LITERATURE REVIEW

As stated in the preceding chapter, the present study was undertaken to investigate “Implicit explicit mood-congruent memory with perceptually driven and conceptually driven tests among depressed, elated and neutral mood in relation to cognitive rigidity and flexibility”. This chapter is devoted to the review of studies that bear directly or indirectly to the present investigation.

This chapter is divided into five sections. The first section of the chapter deals with the review of those relevant studies which are concerned with the dissociation and association of implicit and explicit memory, whereas section second is devoted to the review of those relevant studies which are concerned with mood congruency effect in explicit memory. Section third is devoted to the review of those studies which highlight the presence or absence of mood-congruency effect in implicit memory. The fourth section of the chapter reviews those studies which demonstrate the differential effect of perceptually driven and conceptually driven tests on implicit and explicit memory. The final section i.e. section fifth, of this chapter reviews those relevant studies which highlight the implication of cognitive rigidity-flexibility in mood-congruent memory.

SECTION I

DISSOCIATION AND ASSOCIATION BETWEEN IMPLICIT AND EXPLICIT MEMORY

The first section of this chapter deals with the review of those relevant studies which are concerned with the dissociation and association of implicit and explicit memory. Here we review only recent relevant studies which dissociate implicit and explicit memory. The experimental variables which have been found to have differential
effect on implicit and explicit memory are amnesia, brain disorders, age, psychoactive drugs, rate of forgetting, type of stimulus material, type of study
processing, study test modality change, duration of retention interval, subliminal perception, attention, and interference.

**Amnesia:**

The strongest evidence that give support to the independent memory system is focuses on studies of amnesic patients.

The first recent study was carried out by David, Brown, Pojoga and David (2000). They carried out their study on the relationship between post hypnotic amnesia and directed forgetting on implicit and explicit memory. Forty high and forty low hypnotically susceptible participants were compared in post hypnotic amnesia and directed forgetting and control conditions on estimates of voluntary conscious memory performance. Both groups showed significant decrement in voluntary conscious memory and post hypnotic amnesia condition. There was no relationship between forgetting in both conditions. Post hypnotic amnesia and directed forgetting prevent explicit memory performance while implicit memories remain intact.

Another study was carried out by Reinvang, Nielsan, Gjerstad and Bakke (2000). They conducted their study on patient with retrograde amnesia to test behavioral and physiological indices of explicit and implicit knowledge for her entire life of 42 years. They found intact semantic memory and deficient autobiographic memory. Further testing with forced-choice true/false judgments indicated the presence of implicit memory for both personal and media based information of implicit memory. Therefore, we can conclude that retrograde amnesia impairs explicit memory performance while leaving implicit memory intact.
Faulkner & Foster (2002) in their review, authors consider the proposal that neuropsychological disorders can best be considered in terms of a decoupling between preserved implicit or unconscious processing and impaired explicit or conscious
processing. Evidence for dissociations between implicit and explicit processes in blind sight, amnesia, object agnosia, prosopagnosia, hemi-neglect, and aphasia was examined. The implications of these findings for understanding of a variety of neuropsychological disorders, the conceptualization of normal cognitive functioning, the neural basis of consciousness, and the clinical rehabilitation of brain-injured individuals were discussed.

**Brain Disorders:**

So far as findings of amnesic patients are concerned, these findings clearly demonstrate independent memory system. To strengthen the dissociation here we review some other recent findings of brain disorders which have demonstrated dissociation between implicit and explicit memory.

A recent study in this context was carried out by Vicari, Belluci and Carlesimo (2000) that aimed to investigate implicit and explicit long-term memory functioning in subjects with Down syndrome (DS) and compared to mental age matched normal children. For this reason they used tests of verbal and visuo-perceptual explicit memory, verbal and visual repetition priming and procedural learning tasks. In their study they used 14 Down syndrome subjects and 20 normal subjects. Results showed comparable performance on implicit memory task, while so far as explicit memory is concerned Down syndrome subjects performed worse on explicit memory task than normal subjects. The results revealed a functional dissociation between implicit and explicit memory in subjects with DS.

Maura, Michelle and David (2003) conducted their study on implicit and explicit measures of memory for perceptual information in young adults, healthy older adults and patients with Alzheimer’s disease.
These groups exhibited cross-modality priming of the same magnitude. However, young adults produced greater modality and voice-specific priming than other two groups, suggesting that aging, but not dementia of Alzheimer’s type reduced priming. Young adults demonstrated better recognition memory than healthy older adults, who in turn exhibited better recognition memory than older adults with dementia of Alzheimer’s type. These findings indicate that aging can affect implicit memory whereas dementia of Alzheimer’s type magnifies the effect of aging on explicit memory.

Another study was carried out by Delvecchio, Liporace, Nei, Sperling and Tracy (2004). They conducted their study on temporal lobe epilepsy (TLE) patients. These patients were well known to have deficits on explicit memory, while integrity of implicit memory was not established. They examined the integrity of verbal implicit and explicit memory in left temporal lobe epilepsy (LTLE) patients. They used 15 TLE patients and 15 normal patients matched on age and education. They presented 40 word study list followed by a test phase of completing word stems based on study words or new words/non-list word. Experimental conditions involved instructions to provide either the study words or new / non-list words, when completing the stem. Automaticity and recollection provided the measures of implicit and explicit memory. Results showed significant difference between two groups of subjects, so far as explicit memory was concerned. In contrast, there was no difference so far as implicit memory was concerned. The findings demonstrated the integrity of implicit memory in LTLE patients and provided evidence that implicit and explicit memory rely on different neuroanatomical systems.

Another recent study was carried out by Yeats and Erile (2005). Their study aimed to investigate the implicit
and explicit memory in congenital and acquired brain
disorder. They examined 8 to 15 years old children’s with myclomesitrigoele, shunted hydrocephalus, severe traumatic brain injuries or orthopedic injuries. Each group included 22 and 29 children. Children completed a fragment picture identification task to assess perceptual priming and semantic decision making task to assess conceptual priming. Each task also measured procedural learning and explicit recall and recognition. All 3 groups showed similar perceptual and semantic priming. In contrast both brain disorder group showed poorer explicit memory than comparison group. No group showed procedural learning on either task. The finding revealed that implicit memory is relatively intact in many children’s with congenital and acquired brain disorders, while explicit memory was impaired. These findings provided support to the existence of independent memory system.

Elizabeth, Laura and Rusell (2006) conducted their study on temporal lobe epilepsy and provided support to the independent memory system. According to them temporal lobe epileptic patients provided an excellent model to understand human memory functioning and dysfunctions such as between implicit and explicit memory.

Hudson and Robertson (2007) investigated automatic and controlled uses of memory in Alzheimer’s disease. Their study used the process-dissociation procedure to examine the contribution of controlled uses of memory to a stem completion task in 16 patients with Alzheimer’s disease (AD) and a matched group of healthy elderly subjects.

In an inclusion task subjects attempted to use a studied word to complete three-letter word stems, in an exclusion task they were instructed to complete stems with unstudied words. Elderly subjects produced more target words
under inclusion condition and less target words under exclusion condition.
The probability of AD group using studied words to complete stems was invariant across inclusion and exclusion conditions. Estimates derived from the process-dissociation calculations, showed that the performance of the AD patients was mediated entirely by automatic uses of memory, whereas elderly subjects controlled and automatic processes codetermined task performance. Both estimates of controlled and to a lesser extent automatic uses of memory were greater for the elderly group than AD subjects, indicating that stem completion impairment in AD may not entirely attributable to a deficiency in controlled memory processes but also due to reduced automatic processing.

**Age:**

Numerous studies have powerfully demonstrated an age related dissociation between implicit and explicit memory. Here we review only recent studies on age related dissociation between implicit and explicit memory. Another study in this context was carried out by Mitchell and Bruss (2003). They used 60 subjects, half of them were middle-aged and half of them were older participants. These authors tested age differences in conceptual and perceptual implicit memory via word fragment completion, word stem completion, category exemplar generation, picture fragment identification and picture naming. These subjects named pictures and words at study.

