.

**Clustering analyses.** As previously, ARC analyses of clustering of targets in free recall by affective value of the sentence showed chance level clustering ($ARC = .009$, $t[38] = .114$, $q > .70$). Similarly, there was no difference in the clustering of targets in pleasant, unpleasant vs. neutral sentences ($E[2, 78] = 1.08$, $p = .35$). Also, there was no effect of mood state on clustering of targets in pleasant, neutral or unpleasant sentences ($E[1, 39] = .13$, $p = .72$).

**Pseudo Cued Recall of Sentences.** The pseudo cued recall had involved the recall of three sentences, one in each of the three mood states. As Table 36 indicates, the data refer to the number of subjects who recalled a pleasant, neutral or unpleasant sentence in response to the pseudo cue (“the/a”) when placed in a happy, sad or neutral mood.

When subjects were in a happy mood, many more of them recalled an unpleasant sentence (22) rather than a pleasant or neutral one (10 and 9 respectively). A one-sample Chi-
Square test was performed to test observed frequencies against the expected frequencies (positive = neutral = negative) and the result indicated a significant difference in the number of subjects recalling a pleasant, neutral or unpleasant sentence ($X^2 \[2\] = 7.68, q < .05). Pair wise comparisons (proposed by Marascuilo and McSweeney, 1977 as being similar to the Scheffé multiple comparison procedure for parametric tests) were performed that indicated that a significantly greater number of subjects recalled an unpleasant sentence than a pleasant or neutral one (22 vs. 10 and 22 vs. 9, q < .05).

Pseudo cued recall when subjects were in a neutral mood also showed a significant difference between observed and expected frequency ($X^2[2] = 5.99, q < .05). Pair-wise comparison tests indicated a significant difference in the number of subjects recalling a neutral vs. unpleasant sentence (7 vs. 20, q < .05) and a marginally significant difference in the number of subjects recalling a pleasant vs. unpleasant sentence (13 vs. 20, q < .10).

In the sad mood condition, there was no difference in the frequency of subjects recalling pleasant, neutral and unpleasant sentences (12 vs. 15 vs. 13, $X^2[2] = .351, q > .80)."

Delayed recall of sentences. In the delayed recall test for sentences, overall recall was low (See Table 37). A 2 (Mood at the time of retrieval 23 hours earlier: Happy vs. Sad) X 3 (Sentence Affect: Pleasant vs. Neutral vs. Unpleasant) factorial was performed. Both these factors were within subject factors. There was a main effect for sentence affect ($E[2,56] = 3.48, q = .04), but there was no significant interaction effect between mood at the time of first recall and sentence affect ($E[2,56] = 1.29, q = .28). The significant main effect for sentence affect occurred because of lower recall of neutral sentences compared to unpleasant and pleasant sentences. There was a significant difference between recall of unpleasant and neutral sentences (1.20 vs. .73, $t[29] = 2.97, q = .005) and a marginally significant difference in the recall of pleasant vs. neutral sentences (1.10 vs. .73, t = 1.94, q = .06). This pattern, however, was not the same for subjects in Condition 1 vs. Condition 2. Subjects in Condition 1 (happy at retrieval) showed better memory memory for unpleasant than neutral sentences (1.31 vs. .69, $t[15] =
2.82, \( p = .01 \). On the other hand, subjects who had been in a happy mood at the time of the first recall test (approximately 24 hours earlier), showed a marginally significant differences in recall of targets embedded in pleasant vs. neutral sentences (1.29 vs. .78, \( t[13] = 1.71, p = .11 \)).

Recognition. The recognition responses for target nouns associated with pleasant, neutral and unpleasant events were close to perfect. Both at immediate as well as delayed recognition tests, recognition accuracy was approximately 97%. This made it impossible to conduct any signal detection tests on the data that would differentiate between memory for targets embedded in pleasant, unpleasant and neutral sentences.

Self as agent vs. self as object. In coding the data for the various recall measures, it was noted that although pleasant and unpleasant sentences were similar in all respects (other than their affective content), they seemed to differ in one critical respect: The pleasant sentences appeared to use the self as the responsible agent for the event described in the sentence, whereas the unpleasant sentences tended to use the self as a passive receptor of the event described in the sentence. Thus, when constructing sentences about pleasant events, subjects seemed to make the self the actor or the agent responsible for the positive event being described. On the other hand, the unpleasant sentences appeared to designate the self to a less active role; another person or event was usually the responsible agent, with the self playing the role of the entity to which something negative was happening. A few examples will make this statement clear.

Examples of pleasant sentences demonstrating subjects’ spontaneous use of self-as-agent.

1. I found a great deal of money in a bag lying along the road.

2. I made a dull ball of clay into a beautiful statue.

3. When I push my son in his red wagon, he is very happy.

4. I love to draw and print in multicolored ink.
5. While making cookies, I love to mix the ingredients in procelain bowls.

Examples of unpleasant sentences demonstrating subjects’ spontaneous use of self-as-object.

1. The cork flew from the bottle as I held it and crashed through the stained glass.

2. A monkey snuck up behind me at the circus and stole my wallet.

3. Suddenly, the engine came apart on Sunset Blvd.; it was so embarrassing.

4. The horse slammed his foot on my hand causing me to call out in pain.

5. The ink splattered all over my brand new shirt.[*]

6. My key chain is large enough, but it always manages to get lost.

7. My neighbor practices on his trumpet at 6 a.m., awakening me before my alarm.

[*] Note: If the sentence had read "I splattered ink all over my brand new shirt" it would have been scored as self-as-agent.

Each of the sentences was coded for the role played by the self in each sentence, by a judge who was blind to the hypothesis. It was critical to use a naive judge since each page of the sentence construction booklet had a sign (+, 0 or -) to indicate to the subject the affective quality of the sentence. Each sentence was coded 1 (self as agent) or 0 (self as object). Sentences that were evaluative, such as "I like our new blue station wagon", and sentences that were not completed by the subject, were coded "other". If the judge was unsure regarding the coding of a particular sentence, it was resolved by discussion and mutual agreement with the experimenter. This, however, was not a frequent occurance.
Table 38 reports the distribution of sentences constructed as well as recall of sentences during the pseudo cued recall test for each of the categories. A one-way analysis of variance was performed separately on the data for self as agent and self as object. There was a significant difference in mean number of sentences constructed using self-as-agent (pleasant=5.82, neutral=5.50, unpleasant=3.40, $F(2,78) = 25.18, p = .0001$). Matched samples $t$ tests indicated that the means for pleasant vs. unpleasant sentences were significantly different ($t[39] = 6.92, p = .0001$) as were the means for neutral vs. unpleasant sentences ($t[39] = 4.87, p = .0001$). The difference between the means of pleasant vs. neutral sentences that were constructed were not statistically significant ($t[39] = 1.01, p = .32$).

The analysis for self-as-object sentences showed the opposite effect. The means for pleasant vs. neutral vs. unpleasant sentences constructed were 1.28, 1.08 and 3.83 respectively ($F(2,78) = 42.83, p < .0001$). Similar to the previous analysis, matched samples $t$ tests indicated a significant difference in the means of pleasant vs. unpleasant sentences ($t[39] = 7.73, p = .0001$) as well as the means for neutral vs. unpleasant sentences ($t[39] = 6.99, p = .0001$). There was no difference in the mean number of neutral vs. pleasant sentences constructed in self-as-object sentences ($t[39] = .78, p = .44$).

**Discussion.**

The free recall of targets indicated that subjects in a happy mood at retrieval recalled more targets embedded in unpleasant sentences than targets in pleasant sentences. This result contradicts a previous finding that a positive mood state facilitates the retrieval of positive information (Isen, et al. 1978; Teasdale and Russell, 1983), and needs to be explained.

In discussing the results of the previous experiments, it had been noted that better memory for targets in unpleasant sentences may have occurred as a result of a contrast effect. Subjects had constructed a scenario about their future self, which invariably was positive in nature. Then, subjects had been asked to construct pleasant, neutral or unpleasant sentences
involving their future self. The pleasant sentences would "fit" the self schema that was activated, whereas the unpleasant events described in the sentences would be inconsistent with the activated positive self schema.

The idea that information that is inconsistent with an activated schema or isolated from the background against which it is processed is related to the old Gestalt notion of figure-ground perception. Various findings in social psychology (impression formation and attribution formation), and cognitive psychology (the older von Restorff isolation effect and the more recent schema based frameworks for knowledge representation) suggest that information that is inconsistent or incongruent with the background information against which it is processed is given more weight in forming an impression, resulting in better memory for that information. Particularly relevant to this discussion is the influential work of Hastie (1981; Hastie and Kumar, 1979) and follow up research (Srull, 1981; Bargh, 1984). This work and other related findings were discussed in the report of Experiment 4.

To reiterate, in the present experiments, when subjects constructed a scenario about their imagined future self, they activated a knowledge structure referred to as a self schema (Markus, 1977). Since almost all scenarios about one's future self were extremely positive in nature (an examination of the scenarios indicated this), the unpleasant sentences subjects constructed were remembered better because their affect was incongruent with the affect of the activated self schema. This would explain the finding that subjects in the happy mood state remembered more targets from unpleasant sentences than pleasant ones. Thus, although this finding contradicts the retrieval effect finding in affect and memory (i.e. a positive mood state at retrieval facilitates memory for positive information), the processes involved in the two experimental procedures may be significantly different. The retrieval effect research (discussed in the introduction to this chapter) tested subjects memory for affectively neutral, pleasant and unpleasant trait words. The task did not involve a schema activation manipulation, in relation to which the adjectives were processed.