They found that limited test exposure minimized explicit memory contamination, yielding no reliable age differences and equivalent cross-formal effects, while explicit memory and neuropsychological measures produced significant age differences.
In a follow-up experiment, 24 young adults were informed a prior about implicit testing. Their priming was equivalent to the main experiment, showing that test trial
time restrictions limit explicit memory strategies. These authors concluded that most implicit memory processes remain stable across adulthood. The findings provide support to the dual memory system.

Recently Fleischman, Wilson, Gabrieli and Bi-enias et. al. (2004), conducted a longitudinal study of implicit and explicit memory in old persons. They examined explicit memory and priming on multiple tests over 4 annual data collection. They used large group of older persons without dementia. Results of their study provided strong evidence of independent memory system i.e. explicit memory declined with age while priming remained intact. Findings of their study provide age related dissociation of implicit and explicit memory.

Another recent study of age related dissociation was carried out by Krinsky-McHale, Kittler, Brown, Jenkins and Devenny (2005). They examined implicit and explicit memory in adults with William Syndrome. Repetition priming was used to measure implicit memory and free recall was used to measure explicit memory. These authors found that repetition priming did not show change with age, but free recall was markedly reduced and suggested age-related dissociation between implicit and explicit memory.

These authors also compared performance of adults with William Syndrome to adults with Down Syndrome and those with unspecified mental retardation. Again similar dissociation was found in adults with Down Syndrome but not in adults with unspecified mental retardation. An IQ-related dissociation was also found. Implicit and explicit memory, therefore show different degrees of association with age and IQ. Results also suggest that William Syndrome, similar to Down Syndrome, may be associated with precocious aging, resulting in the loss of some cognitive abilities.
Roy, Selma and Albert (2005) carried out their study on implicit and explicit memory to the effects of errorless learning among young and older adults. It has been suggested that beneficial effects of errorless learning operate through implicit memory whereas others implicate that it is explicit memory is responsible for enhanced memory performance after errorless learning. Their study examined the contribution of implicit and explicit memory function to the memory performance after errorless and errorful learning using process dissociation procedure. They used 40 young adults and 40 older individuals on a spatial memory task (i.e. learning the location of everyday objects in a room). The findings of their study clearly showed an age related decline in explicit spatial memory while implicit spatial memory was unaffected. Additionally young group of adults benefited from errorless learning than errorful learning while older adults did not show any difference between two learning conditions. It was found that errorful learning were related to explicit memory function not implicit memory processing. Therefore we can conclude that implicit and explicit memory independent of each other.

Amy (2006) examined age-related differences in the use of phonology to facilitate implicit and explicit memory for new associations. Two experiments tested young and older adults’ retrieval of episodic memories under intentional (explicit) and incidental (implicit) retrieval conditions following either an implicit encoding task (experiment 1) or an explicit encoding task (experiment 2). In addition, the ability of young and older adults to use lexically identical and phonological primes/cues to retrieve newly-formed associations was assessed.

Investigator conducted two experiments, in experiment 1 he used 90 adults 45 young and 45 older adults. Three independent variables were used, i.e. age group (young and older) and retrieval type (implicit and explicit)
and prime conditions
(repletion, phonological, unrelated) were used. The dependent variables were the percent of time in word stems were completed with target word.

In order to control stimulus presentation, all stimuli were presented on Pentium III 350 MHz IBM-compatible computers using a program written in Visual Basic 5.0. During the encoding phase, participants were told to read the word and complete the stem with the first word that came to mind and completed the stem. Because of the implicit nature of this encoding task, there was no indication of a later memory test. Participants then saw the 48 homophone word-stem pairs, as well as the 24 non-homophone filler word-stem pairs. The word-stem pairs appeared on the screen for a maximum of 4 seconds.

At the end of encoding phase, participants saw a new set of instructions on the screen that corresponded to the implicit retrieval task. Once the implicit retrieval task was completed, all participants proceeded to the explicit retrieval task, where they were told they were now going to be tested on their ability to recall their responses from the first task.

Results of the experiment 1, showed that young adults’ retrieval using lexically identical cues was independent of retrieval type, although their overall retrieval was slightly higher when the task was explicit than it was implicit. In contrast, older adults only benefitted from lexically identical cues when explicitly retrieving.

Experiment 2 was identical with experiment 1, however participants underwent explicit encoding condition, through the manipulation of instructions, contrary to the implicit encoding condition as in experiment 1. In experiment 2, 89 adults 44 young and 45 older adults were participated. Design, material and apparatus were identical. Result
s of the experiment 2 suggested that young adults showed more retrieval with repeated cues than unrelated ones and more retrieval in phonological cues than
unrelated ones and overall more retrieval occurred with explicit than implicit retrieving. For older adults, in
implicit retrieval no differences were found between repetition and unrelated cues but more retrieval occurred
with phonological than related cues, while in explicit retrieval repetition cues led to more retrieval than unrelated
cues, but no differences between phonological and unrelated cues. In the light of above study we can strongly sug
gest dual memory system.

**Psychoactive Drugs:**

Psychoactive drugs are another variable that provide support to the independent memory system. In the previous
chapter we have already discussed numerous studies of psychoactive drugs which have differential effects on
implicit and explicit memory and provide strong evidence in favor of independent memory system. Here we
review only recent studies of psychoactive drugs which directly or indirectly provide support to independent
memory system.

The first study, which is reviewed here, was conducted by Duka, Weissenborn and Dienes (2001) who compared
the effect of alcohol on implicit and explicit memory in terms of recollective experience and familiarity. At
encoding subjects studied a list of 80 words presented in pairs. At retrieval participants first carried out an
implicit stem completion task, followed by an explicit cued recall task (stem completion) which measured
implicit and explicit memory respectively. After stem completion participants were required to indicate whether
the items from the studied list were consciously recollected (remembered response) or was known for a fact that
were presented in the studied list (no response). Forty eight Participants were tested in one of four drug conditions
Results of the study demonstrated that alcohol did not affect overall correct implicit stem completion task and participants who received alcohol prior to encoding.
reported lower awareness of correctly completed study items. In explicit cued recall task alcohol did not affect overall performance. However, participants in same drug state conditions reported greater recollection than familiarity with study material, while participants who encoded and retrieved in different drug-state conditions participant showed recollection and familiarity to the same extend. When investigators directly compared implicit and explicit memory, they demonstrated that alcohol at retrieval decreased performance of explicit cued recall task of items from high associations as compared to placebo, but alcohol had no effect on implicit stem completion task. These findings demonstrated dissociation between implicit and explicit memory.

Suchismita, Marsha and Martin (2004) examined alcohol’s dissociation of implicit and explicit memory. Twenty two participants were used in their study. In semantic priming task, materials were selected from previous research which included six critical categories (e.g. fruit, sport, furniture, articles of clothing, kitchen utensil and kind of human dwelling) and six base line categories (e.g. weapon, part of speech, profession, elective office part of building and religious place) were selected. Study and test words were selected for each category equated in word length and familiarity. For free recall task consisted of list 2, which contained 90 items. Each participant completed two experimental sessions (alcohol challenge, no-alcohol) separated by 1 week. Participants were told to expect alcohol in alcohol challenge session and no placebo was used in no-alcohol l session. Participants performed implicit semantic priming and two explicit free recall tasks in both sessions. In semantic priming task 90 items form list 1 were presented sequentially for 5 seconds in random order on computer screen. Participants were asked to give a linking rating to each word on 7 point scale, 1 (most liking) to
7 (least liking). The liking rating was used to promote deep encoding of words during study. Participants then performed a lexical decision
task consisting of three test blocks. Each block consisted of 30 items: 5 test words from critical category, 5 words from baseline category, 5 distracter words, and 15 pseudo-homophones as non-words. Items were presented in random orders. Participants were asked to indicate by pressing 1 or 2 letters on a keyboard about whether the word was a word or non-word while in free recall task participants were instructed to recall as many words as possible from studied (list 2) within 2 minutes interval.

Results of the study showed that no significant difference in the amount of semantic priming was found between alcohol and no-alcohol conditions. There were also no significant effects of sessions or order of alcohol condition participation. Repeated measures analyses of variance of the reaction time values for critical and baseline words showed that neither the effect of alcohol condition, word condition, nor the interaction between alcohol condition and word condition was statistically significant. Results of explicit free recall task showed that the overall percentage of words recalled was significantly lower in the alcohol condition than it was in the no-alcohol condition. No significant effect of sessions or order was found, although the participant factor was significant. Word frequency facilitated recall in expected direction, but did not significantly interact with participant’s session, or alcohol condition. The findings suggested alcohol dissociation of implicit and explicit memory.

Another study which investigated the effect of psychoactive drug on implicit and explicit memory was conducted by Arndt, Passannante and Hirshman (2004). They investigated the effect of midazolam on implicit and explicit memory. In their study midazolam was administered prior to the study. Midazolam is known to create a
temporary, but dense, period of amnesia. Implicit memory was tested by category exemplar production and
explicit memory was tested by category cued recall. The
effects of blocking stimulus materials by semantic category at study and generation at study were investigated on
category exemplar production and cued-recall.

The results of this study demonstrated a dissociation of the effects of midazolam on category exemplar
production and category-cued recall. Specifically, midazolam reduced the effect of blocking stimulus materials
in category-cued recall, but not in category exemplar production. The differential effect of midazolam on
explicit and implicit memory is at odds with transfer-appropriate processing theory and suggests that theories of
memory must distinguish the roles of different types of conceptual processing on implicit and explicit memory
tests. The overall results suggested differential effects of midazolam on explicit and implicit memory.

Iselin-Chaves, Willems, Jermann, Foster, Adam and Linden (2005) examined the implicit memory during
isoflurane anesthesia for elective surgery. Authors evaluated memory functioning during anesthesia and its
relation to depth of hypnotic state, 48 participants were participated in their study whose age ranged between 18-
70 years. Words were played for 70 min via head phones, after induction general anesthesia for elective surgery.
Within 36 hours after the word presentation memory was tested by an auditory word completion test with
inclusion and exclusion instructions. Memory performance and contribution of implicit and explicit memory
were measured by using the process dissociation procedure. The memory performance was also measured by
the same memory task to the control group of non-anesthetized subjects. The results of experiment showed that
the implicit memory remained intact while explicit memory was found to be absent among anesthetized patients.
Therefore it was conclude that during general anesthesia for elective surgery implicit memory persists even in
adequate hypnotic state to a comparable degree as in non anesthetized subjects. Hence, again dissociation between implicit and explicit memory was found.
Therefore on the basis of the findings obtained in the above experiments, we can safely conclude that psychoactive drugs demonstrate differential effects on implicit and explicit memory. Psychoactive drugs impaired explicit memory while leaving implicit memory intact.

**Rate of Forgetting:**

The dissociation between implicit and explicit memory is further strengthened from the studies of rate of forgetting in implicit and explicit memory. One recent study in this context was carried out by Goshen-Gottstein and Kempinsky (2001). These investigators compared rate of forgetting of implicit and explicit memory tests. They conducted two experiments to compare implicit and explicit memory. In experiment 1, participants encoded target words by judging the pleasantness of their meaning. Immediately after 48 hours later retrieval cues were presented to participants for either implicit or explicit free association task. Results of the experiment 1 showed impairment in explicit memory after delay of 48 hours while implicit memory was unaltered. In experiment 2, memory was tested at 5 retention interval lasting up to 3 weeks. The forgetting function of implicit and explicit memory confirmed to a logarithmic function. Despite large conceptual priming effect due to the relational encoding implicit memory performance still decline at much slower rate than explicit cued recall test.

The finding supported to the dual memory system.

Tunney (2003) conducted a study on implicit and explicit knowledge decay at different rates. In a training phase participants responded to sequences of letters generated by a finite-state grammar by pressing corresponding letters on a key board. A control group responded to randomized sequences. Participants were tested
immediately following training and after intervals of seven and fourteen days. During each test participants
responded to the letters of old and new sequences and performed
a concurrent recognition test. Priming was indexed by the time taken to respond to the sequences. In the immediate test both priming and recognition were substantially greater than the control group. In the delayed tests, the level of priming remained unchanged but recognition had declined. The data indicate that priming and recognition decay at different rates. Therefore, suggested independent memory systems.

David and Brown (2003) assessed the impact of different directed forgetting instructions on implicit and explicit memory. Their study adopted the recent modification of process dissociation procedure on implicit and explicit memory. They conducted two experiments. In experiment 1, 120 subjects were compared in global directed forgetting, item by item directed forgetting and control condition on estimate of voluntary conscious and involuntary conscious memory performance. In experiment 2, 80 participants were compared in directed forgetting and control conditions on involuntary conscious memory and involuntary unconscious memory performance. Participants showed significant impairment involuntary and involuntary conscious memory for directed forgetting in all conditions, while no impairment was found in involuntary unconscious memory performance i.e. implicit memory. Results of the study suggested that regardless of type of instruction, directed forgetting impaired explicit expression of memory while leaving implicit memory intact.

Tamayo and Frensch (2007) replicated the findings of Tunney (2003). In her study she shown that implicit knowledge is preserved after a retention interval of one week but explicit knowledge is significantly reduced. In two experiments, Tamayo and Frensch replicated and extended Tunney’s findings. Experiment 1 demonstrated that the decline in retention was not due to repetition of test items at the pre and post times of assessment.
Recognition scores assess explicit rather than implicit knowledge.
Experiment 2 extended Tunney (2003) findings theoretically by demonstrating that interference can produce the pattern of finding in experiment 1.

Ricardo, and Tamayo Osorio (2008) investigated dissociations in the forgetting patterns of implicit and explicit knowledge. In a series of 4 students were exposed to environmental regularities embedded in artificial grammar (AG) and serial reaction time (SRT) tasks. To compare the forgetting patterns participants’ implicit (motor performance based) and explicit (recognition based) knowledge was assessed before and after a retention interval. Taken together, the results indicated that explicit knowledge decayed faster than implicit knowledge in both AG and SRT tasks. Furthermore, an interference task introduced instead of a retention interval produced the same pattern of dissociations. The findings provided empirical evidence of dissociations in their forgetting patterns of implicit and explicit memory.

**Type of Stimulus Material:**

The other experimental variable that demonstrates whether the same or different processes operate under implicit and explicit memory is type of stimulus material. Khan (1990) examined the effect of age and task similarity on implicit and explicit memory using new associations. In his study 80 male subjects were participated in which 40 were young and 40 were old subjects. Two groups namely young and old were presented a list of paired associates. In half of the pairs the stimulus members of two successive pairs were phonemically similar and in other half of the pairs the stimulus members of two successive pairs were semantically similar attached with unrelated meaningful common words. The retention scores obtained for
semantically similar items and phonemically similar items though correlated observations, were treated as separate observations of the two sets of the items presented in a mixed list to
each of two groups of subjects. Thus, it yielded four observations on two groups for each of the two measures of the dependent variable i.e. implicit and explicit memory.

Implicit memory was assessed by word completion test and cued recall test was used to measure explicit memory. The test list to measure implicit memory showed a random arrangement of 24 test items. Each item consisted of a stimulus word attached with first three letters of stem of response word. Out of 24 test items, 6 were the members of phonemically similar word pairs, 6 were the members of semantically similar word pairs of the target list and remaining 12 test items were distracter items which were not presented in study list and responses of these items were not included in retention scores. The purpose of the distracter items was to disguise its memory testing aspects, for once memory testing aspect of the word completion become apparent to the subject, a completion test can be transformed into a cued recall test.

For explicit memory investigator used cued recall test, which consisted of 12 test items, out of which 6 were phonemically similar word pairs and 6 were semantically similar word pairs of the target list. These test items were not used in completion test but they were constructed in the same manners for completion test. All the 80 subjects were tested individually. After necessary instructions, the study list was presented at the rate of 4 sec. per pair for four trials. Immediately after the last trial a word completion test followed by cued recall test. In this way each subject was tested for implicit and for explicit memory.

The findings of the study provided clear evidence in favor of dissociation between implicit and explicit memory. The mean cued recall score obtained by young subjects was significantly higher than the mean cued
recall score obtained by old subjects whereas no significant effect of age was observed on implicit memory. More over, mean cued recall score under phonemic similar condition was markedly
higher than the mean cued recall score under semantically similar condition, whereas task similarity affected implicit memory in entirely reverse direction. The mean word completion score under phonemically similar condition was found significantly lower than semantically similar condition. The interactional effect between age and task similarity on implicit as well as explicit memory was not significant.