If this line of reasoning is correct, why did the better memory for inconsistent information not occur when
subjects were in a sad mood state at retrieval (i.e. better memory for targets embedded in pleasant sentences)? There are three possible reasons for this: First, the means are in the predicted direction (i.e. higher recall of targets in pleasant sentences when subjects were in a sad mood at retrieval) and it is possible that the experimental procedure lacked the power necessary to detect an effect. For instance, the delayed free recall data did demonstrate better memory for targets in pleasant sentences for subjects in the sad mood at retrieval 24 hours earlier. However, a problem in interpreting the delayed recall data is the within-subject manipulation of recall interval. The delayed recall data are contaminated by the previous recall (24 hours earlier) and as a result are not a true test of the original information itself. The better test would be to introduce the variable of immediate vs. delayed recall as a between-subjects factor so that recall at delay reflects memory of the original material rather than the first recall test. (This is done in Experiment 6). It is possible that subjects in the sad mood at retrieval, having been exposed to the happy mood manipulation earlier, resisted getting into a sad mood. Thus, the sad mood manipulation may not have been as successful as the happy one. Although the manipulation check indicated significant differences in the ratings given by subjects in a happy vs. sad mood, it must be noted that the measure was very direct and open to demand characteristic explanations. Third, in the happy mood condition, the mood state reinforced the positive affect of the future scenario constructed earlier. When subjects were in a sad mood, however, this was not possible.

The pseudo cued recall gives more support to the argument that (i) when the experimental task taps a well-developed schema, the affect of that schema will provide a context against which incoming affective information is processed and (ii) affectively inconsistent information will be remembered better. Many more subjects in a positive and neutral mood state generated an unpleasant sentence in response to the pseudo cue "the". This effect did not hold up in the sad mood condition, where approximately equal numbers of pleasant, unpleasant and neutral sentences were generated.

The self-as-agent vs. self-as-object finding is interesting in that subjects spontaneously attributed to themselves significantly different roles when describing
pleasant vs. unpleasant events. Recently, much theoretical as well as empirical interest has been generated in the study of biases involving the self (see Weary Bradley, 1978; Greenwald, 1980). In particular, one of several findings that indicate a cognitive bias favoring the self, is that individuals make self-attributions for positive behaviors and external attributions for their negative behaviors. In this experiment, subjects used themselves as the cause or the person responsible for outcomes that were pleasant; on the other hand, they made other persons (for example, and imaginary husband, children or neighbor) or inanimate objects (the cork in the bottle, the engine in the car) responsible for outcomes that were unpleasant.

Although the finding is not a new one, it is interesting in three ways: First, subjects demonstrate this pattern when the experimental task demanded that they spend a very short period of time (40 seconds) generating the sentence. This suggests that this self bias does not require pre-mediated thought; rather, it appears to be automatic and spontaneous, suggesting that it is the "true" behavior of the subject and not an outcome of trying to present the self favorably. Second, the bias occurs even when the events that subjects are describing are not "real" events that have happened to them or ones that will have any consequences for the future. The task is clearly an "imagination" task, and yet subjects manifest this bias. Finally, the results are very robust, and perusal of each subject's data indicated that there was no individual subject for whom the pattern of data differed from the overall finding.
Experiment 6

Some critical changes were made in the procedure of Experiment VI to allow for improvement over the previous experiment and introduce procedures to test some new hypotheses.

Success and failure mood manipulation. First, it was considered necessary to manipulate mood in a between subjects design, so as to overcome the interpretation problems of the previous experiment. Second, a mood manipulation involving induction of success and failure was used rather than the direct happy/sad mood manipulation induced by the Velten statements. This was done for two reasons. First, it is as yet unclear whether negative affect induced as a result of failure vs. negative affect induced by reading depressing statements have the same effect on memory. In fact, many of the inconsistencies in the findings of the various mood/memory studies have been attributed to differences in the mood manipulation techniques that have been used (Teasdale and Russell, 1983). Studies reviewed in Chapter 1 that were directed at developing an experimental test of the repression hypothesis consistently used success/failure mood manipulations because it was argued that failure would produce ego-threat, which in turn would lead to memory decrement for the ego-threatening information.

Second, although affect induction procedures such as the Velten mood statements, have been widely used in affect/memory experiments, there are a number of problems with them. One such problem is that the affect induction technique is very direct - subjects are told that these statements are intended to change their mood and are asked to experience as fully as possible the feeling described in each statement. A manipulation check asking subjects to rate how they are feeling seems to be a reactive measure. Thus, in Experiment VI a success/failure manipulation was developed and used to test whether memory following these experiences exhibits selective retrieval.
However, success/failure tasks have often involved deception, typically in the form of giving subjects false feedback regarding their performance on a given task. To avoid the problem of deception in psychological research, and yet be able to manipulate feelings of success and failure, tests such as the Remote Associates Test (RAT; Mednick, 1962; Blascovich and McFarlin, 1982; McFarlin and Blascovich, 1982) in which the difficulty of the items is manipulated, such that subjects can be given an accurate report of their performance. However, administration of the RAT involves about 20-25 minutes of experimental time, and the experimental procedure of the affect/memory studies in this research did not allow for this time to be spent on the success/failure manipulation. (Since this experiment was run during summer quarter, subjects were paid for their participation, and this made it inconvenient to extend the experiment to two hours). A new success/failure task was developed and used in Experiment 6, to be described in detail in the section on Materials.