Srinivas (1996) her study on contrast and illumination effect on explicit and implicit measures of memory. She examined the effect of changing the contrast polarity and illumination of object on explicit (episodic recognition) and implicit (fragment naming or object-non object decision) memory tasks. Changes in contrast polarity of line drawings of object did not affect priming on fragment naming or non-object decision tasks but adversely affected recognition judgments. Similarly, changes in illumination did not affect priming on the object-non object decision task but adversely affected recognition memory. Together, the results suggested that implicit measures tap abstract descriptions of object structure useful for the purposes of object identification, whereas recognition memory taps descriptions that integrate shape information with lower level perceptual information. It was argued that lower level perceptual information influences episodic recognition because it provides a cue to the spatiotemporal context within which the prior encounter with the object occurred.

Cave, Bost and Cobb (1996) examined the effect of color and pattern on implicit and explicit picture memory. In 2 sets of experiments with picture as stimuli, they tested the effects of color and pattern manipulations between study and test on implicit memory (i.e., naming facilitation) and explicit memory (i.e., 2 forms of recognition). These manipulations did not affect priming. However, participants were able to explicitly detect stimulus
changes at above-chance levels. Changed in color also produced small decrements in participant’s ability to
judge that repeated stimuli were
old on a recognition test. Experiment 2 showed diminished priming with changes in the stimulus exemplar (i.e., a different picture of the same named object) from study to test, which demonstrated that the picture-naming paradigm is sensitive to changes in physical attributes. The results suggested that physical attributes that are not essential to formation of a shape representation do not influence repetition priming in a basic identification paradigm.

Hamilton and Rajaram (2001) examined the concreteness effects in implicit and explicit memory tests. Four experiments were conducted to examine the concreteness effect in implicit and explicit memory measures. Experiment 1 replicated prior reports of an imagery effect on an implicit conceptual memory test. In Experiment 2, they confirmed our prediction of conceptual sensitivity of free recall, explicit general knowledge, explicit word fragment completion, and the implicit general knowledge tests with a level of processing manipulation. Furthermore, although they obtained the concreteness effect (better memory for concrete than abstract nouns) in free recall and the explicit general knowledge test, they failed to find this effect in the implicit general knowledge test. Experiment 3 revealed that the failure to find the concreteness effect on the implicit general knowledge test was not attributable to combining two encoding manipulations in Experiment 2. In Experiment 4, authors ruled out the possibility that the failure to find the concreteness effect in conceptual implicit memory may be related to the number of meaningful associates for targets.

Briefly, results suggested that the concreteness effect in explicit memory but not in implicit memory. Therefore we found the differential effect of concreteness on two forms of memory measures.
Type of Study Processing:

Another experimental variable which demonstrated that implicit explicit memory entirely independent of one another is type of study processing. Numerous studies had demonstrated that variation in level or type of processing had differential effect on implicit and explicit memory.

Brooks, Gardiner, Keminska and Beavis (2001) carried out a study to investigate implicit versus explicit memory retrieving of surnames of famous people. They conducted two experiments. In experiment 1, 80 subjects were participated whose age ranged between 18-35 years. They investigated whether a test of implicit memory of name generation and explicit memory test of name cued recall were equally susceptible to level of processing effects. In both tests the common forenames of previously studied famous surnames, were used as test cues. The findings revealed dissociation between implicit and explicit tests and explicit tests exhibiting a significant level of processing effect, while implicit memory tests remain unaffected with level of processing. The findings clearly showed dissociation between implicit and explicit memory tests.

Experiment 2 was carried out with the same methodology and compared performance of 32 younger adults whose age ranged between 18-25 years and 32 older adults whose age ranged between 58-82 years on implicit and explicit memory tests. Results of the second experiment showed two replications of level of processing dissociation. Furthermore younger adults performed significantly better than older adults on explicit memory test but not in implicit memory test. Because forename or surname in name generation task have strong associative connections but less semantic connections and associative connection are implicated when priming of strongly
related words fails to benefit from conceptual elaboration.
Schott, Richardson-Klavehn, Heinze and Duzel (2002) examined the hypothesis that perceptual priming and explicit memory have distinct neural correlates at encoding. Event-related potentials (ERPs) were recorded while participants studied visually presented words at deep versus shallow levels of processing (LOPs). The ERPs were sorted by whether or not participants later used studied words as completions to three-letter word stems in an intentional memory test, and by whether or not they indicated that these completions were remembered from the study list. Study trials from which words were later used and not remembered (primed trials) and study trials from which words were later used and remembered (remembered trials) were compared to study trials from which words were later not used (forgotten trials), in order to measure the ERP difference associated with later memory (DM effect). Primed trials involved an early (200–450 msec) centroparietal negative-going DM effect. Remembered trials involved a late (900–1200 msec) right frontal, positive-going DM effect regardless of LOP, as well as an earlier (600–800 msec) central, positive-going DM effect during shallow study processing only. All three DM effects differed topographically, and, in terms of their onset or duration, from the extended (600–1200 msec) fronto-central, positive-going shift for deep compared with shallow study processing. The results provided the first clear evidence that perceptual priming and explicit memory have distinct neural correlates at encoding, consistent with previous studies on distinction between brain systems concerned with perceptual representation versus semantic and episodic memory. Authors also shed additional light on encoding processes associated with later explicit memory, by suggesting that brain processes influenced by LOP set the stage for other, at least partially separable, brain processes that are more directly related to
encoding success.
Newell and Andrews (2004) carried out their study on level of processing effect on implicit and explicit memory tasks. They conducted two experiments. Experiment 1 consisted of two experiments namely 1A and 1B.

Experiment 1A examined reliability and generalizability of question position manipulation in explicit memory tests and experiment 1B extended the question position manipulation to an implicit stem completion memory task to provide evidence relevant to the lexical processing hypothesis of priming effect. If these two tests of memory will show different pattern of results then it will provide support to distinct memory system.

Experiment 1A and 1B compared graphemic, phonological and semantic encoding tasks.

In each encoding condition, participants received a different specific question for each word containing an item-specific cue letter or word that provided the basis for a binary letter, rhyme, or semantic judgment (e.g., the word horse might be paired with the questions: Does it contain the letter r? Does it rhyme with course?, or Is it semantically related to rider?). The particular question for each target item was presented either before or after the target word.

Both experiments consisted of a study phase in which level of encoding task was manipulated within subjects, and a test phase in which whole studied items (experiment 1A) or stems of studied items (experiment 1B) were presented with distracter items.

The participants in Experiment 1A were 28 University students. Participants were randomly assigned to either the before or after condition resulting in 14 in each condition. The participants in 1B were 42 undergraduate university students. Half were randomly assigned to before and half were assigned to the after condition.
Four sets of 12 target words were generated that were matched on word frequency, and number of possible completions. There were 36 target items in each
study list and 12 distracter items that appeared only in the memory test. The test sheets were single A4 piece of paper containing the 48 words or stems. Regardless of encoding list, all participants received identical test lists containing whole items or stems of all four lists. The encoding phase of the experiment was run on IBM PC computers using the Inquisit experiment generator program. All instructions for carrying out the tasks were presented on the computer. Participants responded by pressing assigned keys.

For Experiment 1A, in test phase participants were instructed to circle words they had seen in the encoding task. In Experiment 1B, the test list contained 3-letter stems of targets and distracter words. To disguise the implicit memory demands of the stem completion task, participants completed a 5 minute filler stem-completion task immediately after encoding which consisted of three letter stems of the names of 48 cities in the world that participants were told to complete with as many city names as possible. The test list was then distributed and participants were instructed to complete the word stems with the first word that came to mind (Experiment 1B).

The results of the experiment 1 revealed that in experiment 1A there was no main effect of question position, but the effect of encoding task interacted with question position, because the memory for letter encoded items improved in the question after condition than before condition. In the before condition, performance following the rhyme task was better than in the letter task whereas in the after condition there was no difference between performance following letter or rhyme encoding.