Stronger manipulation for imagined future self scenerio. In previous experiments, subjects had been told to generate sentences about future events involving themselves. Results of Experiment V had suggested that the reason for the better memory of unpleasant events when in a pleasant mood may be due to a contrast effect. It was assumed that scenarios involving subjects future selves would tend to be positive. It was hypothesized that better conditions for obtaining a contrast effect would occur if subjects were allowed to spend more time developing such a scenario, before they constructed sentences.

Self as agent. The finding in Experiment 5 that subjects used self-as-agent to a greater extent in pleasant sentences than unpleasant sentences, and self-as-object to a greater extent in unpleasant than pleasant sentences, posed a problem. It was possible that subjects memory was affected by the selective use of self-as-agent vs. self-as-object. This finding was interesting as was considered worthy of further attention. However, so as not to deviate from the main course of this research, it was considered adequate to control this bias by instructing subjects to construct all sentences using self-as-agent.

Pseudo cued recall. In the previous experiments, subjects had been given the same cue (for example, "the")
on every occasion a pseudo cued recall measure was obtained. It was possible that giving subjects the same cue led them to retrieve a sentence of the "same" affect type as the previous one, because of sampling similar sentences in memory. In Experiment 6, three different cues were used ("a", "the" and "I") in the pseudo cued recall test to avoid this problem.

A test of intensity of affect. After Experiments I, II and III, it was clear that a rating type measure of intensity of affect had been informative, but not satisfactory. In Experiment 6, a manipulation of affective intensity was introduced by asking subjects to create sentences that differed along this dimension. Two categories of affective intensity, extreme and moderate, were used.

Method.

Subjects. Forty-four subjects, recruited from the Ohio State University campus were paid $4.00 for one hour of participation.

Materials. The success/failure task was constructed in the following way. First, approximately forty names of persons were generated in each of two categories. The first category consisted of names of people who were famous and would be well-known to a very high percentage of college students (for example, Michael Jackson). The second category, consisted of names of persons who were famous and well-known to a specific audience, but known to probably a very small percentage of college students (for example, Ludwig Wittgenstein). Each of these names was generated such that it belonged to one of six specific categories: writers, scientists, politicians, entertainers, artists, and philosophers.

Next, these lists were given to four graduate students and one faculty member, who judged each name regarding its identifiability by an undergraduate at Ohio State.
After this, thirty names in each of the two categories (well-known/little-known) were chosen on the basis of greatest agreement by the judges. Four new lists were created, each of which consisted of 15 names. Two lists consisted on 10 names of well-known persons and 5 names of little-known persons. The other two lists consisted of 10 names of little-known persons and 5 names of well-known persons.

Finally, part of the instructions regarding the task read as follows: "The following is a test of general knowledge. It will reflect how much you know about great achievements in the important fields of scientific and artistic endeavor. Although this is not an intelligence test, your performance will indicate to us your level of intellectual awareness."

Seating Arrangement. Although subjects were randomly assigned to either the success or failure condition, they were seated in an alternating fashion during the experiment. Thus, subjects in either the success or failure condition would always have a person/s in the opposite condition seated next to them. This was done to increase the social awareness of success or failure. For example, subjects in the failure condition not only learned that they could not identify many of the "famous" persons, they also saw/heard their "successful" neighbors fill in all the answers. (From the debriefing session it was learned that none of the subjects suspected that the names appearing on their list may not be the same as those of their neighbors). Similarly, subjects in the success condition were made more aware of their success at the task, by the behavior of their "ignorant" neighbors.

Procedure. The procedure for Experiment 6 was the same as that of Experiment 6, except for the modifications discussed in the introduction. The following is a brief outline of the procedure:

Subjects were introduced to the trivia as the main purpose of the experiment. Then, they were briefly told about two other tasks they would perform: sentence construction and name identification (at this point, subjects were not told that the latter would be a test of general knowledge).
Next, subjects wrote a short description about their imagined future self for approximately 2 minutes. Examples of scenarios created by previous subjects were presented in the instructions. Subjects were informed that the purpose of writing this scenario was to aid in later sentence construction of imagined events.

Subjects then constructed 24 sentences, eight of which were pleasant, eight were unpleasant and 8 were neutral. Of the 8 pleasant and unpleasant sentences, subjects constructed 4 sentences of moderate affective intensity and 4 sentences of extreme affective intensity.

All subjects then studied answers to 10 neutral trivia questions for 2 minutes. Following this, subjects were given the first pseudo cued recall test. (The order in which the three cues were used was counterbalanced across subjects). Subjects in the success condition were given the "easy" set of 15 names to identify as part of the general knowledge test. Subjects in the failure condition were given the "hard" set of 15 names to identify, following this, subjects were given the second pseudo cued recall measure. Subjects in the success and failure conditions were given the second appropriate set of names to identify, following which they were given the third pseudo cued recall test.

All subjects were given a manipulation check for the success/failure task. Since the task had not been used previously, it was considered important to use an open ended measure so as not to constrain subjects' responses to any one dimension, as well as make available information that would be useful in modifying the method.

The free recall of target nouns test was administered, after which the cued recall test was given. In the cued recall test, subjects were provided with the target nouns and were asked to write the sentence they had generated in response to the target word earlier in the experiment.

Subjects could not be debriefed regarding the actual purpose of the success/failure manipulation, as this may affect the delayed recall measures that were to be collected. So, subjects were debriefed without informing
them about the expected relationships between a success/failure feeling and memory. The following debriefing method was used: First, subjects were informed that some of them had received hard items and others had received easy items. Subjects in the failure condition were given the success items and vice versa. The task was explained as one that was to be used in a later experiment in which subjects were made to feel that they had been successful or that they had failed. Subjects were allowed to take these items with them if they wished. (Interestingly, subjects in the failure condition, took the "success" items with them more often than success subjects took the "failure" items).

Memory measures after a 24-hour delay. As in Experiment 5, subjects were requested to allow the experimenter to collect data on memory for the trivia items after approximately a 24 hour delay. All subjects who had a phone obliged by providing their telephone numbers and a convenient time.

When subjects were called the next day they were first asked to answer three trivia questions. Next, they were asked to recall as many as they could of the sentences they had constructed during the experiment. Then, subjects were asked to recall any target words they could remember, even though they may not remember the sentence they wrote for the word. It was noted that after subjects had recalled target words, they were usually able to generate the sentence they had written for it, although they had been unable to retrieve any more sentences in response to the first free recall question.

Results.

Free Recall of Targets. The design was a 5 (Affect of the sentence: Extremely pleasant, moderately pleasant, neutral, moderately unpleasant, extremely unpleasant) X 2 (Time of recall measures: Immediate vs. delayed) X 2 (Mood Induction: Success vs. failure) factorial. The first two factors were within-subject factors, and the last one was a between-subject factor. Since only 17 of the 22 subjects in the success condition and 16 of the 22 subjects in the failure condition could be contacted after a 24 hour delay, the overall analysis on free recall of targets is based on
data for 33 subjects.

As Table 39 indicates, overall free recall of targets did not differ as a function of the mood of the subject at retrieval ($E[1, 31] = 0.00, q = .97$). There was a difference in overall free recall of targets embedded in sentences of varying affective quality and intensity ($E[4, 124] = 10.07, q = .0001$). Not surprisingly, there was overall higher recall of targets in the immediate recall test vs. the delayed recall test ($E[1, 31] = 52.15, q = .0001$).

Of particular significance, was the interaction effect of affect of the material and the mood of the subject at retrieval. The interaction effect in the overall analysis was significant ($E[34, 1240] = 4.49, q = .002$).

Immediate vs. delayed free recall of targets. To explore this interaction effect further, separate analyses were performed on the immediate vs. delayed free recall data for target nouns. Each of these data sets were first analyzed in a 2 (mood of the subject: after success vs. after failure). The data were converted to proportions to take into account the unequal number of sentences constructed at each of the five levels of affect (note: although there were equal numbers of pleasant, neutral and unpleasant sentences that were constructed, the pleasant and unpleasant sentences were of either high or low intensity, resulting in only four sentences at each of these levels of affective intensity).

For the immediate free recall test, the pattern of the data was similar to the overall test. (See Table 40 for immediate recall data for all 22 subjects). First, there was no difference in overall recall as a result of the mood of the subject ($E[1, 42] = 0.00, q = 1.00$). Second, there was a significant difference in the free recall of targets due to the affect of the sentence ($E[94, 168] = 12.87, q = .0001$). Likewise, the interaction effect of affect of the sentence X mood at retrieval was also significant ($E[91, 168] = 4.57, q = .002$).

Pair-wise comparisons, using the Duncan multiple range
test, indicated that subjects in the **failure condition** remembered more targets in extremely unpleasant than moderately unpleasant sentences (.55 vs. .32, \( p < .05 \)) and more targets embedded in extremely unpleasant than neutral sentences (.55 vs. .26, \( p < .05 \)). For subjects in the **success condition**, there were some marginally significant effects, caused by the low recall of targets in moderately unpleasant sentences. Subjects recalled fewer targets in moderately unpleasant sentences than in pleasant, neutral or extremely unpleasant sentences (.28 vs. .42 and .41 and .41, \( p < .10 \)).

An independent samples \( t \) test indicated that subjects in the failure condition remembered more targets in the extremely unpleasant sentences than subjects in the success condition (2.18 vs. 1.63, \( t(42) = 1.80, p < .07 \)). Also, subjects in the success condition remembered more targets in neutral sentences than subjects in the failure condition (3.31 vs. 2.14, \( t(42) = 2.60, p < .01 \)).

In the **delayed free recall** test, as in the immediate free recall test, there was no main effect for mood (\( F(1,31) = 0.00, p = .98 \)). There was a significant effect for affective quality (\( F(4,124) = 6.18, p < .001 \) and a significant affect of the sentences \( \times \) mood of the subject interaction (\( F(2,124) = 3.82, p < .01 \)).