The findings of experiment 1B revealed that the completion rates for all encoding conditions were significantly higher than when the same items appeared only as distracter stems in the test task. Significant priming was
observed following all encoding tasks. However, the results of the stem completion task did not show
interaction between level of processing and question position. There was significant priming for words from all encoding conditions and no evidence of level of processing effect in standard question before condition and no modulation of priming by question position. Therefore, we can suggest independent memory system because of the differential effect of level of processing and question position on implicit and explicit memory.

Experiment 2 was designed to provide more extensive evidence about whether question position modulates level of processing effects in explicit and implicit tests of memory. In addition to increasing the number of participants (to increase power) and testing all participants in the same location under identical encoding conditions, three major modifications were made to the design of Experiment 1.

First, a cued stem-recall test of explicit memory was used in place of recognition memory test. Cued stem-recall test was used to achieve equivalence between explicit and implicit memory performance. In implicit stem completion test, participants were instructed to complete word stem with the first word that came to mind, while in cued stem recall test they were instructed to complete the stem with words from study task.

Secondly, they introduced an additional test of exclusion stem completion task, to provide more evidence about the basis of any observed effects of question position. Exclusion tasks instruct participants to complete stems with words that were not part of the study list in order to attempt to distinguish familiarity from recollection based memories. Comparison of the exclusion stem-completion data for before and after conditions will shed light on the nature of the additional processing that participants engage when they must maintain the word in memory until the question is presented.
The third modification concerned the graphemic encoding task. A possible explanation for the absence of level of processing effect in standard before condition of stem-completion data in Experiment 1B is that the shallow task was not shallow enough to be sensitive to the effects of lexical processing on stem completion performance.

Experiment 2 used graphemic task. The task required participants to make judgments about the numbers of enclosed spaces, or numbers of ascending and descending letters in the target words.

Two hundred and eight psychology students were participated in the experiment as part of their practical class. 72 participants performed cued stem-recall task and 72 performed stem-completion task and further 64 participants performed the exclusion stem-completion task. For all task participants were evenly divided into two question position conditions.

The materials and procedure for the encoding task were identical to those used in Experiment 1A and 1B, except that the phonological task was replaced by a feature encoding task. This latter task required subjects to make YES/NO responses to questions such as “Does the word contain letters with enclosed spaces?” or “Does the word contain ascending letters?” Participants in all test conditions completed the filler city stem completion task used in experiment 1B for 5 minutes between encoding and test.

The results of the experiment 2 revealed significant priming in all conditions of stem completion task. Significant differences between completion rates for studied and unstudied words but the letter/before condition of the exclusion task, proportion of studied words were higher than unstudied words in all conditions of cued stem-recall task.
Cued-stem recall data showed that the performance increased as the depth of the task increased and a main effect of question position, indicating improved performance when target appeared after the question and significant interaction between question position and encoding task, indicating that an improvement was only observed in the shallow encoding task. But priming effects for stem completion task showed identical pattern in experiment 1B. No main effect of encoding task or of question position and no interaction effect were found.

Exclusion task data showed identical pattern as with cued stem-recall task i.e., main effects of encoding task, question position and interaction between two variables.

Despite these clear indications of the influence of question position on the effect of level of processing on explicit memory performance, there was no evidence that influenced priming effects in the stem completion test. Significant priming was observed following all encoding tasks but magnitude of the priming effects was not influenced by either the type of encoding task or question position.

To conclude there is ample evidence that level of processing influence performance on explicit memory task, while implicit memory remain intact (Brooks, Gardinar, Keminska and Beavis 2001, Schott, Richardson-Klavehn, Heinze and Duzel 2002 and Newell and Andrews 2004).

**Study Test Modality Change:**

The dissociation between implicit and explicit memory may also be demonstrated by the effect of study-test change in the modality of presentation and other type of surface information. Study-test change in the modality of presentation has detrimental effect on implicit memory while explicit memory remains unaffected.
Parker, Dagnall and Coyle (2007) conducted their study on environmental context effects in conceptual explicit and implicit memory. In Experiment 1 they
assessed the effects of context change on category-exemplar generation (conceptual implicit memory test) and category-cued recall (conceptual explicit memory test). In Experiment 2 they assessed the effects of context change on word association (conceptual implicit memory test) and word associate cued recall (conceptual explicit memory test). In both experiments, study-test changes in environmental context were found to influence performance only on tests of explicit memory. It was concluded that when retrieval cues across explicit and implicit tests are matched, and the probability of explicit contamination is reduced, then only conceptual explicit test performance is reduced by study-test changes in environmental context.

**Duration of Retention Interval:**

Another experimental variable which demonstrated that implicit and explicit memory are entirely independent of one another is duration of retention interval. Numerous studies have demonstrated that duration of retention interval has differential effect on implicit and explicit memory.

(2006) conducted a very extensive study with the longest duration of retention interval. Individuals were asked to complete an implicit memory task (picture-fragment identification) involving pictures they had named in a laboratory study 17 years earlier. Forty-eight students, ages 19–32, 50% male served in the original laboratory study. Approximately 6 months later, 29 of these subjects returned questionnaires sent by mail. A second questionnaire was mailed out, 12 subjects now ages 36–46, 58.3% female responded. A control group 21 subjects ages 18–27, 57.1% female of naive subjects (i.e., not exposed to the original stimuli) was tested.
In the current study, black-and-white picture fragments were seen for the first time. Arranged in rows and columns on two sheets of papers, were 70 fragments, 28 fragments corresponding to intact named pictures (targets), 28 corresponding to
distracters from the recognition test, and 14 novel foils (for assessing the baseline identification rate). Subjects were asked to identify as many fragments as possible by writing next to each fragment the name of the object corresponding to it. They were also asked to share any conscious recollections of their laboratory session 17 years earlier.

The original subjects completed implicit (picture naming) and explicit (picture recognition) memory tasks in the laboratory. About 6 months later, they received an unexpected questionnaire requesting explicit recall of laboratory events. Seventeen years later, a second unexpected questionnaire including the picture-fragment identification test was mailed to these individuals. Twelve mailed completed sheets back. The mean retention interval was 17.4 years (206–215 months). Various measures taken in original study showed no reliable differences between the 12 subjects who responded earlier and the 17 who did not.

Four subjects confessed that they had no conscious recollection of their laboratory visit 17 years earlier. Apparently, these individuals knew they had participated in psychology experiments during their undergraduate years, but could not remember this particular experience. Ironically, priming among these “amnesic” subjects was slightly higher than—but not significantly different from—priming among the subjects who remembered participating.

The present findings extend the longevity of perceptual priming in at least three ways. First, the fact that priming is reliable after 17 years. Second, priming was unrelated to conscious recollection. “Amnesic” individuals exhibited as much priming as those who remembered participating in the original laboratory study. Third,
priming was found despite substantial changes in context (i.e., laboratory to “real world”). Implicit memory tasks appear to be unaffected by changes in environmental context.
Timothy, Kari and Lynn (2008), investigated divergence of explicit and implicit processing speed during associative memory retrieval. Consolidation theory assumes that as time passes, some memories are strengthened and became resistant to change while others are forgotten. Recent demonstrations that implicit, or procedural, memories are retrieved more efficiently after learning and retention are consistent with the idea that these particular memory traces have strengthened with time and therefore may be accessed faster. However, it is not clear whether the process of explicit memory retrieval also becomes more efficient with time. In two experiments these authors explored how much time is required for retrieval of separate explicit and implicit components of hippocampal-dependent visuomotor associative memories after variable retention intervals and how the explicit and implicit processing times change when the associations are rehearsed after initial retrieval. They found that after learning and retention explicit and implicit processing times diverged. The time taken to retrieve successfully the explicit component increased relative to a pre-retention baseline but after spaced rehearsal decreased although not to a level significantly below that obtained at the end of learning and the implicit or procedural component processing times continued to gradually decrease after retention and with continued rehearsal reached a level significantly below the pre-retention baseline. The authors conclude that the observed divergence in post-retention reaction times suggests that explicit and implicit memory systems may reorganize differently after learning and that as a consequence different amounts of processing time may be required for retrieval of these different memory components.

Subliminal Perception:
As we have already mentioned in the previous chapter that the distinction between implicit and explicit memory can be made by investigating the effect
subliminal perception. Subliminally encoded Stimuli have revealed the phenomena of implicit memory without explicit reference of them.