Pair-wise comparisons, using the Duncan multiple range test, indicated that subjects in the **failure condition** (24 hours earlier) recalled far fewer targets in neutral sentences than targets in moderately pleasant, extremely pleasant or extremely unpleasant sentences (.17 vs. .33, .33 and .31, \( p < .05 \)). In the **success condition**, subjects did not exhibit the lower recall of targets in neutral sentences. Instead, subjects showed lowest recall for targets in moderately negative sentences, recall for which was significantly lower than recall for targets in neutral, moderately pleasant as well as extremely pleasant sentences (.15 vs. .31, .29 and .24, \( p < .05 \)).

Independent samples \( t \) tests indicated that the difference in recall of targets in neutral sentences by subjects in the success and failure condition occurred even after a delay (2.47 vs. 1.38, \( t(31) = 2.53, p = .02 \)). However, the difference in recall of targets in extremely
unpleasant sentences between the success and failure subjects at immediate recall was not significant after a delay (.94 vs. 1.31, \( t[31] = 1.47, p = .16 \)). Further, the difference in recall of targets in moderately unpleasant sentences between the success and failure groups was marginally significant (.59 vs. 1.06, \( t[31] = 1.74, p = .09 \)).

Clustering analyses. As in all the previous experiments, clustering of targets in free recall by affective category was at chance level (ARC = .13, \( t[42] = .19, p = .60 \)). Similarly, there was no difference in clustering for pleasant, unpleasant vs. neutral items (E[2,84] = 1.24, \( p = .29 \)) and there was no difference in clustering by mood condition (E[1,42] = .61, \( p = .44 \)).

Pseudo cued recall. As Table 41 indicates, there was not much difference in the frequencies for the first vs. second pseudo cued recall. In the neutral mood condition, the total number of sentences recalled consisted of 44 independent observations. Thus it was possible to do the one-sample \( X^2 \) test, with expected frequency set at 44/5 = 8.8. (\( X[2][4] = 2.63, p > .50 \)). The data were then collapsed across values of affective quality to test for an intensity effect (i.e. extremely pleasant and unpleasant = 23; moderately pleasant and unpleasant = 10; neutral = 11), and the \( X^2 \) for intensity was found to be significant (\( X[2][2] = 7.14, p < .05 \)).

The two measures in each of the success and failure conditions, unlike the neutral condition, were obtained from the same set of 22 subjects and therefore it was not possible to perform the one-sample \( X^2 \) test on the total. Instead, a separate \( X^2 \) test should have been performed on each recall test. (with expected frequencies set at 4.2). However, when \( df > 1 \), that is, when \( k > 2 \), the \( X^2 \) test for the one sample case should not be used when more 20% of the expected frequencies are smaller than 5, or when any expected frequency is smaller than 1 (Cochran, 1954). The pattern of data indicates that there is not much difference in the recall of sentences of varying affective quality and intensity in the success and failure conditions except for the unexpectedly high recall of neutral sentences in the first pseudo cued recall by success subjects.
Recall of sentences after a 24 hour delay. The delayed recall of sentences data are presented in Table 42. The design was a 2 (mood at retrieval 24 hours earlier: success vs. failure) X 3 (affect of the event described in the sentence) factorial. As in the free recall of targets, there was no main effect for mood ($E[1,31] = .34, q = .56$). There was, however, a significant main effect for affect ($E[2, 62] = 4.10, q = .02$). The interaction between affect and mood was not significant, although the pattern of means are in that direction. Pair-wise comparison tests indicated that there was a significant difference in the recall of targets in extremely unpleasant vs. moderately unpleasant sentences ($q < .05$). There was also a marginally significant intensity effect, i.e. better recall for extremely pleasant and unpleasant sentences than moderately pleasant and unpleasant sentences ($1.31 \text{ vs. } .87, t = 1.78, q = .08$).

Discussion.

The most important finding of Experiment 6 is the failure to replicate the findings of Experiment 5. The immediate free recall of targets did not indicate the inconsistency effect observed in Experiment 5 (in the form of higher recall of unpleasant items when in a positive mood state). Instead, there was some support for a mood congruency effect - but this was restricted to the failure condition and high intensity stimuli, i.e. subjects in the failure condition showed better memory for targets in unpleasant sentences. In the success condition, the significant finding was the suppressed recall of targets in moderately unpleasant sentences. The mood congruency finding in the negative affect state is the first known supportive data. Previous research has indicated either no mood congruency effect for negative information (Isen, et al., 1979) or has found the congruency effect for negative information but only if mood was induced at encoding and not at retrieval (Bower, et al., 1981). However, none of these studies manipulated intensity of affect, which seems to have been the contributing factor in the present experiment.

In the delayed free recall of targets, there was some support for an intensity principle, but the pattern differed as a function of mood state of subjects at the time of previous recall (24 hours earlier). For instance,
an intensity effect showed up in the form of lower recall of targets in neutral sentences (than extremely pleasant, moderately pleasant and extremely unpleasant) for subjects who had received the failure manipulation before recall the previous day. On the other hand, subjects in the success condition the previous day showed an intensity effect in the form of low recall of targets in moderately unpleasant sentences. The results of the delayed recall test (by their similarity to the pattern of data at immediate recall) demonstrates the influence of first recall on later recall. Some more support for an intensity effect was also found in the neutral condition of the pseudo cued recall test and the delayed recall of sentences.

The question to be answered is why the recall data did not produce the pattern of data of the previous experiment. The major difference in the two experiments was the method of mood induction. The manipulation check used in this experiment indicated that the manipulation had worked for all but two subjects (one in the success condition, who found the test hard and the other in the failure condition, who reported finding the test a challenge and enjoying it). The issue of mood induction techniques is an important methodological concern for researchers interested in studying the role of affect on other psychological processes. The problem concerns the lack of information on the different affective states that may be evoked as a result of variations in induction procedures and in previous research it has often been used as an explanation of inconsistent findings of conceptually similar operations.

The hypothesis that superior memory for unpleasant information in the previous experiments was a function of its inconsistency with an activated schema was not supported in Experiment 5. Experiment 6 was designed to test the hypothesis further by extending the hypothesis to make another specific prediction regarding the processing of affectively inconsistent information.
Table 34: Mean Immediate and Delayed Free Recall of Target Nouns Embedded in Pleasant, Neutral and Unpleasant Sentences. (Experiment 5)

<table>
<thead>
<tr>
<th>Affect of the sentence</th>
<th>Pleasant</th>
<th>Neutral</th>
<th>Unpleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mood at Retrieval</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Happy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=16)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immediate</td>
<td>2.56</td>
<td>2.09</td>
<td>3.06</td>
</tr>
<tr>
<td>Delayed</td>
<td>1.69</td>
<td>1.20</td>
<td>2.13</td>
</tr>
<tr>
<td>Sad</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(n=14)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immediate</td>
<td>3.00</td>
<td>1.19</td>
<td>2.71</td>
</tr>
<tr>
<td>Delayed</td>
<td>2.28</td>
<td>1.20</td>
<td>1.14 .</td>
</tr>
</tbody>
</table>

Note: The data presented in this table are the free recall scores for subjects who were tested at both immediate and delayed time intervals.
Table 35: Mean Immediate Free Recall of Target Nouns Embedded in Pleasant, Neutral and Unpleasant Sentences. (Experiment 5)

<table>
<thead>
<tr>
<th>Affect of the sentence</th>
<th>Pleasant</th>
<th>Neutral</th>
<th>Unpleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affect at Retrieval</td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Happy</td>
<td>2.71</td>
<td>1.97</td>
<td>3.04</td>
</tr>
<tr>
<td>(n=21)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sad</td>
<td>3.05</td>
<td>1.57</td>
<td>2.80</td>
</tr>
<tr>
<td>(n=20)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The data presented in this table are the free recall scores for all subjects who received an immediate recall test (irrespective of whether a delayed recall test was obtained).
Table 36: Pseudo Cued Recall of Sentences after a Positive, Neutral or Negative Mood Manipulation (Experiment 5)

<table>
<thead>
<tr>
<th>Mood of Subject</th>
<th>Positive</th>
<th>Neutral</th>
<th>Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Affect of the sentence</td>
<td>Total number of sentences generated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pleasant</td>
<td>10 a</td>
<td>13 ab</td>
<td>12 a</td>
</tr>
<tr>
<td>Neutral</td>
<td>9 a</td>
<td>7 a</td>
<td>15 a</td>
</tr>
<tr>
<td>Unpleasant</td>
<td>22 b</td>
<td>20 b</td>
<td>13 a</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

Note: Since each subject generated one sentence, the total number of sentences generated in each cell also corresponds to the total number of subjects who generated an item in each cell. There were a total of 41 subjects who performed the pseudo cued recall test. Two subjects, (one in a neutral mood and the other in a negative mood) did not generate a sentence in response to the pseudo cue, resulting in an n of 40.

Frequencies with subscripts of the same letter are not significantly different from each other. (Note: Comparisons are restricted to within columns).
Table 37: Free Recall of Sentences after a 24 hour delay.
(Experiment 5)

<table>
<thead>
<tr>
<th>Affect of the sentence</th>
<th>Pleasant M</th>
<th>Neutral M</th>
<th>Unpleasant M</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mood at Retrieval (24 hours earlier)</td>
<td>SD</td>
<td>SD</td>
<td>SD</td>
</tr>
<tr>
<td>Happy (n=16)</td>
<td>.94</td>
<td>.68</td>
<td>.69</td>
</tr>
<tr>
<td>Sad (n=14)</td>
<td>1.29</td>
<td>.47</td>
<td>.78</td>
</tr>
<tr>
<td>Self Attributions</td>
<td>Pleasant</td>
<td>Neutral</td>
<td>Unpleasant</td>
</tr>
<tr>
<td>-------------------</td>
<td>----------</td>
<td>---------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>Self-as-agent</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>5.83</td>
<td>5.50</td>
<td>3.40</td>
</tr>
<tr>
<td>sd</td>
<td>1.48</td>
<td>1.88</td>
<td>1.81</td>
</tr>
<tr>
<td>%</td>
<td>26.26</td>
<td>24.78</td>
<td>15.30</td>
</tr>
<tr>
<td><strong>Self-as-object</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>1.28</td>
<td>1.08</td>
<td>3.83</td>
</tr>
<tr>
<td>sd</td>
<td>1.22</td>
<td>1.45</td>
<td>1.98</td>
</tr>
<tr>
<td>%</td>
<td>5.77</td>
<td>4.86</td>
<td>17.25</td>
</tr>
</tbody>
</table>
Table 39: Percentages and SD of Immediate and Delayed Free Recall of Target Nouns Embedded in Pleasant, Neutral and Unpleasant Sentences (Experiment 6).