Beauregard, Benhamou, Laurent and Chertkow (1999) stated that brief presentation of words, even below the awareness threshold of subjects can produce semantic priming without explicit memory contamination. In their study normal subjects were participated. These subjects were tested for word priming on a speeded category membership decision task. Explicit and implicit encoding procedures were used in four different experiments.

The findings of their study demonstrates that brief presentation of words can indeed offer a means of producing word priming in absence of explicit recognition or recall of primed words presented during the study phase.

These authors also showed that such priming is equivalent to the priming measured when either a conventional implicit memory design or explicit encoding procedure prior to the study of the primes.

In the light of the above study we can safely conclude that subliminally encoded stimuli revealed implicit memory in the absence of explicit memory. Subliminal perception is another dissociable phenomenon of implicit and explicit memory.

**Attention:**

Attention is another important variable that play a vital role in distinguishing of implicit and explicit memory.

There are numerous researches that studied the effect of attention on implicit and explicit memory and demonstrated distinctions. Here we review only recent studies of attention that clearly showed that attention is required to large extend for explicit memory while implicit memory did not.
Helman, Berry (2003) in a study investigated the effects of divided attention and speeded responding on implicit and explicit retrieval of artificial grammar knowledge. These researchers carried out two experiments. The findings of the
experiment 1 showed that divided attention manipulation at the time of retrieval interfered with explicit memory performance of artificial grammar knowledge but it did not interfere with implicit retrieval. In experiment 2 they showed that forcing participants to respond within very tight deadline resulted in the same asymmetric interference pattern between the tasks.

Another study that examined the role of attention on implicit and explicit memory was conducted by Ballesteros, Reales, Garcia and Carrasco (2006). In their study these authors investigated the effects of selective attention during encoding and delay between study and test on implicit and explicit memory tests. They conducted three experiments. In the first two experiments they manipulated selective attention at encoding by using superimposed outlined of pictures and tested implicit memory by using fragmented pictures of the same objects. Explicit memory was tested by using recall (experiment 1) or a recognition (experiment 2 and 3) test. In experiment 3 they manipulated selective attention at encoding in the same way but implicit memory was tested by using speeded object naming task.

In Experiment 1, sixty males, 18 to 21 years old participated in one or two experimental session of 45-minutes, depending upon the delay condition they were assigned. All participants had normal vision and naïve to the purpose of study. The stimuli were presented on 14 color monitor of a compatible PC. The system was interfaced to voice key to record the level of fragmented completion at which picture was named. The 90 stimuli were randomly divided into three groups of 30 pictures, each of these groups appeared as attended, unattended and non-studied pictures for 4 observers in each delay condition. During study phase
participants performed a speeded-naming task—they were asked to name the pictures as quickly as possible and study phase lasted
approximately 5 to 6 minute. In test phase, according to the delay condition participants were presented less fragmented pictures, if they did not respond for 1.5 seconds, the next more complicated level was shown. Participants responded by pressing the space key. The order of presentation of 90 pictures—30 attended, 30 unattended and 30 non-studied was randomly presented.

Experiment 2 assessed the same factors on implicit and explicit memory but to avoid explicit contamination after the encoding participants performed either the implicit or explicit memory task. Experiment 2 replaced free recall test with a recognition test.

Experiment 1 and 2 consistently indicated that at all delays (immediate to 1 month) picture-fragment identification threshold was lower for the attended than unattended pictures, the attended pictures were recalled and recognized better than the unattended and attention and delay interacted in both memory tests. For implicit memory, performance decreased as delay increased for both attended and unattended pictures, but priming was more pronounced and lasted longer for the attended pictures, it was still present after 1-month delay. For explicit memory, performance decreased as delay increased for attended pictures, but for unattended pictures performance was consistent throughout delay.

Experiment 3 investigators provided same retrieval cues for both implicit and explicit memory tests in order to limit at maximum retrieval strategies. 24 students participated in 30 minutes experimental session. Authors assessed implicit memory with a speeded picture naming test, and explicit memory with recognition test, as in experiment 2. Experiment 3 showed implicit and explicit memory for attended but not for unattended pictures.
This study demonstrated that picture repetition priming requires attention at the time of study and that neither delay nor attention dissociates.
performance in explicit and implicit memory tests, both types of memory require attention but explicit memory
does so a longer degree.

Therefore we conclude that attention is necessary for implicit and explicit memory but attention is more
necessary for explicit memory to large extend as compared to implicit memory.

**Interference:**

The bulk of evidence favors the common interpretation that implicit memory is immune to interference while
explicit memory is not. This common interpretation is based largely on the results obtained by earlier studies here
we will review only recent studies.

Meng and Guo (2007) investigated the symmetric effect of interference at encoding or retrieval on implicit and
explicit memory. Fifty undergraduate students 30 in experiment 1 and 20 in experiment 2 participated in the
study. Two behavioral experiments were conducted with Chinese characters as stimuli. These experiments
adopted a study-to-test paradigm, in which participants performed a “shallow” (color) study task or a “deep”
(pleasant) study task, followed by either a lexical decision test of implicit memory (Experiment 1) or a
recognition test of explicit memory (Experiment 2). An interference task was used to ask participants to account
the total number of “+” in a regulated orientation which appeared with word, which was performed concurrently
with either the encoding or the retrieval phase of the memory task for encoding interference condition or
retrieval interference condition.

The experiments showed that the effects of interference at encoding on the performance in implicit memory test
were different from that at retrieval. The performance of a concurrent task during encoding had little effects on
later lexical decision performance but interference during retrieval disrupted priming, and this was
the same case for shallow or deep encoding items. The effects of interference at encoding on the performance in explicit memory test were different from those at retrieval. The performance of a concurrent task during encoding reduced later recognition accuracy. But dividing attention in the same way during retrieval had no or little effects on recognition performance. For shallow encoding items the different effect of encoding or retrieval interference on recognition was more evident.

In other words interference during encoding had effects on explicit memory but left implicit memory intact. Interference during retrieval affected implicit memory but had little effects on explicit memory. So the relation between encoding and retrieval was different between implicit and explicit memory thus providing further evidence on the dissociation between implicit and explicit memory.

Above discussion provides impressive evidence in favor of dissociation between implicit and explicit memory, as numerous experimental variables have suggested independent memory system. The experimental variables such as amnesia, age, psychoactive drugs, rate of forgetting, type of stimulus material, type of study processing, study-test modality change, duration of retention interval, subliminal perception, attention and finally interference have demonstrated dissociation between implicit and explicit memory. But still there is substantial body of evidence which advocated similarities between implicit and explicit memory.

**Association between Implicit and Explicit Memory:**

There are wide number of studies which suggested association between implicit and explicit memory. It will be herculean task to report each study individually, it will not only occupy more space but also less rewarding.
Hence, some important recent studies will be reported here.
Carrasco, Penpeci-Talgar and Eckstein (2000), these authors associated implicit and explicit memory in terms of attention. These authors examined whether attention and delay interact, both implicit and explicit memory were assessed at several delays between study and test from immediate to a month. Because attention at encoding strengthens stimulus representation, these authors hypothesized that attended material may be more resilient to the passes of time so that performance in both implicit and explicit memory tasks would be superior and last longer for attended than unattended pictures.

Similarly Mulligan and Hornstein (2000) and Rajaram, Srinivas and Travers (2001) suggested that attention is necessary for explicit as well as implicit memory task. These studies on verbal implicit memory tests indicated that attention is necessary at encoding to establish a lasting representation that can support repetition priming. These verbal perceptual priming studies indicate that implicit and explicit memory for words can no longer be distinguished on the grounds that attentional manipulations affect performance on explicit but not on implicit tests.

Exner, Weniger and Irle (2001) examined explicit and implicit memory learning and memory in subjects with thalamic lesions and analyzed the influence of lesion characteristics on cognitive performance. 15 subjects, mean age 56 years with focal thalamic infarction or hemorrhage completed a comprehensive neuropsychological test battery focusing on tests of explicit memory and learning of a non declarative motor skill. Their results were compared to 15 healthy matched control subjects (mean age 54 years) and to a clinical control group of 22 subjects (mean age 54 years), who had sustained basal ganglia lesions. Subjects with
thalamic lesions showed well-preserved intellectual and executive functions but demonstrated deficits on
measures of attention and psychomotor speed, explicit memory and implicit visuomotor sequence learning.
Lesion size in the thalamus was clearly related to subjects’ long-term explicit memory performance. However, few of the neuropsychological outcomes of focal thalamic infarctions, Subjects with lesions in the basal ganglia demonstrated similar deficits.

McBride, Dosher and Gage (2001) compared the forgetting for conscious and automatic memory processes in word fragment completion tasks. This study evaluated forgetting for implicit and explicit word-fragment completion. In experiment 1, forgetting rates were compared for implicit and explicit task performance.

Forgetting rates did not differ significantly between two tasks. In experiment 2 implicit and explicit memory estimates derived from multinomial models for process dissociation were compared. Forgetting rates for implicit memory and explicit memory processes did not differ significantly estimated by guessing-elaborated model. Results indicated that forgetting is similar for implicit and explicit memory processes when measured with a fragment completion task for delays up to 45 min. these authors suggested single memory system.

Eskes, Szostak and Stuss (2003) investigated the role of frontal lobes in implicit and explicit retrieval tasks. The role of frontal lobe in explicit retrieval task is well supported, the findings for implicit tasks are less conclusive. The role of frontal lobes in perceptual and conceptual implicit priming was investigated. Three memory paradigms were presented under both implicit and explicit retrieval instructions, using word-fragment completion, picture fragment completion and category exemplar generation. Three groups of individuals with frontal lesions were compared to normal controls, 5 subjects with left dorsolateral lesions, 4 with right dorsolateral lesions and 9 subjects with medial lesions were compared to normal controls. Word fragment completion primin
g was impaired by left dorsolateral lesions, with other priming tests were
unaffected by any lesion. Explicit memory performance showed a different pattern, with category exemplar cued recall impaired by left dorsolateral and medial lesions.

The findings of the above study supported the role of frontal lobes in both implicit and explicit retrieval tasks mechanisms under certain conditions requiring strategy application or lexical retrieval. The authors suggested single memory system.

Another study showing association between implicit and explicit memory was conducted by Lequeux, Contraine, L evarlet and Barvais (2003). In their study 60 patients were participated. They conducted their study on the absence of implicit and explicit memory in unconscious patients using a TCI of propofol. These researchers randomly assigned 60 patients in experimental group and their performance was compared with control and reference group. Loss of consciousness was obtained by progressive step wise increases of propofol using a target-controlled infusion (TCI) device. A tape consisted of 20 words was played to the patients in control before start of anesthesia, and to the patients in the experimental group at a constant calculated concentration of propofol associated with loss of consciousness. The tape was not played to the patients of reference group.

Three types of memory tests were administered post operatively.

The findings of the above study suggested single memory system because implicit and explicit memories were evidence in control group while both types of memory were absent in experimental group. The findings revealed association between implicit and explicit memory.

Verfaellie, Page, Ornaldo and Schacter (2005) investigated implicit memory for gist information in amnesic
patients. There authors conducted 2 experiments.

In experiment 1, participants saw multiple sets of associates each converging on a theme word. For these purpose 14 amnesic individuals (10 men and 4 women) and 18
individuals with intact memory abilities (8 men and 10 women) participated. Stimuli consisted of 16 sets of 16
words used by earlier researchers, with minor modifications in terms of culture and language differences. Each
set contained 15 words to be presented for study, and a critical lure that was not presented for study. Study
words were highly associated to critical lures.

Implicit memory was tested by Stem completion test while explicit memory was tested by Cued recall test.

Participants took part in three phases, i.e., a study phase, an implicit stem completion phase and an explicit Cued
recall phase.

In study phase participants were shown group of converging associates, one at a time on computer screen at a
rate of 2 sec per word, each group of associates was separated by asterisk that was shown for 5 sec. Participants
were asked to read the word aloud and indicate verbally how many meanings they believed for each word to
have.

In implicit stem completion test, which started after 3 min after study phase, participants were asked to
complete stems with the first word that came to mind as quickly as they could. This phase was used as a filler
task unrelated to memory experiment in which they were participating. After this implicit memory task, explicit
memory task was started with cued recall task where participants were asked to complete stems with word from
previously studied list and were asked to complete the stem only with remembered words from the study list
and also told them many stems would not correspond to studied words and were instructed to leave them blank.

At the end of experiment, participants were instructed to fill up a questionnaire that assess whether they used
explicit memory during implicit test phase, and data indicating such explicit memory were eliminated.

So far as implicit memory is concerned both amnesic and control showed higher completion rates for studied than for unstudied targets. Additionally, control
participants showed higher completion rates for lures corresponding to studied associates than to unstudied associates, but amnesic participants did not. For explicit memory test, both groups produced more target completion on cued recall test for studied than unstudied targets, but this difference was greater in control participants than amnesic participants. Control participants produced more lures corresponding to studied associates than unstudied associates, but amnesic did not.

In experiment 1, amnesic showed intact implicit and impaired explicit memory for studied words, but memory for non-presented lures was impaired for both implicit as well as explicit memory tests.

To evaluate whether impaired implicit memory for lures was due to accelerated forgetting of gist information, short study lists were used in experiment 2. Each list consisted of a single set of associates.

17 amnesic (11 men and 6 women) and 20 patients with intact memory abilities (12 men and 8 women) participated in this experiment. Stimuli were identical as experiment 1. Participants took part in an implicit and an explicit task that were administered at least 1 week apart. Implicit memory was always tested first and each session consisted of eight brief study-test runs. As experiment 1, implicit memory was tested by using stem-completion test and explicit memory was tested by cued recall test.

Findings of the experiment 2, again found similar results as in experiment 1, for implicit memory test, both groups showed higher completion of studied than unstudied targets and control participants showed higher completion rates for lures corresponding to studied associates than unstudied associates, but amnesic participants did not. For explicit memory, cued recall test were higher for studied than unstudied targets in both the groups,
but corrected cued recall, indicated by the difference between these
conditions was much for control and similar pattern was seen for lures productions but corrected cued recall group than amnesic group. These results indicated the inability to encode robust gist representations as the cause of impaired gist memory in amnesia.

The findings of the above study indicated that gist memory is impaired not only when tested explicitly but also when tested implicitly. In amnesia, gist memory impairment was found in both types of memory, thereby showing association between implicit and explicit memory.

Recently Turk-Browne, Yi and Chun (2006) advocated similarities between implicit and explicit memory in terms of encoding. These investigators took sixteen men and women and showed them 120 photographs and participants were asked to answer which were taken indoor or outdoors. Each image then shown once again and these investigators used fMRI to record the brain activity during the test. After 15 minutes, subjects were given a third recognition task, this one unexpected, which included the 120 original photos and 60 new. The subjects’ response was again recorded by fMRI. By coding the brain imaging data according to whether the items were subsequently remembered or forgotten the researchers were able to examine the neural signatures of memory formation.

Remembered photographs were characterized by strong activation of medial temporal brain regions in response to their first presentation but this activation reduced in the same regions when photos were repeated. These researchers said this reduction as a sign of implicit memory. The brain signal is not as strong when image is viewed, remembered and then viewed for a second time.
These researchers concluded that only explicitly remembered photographs produced this weaker signal and therefore these researchers demonstrated that implicit
memory and explicit memory are strongly linked during encoding of new information in the brain and suggested association between implicit and explicit memory.

Ballestero, Reales, Garcia and Carrasco (2006) carried out their study on the effect of attention and delay on implicit and explicit memory. We have already reviewed this study earlier in detail. Hence here we will review it shortly. Three experiments investigated the effect of selective attention during encoding and delay between study and test on implicit and explicit memory. In experiment 1 and 2 these researchers found that at all delays implicit memory was better for attended than unattended pictures and attended pictures were better recalled and recognized than unattended pictures that is explicit memory and attention and delay both influenced implicit and explicit memory min the same fashion.

Experiment 3 showed that attention is required for both types of memory and neither attention nor delay dissociates performance in implicit and explicit memory. Thus Ballestero, Reales, Garcia and Carrasco provided evidence in favor of single memory system.