<table>
<thead>
<tr>
<th>Affect of the sentence</th>
<th>Pleasant</th>
<th>Neutral</th>
<th>Unpleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extreme</td>
<td>Moderate</td>
<td>Extreme</td>
</tr>
<tr>
<td>Mood at Retrieval</td>
<td>P[+]</td>
<td>SD</td>
<td>P</td>
</tr>
<tr>
<td>Success (n=17)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immediate</td>
<td>37</td>
<td>27</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>19</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>41</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Delayed</td>
<td>29</td>
<td>18</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>30</td>
<td>17</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Failure (n=16)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immediate</td>
<td>45</td>
<td>26</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>22</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>63</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Delayed</td>
<td>31</td>
<td>23</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>14</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>33</td>
<td>19</td>
<td></td>
</tr>
</tbody>
</table>

Note: The data presented in this table are the free recall scores for subjects who were tested at both immediate and delayed time intervals.

[+P = Percentages
Table 40: Percentages and SD of Immediate Free Recall of Target Nouns Embedded in Pleasant, Neutral and Unpleasant Sentences (Experiment 6).

<table>
<thead>
<tr>
<th>Affect of the sentence</th>
<th>Pleasant</th>
<th>Neutral</th>
<th>Unpleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extreme</td>
<td>Moderate</td>
<td>Extreme</td>
</tr>
<tr>
<td>Mood at Retrieval</td>
<td>P[+]</td>
<td>SD</td>
<td>P</td>
</tr>
<tr>
<td>Success (n=22)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immediate</td>
<td>31</td>
<td>28</td>
<td>42</td>
</tr>
<tr>
<td>Failure (n=22)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immediate</td>
<td>42</td>
<td>27</td>
<td>43</td>
</tr>
</tbody>
</table>

Note: The data presented in this table are the free recall scores for all subjects who were given the immediate recall test irrespective of whether they got the delayed recall test.

[+]P=Percentages
Table 41: Pseudo Cued Recall of Sentences after a Success, Failure or No (Neutral) Mood Manipulation (Experiment 6)

<table>
<thead>
<tr>
<th>Mood of Subject</th>
<th>Neutral</th>
<th>Success</th>
<th>Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-Pleasant</td>
<td>6</td>
<td>7</td>
<td>13a</td>
</tr>
<tr>
<td>M-Pleasant</td>
<td>3</td>
<td>4</td>
<td>7a</td>
</tr>
<tr>
<td>Neutral</td>
<td>7</td>
<td>4</td>
<td>11a</td>
</tr>
<tr>
<td>X-Unpleasant</td>
<td>1</td>
<td>2</td>
<td>3a</td>
</tr>
<tr>
<td>M-Unpleasant</td>
<td>5</td>
<td>5</td>
<td>10a</td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td>22</td>
<td>44</td>
</tr>
</tbody>
</table>

Note: Since each subject generated one sentence, the total number of sentences generated in each cell also corresponds to the total number of subjects who generated an item in each cell. There were a total of 22 subjects who performed the pseudo cued recall test on three occasions. In the neutral mood condition the 44 observations refer to independent observations (i.e. 44 subjects). In the success and failure conditions, the 44 observations refer to two recall tests by 22 subjects.

Frequencies with subscripts of the same letter are not significantly different from each other. (Note: Comparisons are restricted to within columns).

1 IS = First pseudo cued recall of subjects prior to the success manipulation
2 IF = First pseudo cued recall of subjects prior to the failure manipulation
3 ISF = Pseudo cued recall of all subjects prior to success and failure manipulation
4 2S = Second pseudo cued recall of subjects in the success condition
5 3S = Third pseudo cued recall of subjects in the success condition
6 TS = Total pseudo cued recall of subjects in the success condition
7 2F = Second pseudo cued recall of subjects in the failure condition
8 3F = Third pseudo cued recall of subjects in the failure condition
9 TF = Total pseudo cued recall of subjects in the failure condition
<table>
<thead>
<tr>
<th>Affect of the sentence</th>
<th>Pleasant</th>
<th>Neutral</th>
<th>Unpleasant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mood at Retrieval (24 hours earlier)</td>
<td>Ext.</td>
<td>Mod.</td>
<td>Ext.</td>
</tr>
<tr>
<td>Happy (n=17)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>12</td>
<td>10</td>
<td>16</td>
</tr>
<tr>
<td>SD</td>
<td>19</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Sad (n=16)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Percentage</td>
<td>15</td>
<td>14</td>
<td>09</td>
</tr>
<tr>
<td>SD</td>
<td>17</td>
<td>19</td>
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