Raanaas and Magnussen (2006) investigated serial position effects in implicit and explicit memory in a short-term memory task. A study list composed of four, spatially distributed, two-digit number was presented, followed by an item recognition task (explicit test) and an implicit memory task in which participants were asked to verify a simple addition equation where the presented answer was either primed are not primed by one of the number pairs in the study list. Similar serial position effects were observed in explicit and implicit memory, with faster response times for correct decisions on the first than on the later list positions. The
presence of a primacy effect but no recency effect is consistent with previous studies of explicit memory with visual
presentation. The results suggested that similar principles of temporal information processing govern priming and episodic short-term memory.

In another study Raanaas and Magnussen (2006) investigated the effects of serial position in explicit and implicit memory in a noncolor word stoop task. Participants were presented with a study list of four words printed in different colors and were tested for memory of the list position of the color (explicit memory task), then they were asked to complete a word stem primed (or not primed) by one of the words in the study list (implicit memory task), a task presented as a distracter task. The results showed serial position effects in both explicit and implicit memory, for both response times and proportion of correct responses, with marked primacy effects, a drop in performance towards the third list position and a rise in memory performance at the fourth list position, the recency effect being most pronounced in implicit memory. These authors conclude that explicit and implicit expression of memory is governed by similar principles of temporal information processing and advocated single memory system.

On the basis of all the studies of dissociation and association we can see that still there is controversy regarding dissociation and association between implicit and explicit memory. Although majority of researches are in favor of dissociation but there are some impressive evidence in favor of association. It is therefore, highly desirable to carry out more extensive researches with new variables so that existing controversy regarding association-dissociation between implicit and explicit memory may be resolved. One of the objectives of the present research
is to make an attempt to resolve this controversy. Thus in order to resolve this controversy other variables somewhat recently have emerged from the studies of mood and memory researches namely mood congruent memory. Thus we will review all the studies of mood congruency in explicit and implicit memory in the next sections of the present chapter.
SECTION II

MOOD CONGRUENCY EFFECT IN EXPPLICIT MEMORY

Section second of this chapter is devoted to those relevant studies which are concerned with mood congruency effect in explicit memory. Here we review all those studies which directly or indirectly provide support to mood congruency effect in explicit memory.

The first study, in this context was conducted by Teasdale and Forgarty (1979), who investigated differential effects of induced mood on retrieval of pleasant and unpleasant events from episodic memory. This study aimed to obtain evidence of the relationship between depressed mood and speed of retrieval of pleasant and unpleasant past experiences. In this study 30 subjects were participated. Each subject was seen on two occasions, depressed mood induction on one occasion and a happy mood induction on the other. On each occasion subjects were presented with a series of words. And for each word they were asked to recall a real-life experience, and word latency of retrieval was measured for each experience.

The ratio of the latency for retrieval of unpleasant experiences to latency for retrieval of pleasant experiences was significantly less following depressed mood induction than following happy mood induction. This result was largely due to an effect of mood or retrieval of pleasant experiences. Additionally, in depressed mood induction, the subjects were also significantly more anxious, less happy and showed longer speech pause time in counting 1 to 10, and took longer time to retrieve memories associated stimulus words. The “worse” the mood was in the depressed condition relative to happy conditions, the greater was the slowing of recall of pleasant
experiences relative to the happy condition.
Another study which demonstrated mood congruency in explicit memory was conducted by Bower, Gilligan and Manteiro (1981). They conducted series of experiments for determining that the selectivity of learning caused by the affective states. They have used post-hypnotic suggestion to investigate how emotional states influence the learning and memory of the text. In experiment 1, 16 under graduates with scores on the standard hypnotic susceptibility scale, happy and sad readers were identified. They have recalled more facts about a character which was in the same mood as they were. In experiment 2, 16 experienced mental health professionals served as a subjects but this time selective recall by character could not be produced by inducing the mood at recall after subjects had read the story in a neutral mood. In experiment 3, in which 32 subjects were participated, found that mood during reading caused selective learning of mood congruent incidence; but during recall mood had little effect. Experiment 4, with 16 subjects, they found that inducing the mood only during recall produced no selective recall of happy vs sad incidence. Finally in experiment 5, with 16 subjects, they found that subjects selectively learned whatever affective material was congruent with their emotional state, rather than identifying exclusively with the same mood character. This study provides clear evidence of mood congruency in explicit memory.

Madigan, Bollenback (1982) conducted two experiments to see the effect of induced mood on retrieval of personal episodic and semantic memories, which are the forms of explicit memory. 95 subjects were participated in their study. In experiment I, subjects read statements that induced temporary elation or depression and then recalled specific personal memories. Subjects in the elated condition rated their memories significantly more
pleasant than those experiencing a depressed mood. In experiment II, subjects who had read elated or depressed statements gave single words associates to
each of fifteen stimulus words. The mean ratings for associate words produced by subjects in the elated condition were significantly more pleasant than those for depressed and suggested mood congruency in explicit memory.

Natale and Hantas (1982) conducted an experiment to determine the effect of temporary mood states on selective memory about the self. 54 undergraduates were made to experience happy, sad or neutral states by means of a hypotonic mood induction procedure. Temporary depression caused decreased recall of positive life experiences, weaker memory strength for positive information about oneself, and a bias to recall false negative self descriptions. Induced elation was associated with decreased recall of negative events and an increased recall of positive events. Results, demonstrated explicit mood congruent memory bias.

MacLeod, Mathews and Tata (1986) provided evidence of mood congruent memory bias in explicit memory, and suggested that the anxious patients selectively attended threat related stimuli and it might be expected that this selective bias would be associated with elevated level of recall i.e., explicit memory for threatening material by anxious patients. These authors also suggested mood congruency in explicit memory.

Eich and Metcafe (1986) in their study titled “mood dependent memory for internal vs. external events” proposed that event that originate through internal mental operations such as reasoning imagination and thought may be more colored by or connected one’s current mood. They conducted two experiments with a total of 61 undergraduates to examine mood biasing, the tendency to remember to information consistent with one’s prevailing mood. Mood biasing was demonstrated in experiment I, in which mood induced subjects recalled
personal experience and a list of self-descriptive personality traits. Elated subjects recalled more positive experiences and
traits, while depressed subjects recalled more negative experiences and traits which reflect explicit mood congruent memory.

Another extensive study was conducted by Mogg (1988), who investigated explicit mood congruent memory in generalized anxiety disorder patients. He examined generalized anxiety patients in several experiments. These patients were tested for their long-term retention of threat related and neutral words. In the four experiments, these patients showed no evidence of negative memory bias, in which recall test was used. But in the fifth experiment, in which both intentional recall and recognition tests were used, investigator found the absence of negative memory bias on recognition memory test but negative memory bias was found on recall test. Therefore, Mogg clearly demonstrated the explicit mood congruent memory bias in patients with generalized anxiety disorder.

Singer and Salovey (1988) discussed the G.H. Bower network theory of affect. This theory specified four ways in which mood can have an observable effect on memory. (a) Memory is facilitated when mood states at learning matches mood state with recall (b) Material with affective tone that is congruent with current mood is most easily retrieved from memory (c) Material with affective tone that is congruent with current mood is most easily learned; and (d) affectively intense material is learned best. Empirical literature that addresses each of these predictions by looking at studies that manipulate in the laboratory as well as those that utilized naturally occurring mood is discussed. Each prediction was supported although congruency during learning (prediction C) yielded most consistent findings.
Greenberg and Beck (1989), presented more positive findings in the context of explicit mood congruent memory. In their study they presented a list of positive and negative depression-relevant and anxiety-relevant adjectives, and each adjective had to
be judged with respect to one of the questions: “describes you?”; “describes the world?” or “describes the future?” This task was followed by free recall, with the scores of interest being the number of words recalled that had received “yes” judgments previously.

The findings revealed that anxious patients did not differ from normal control in their recall of “yes” rated depression-relevant adjectives, with “yes” rated anxiety-relevant adjectives, however, anxious patients recalled considerably more negative than positive adjectives, whereas control subjects did not differ in their recall of two types of adjectives. The findings indicated that anxious patients showed negative memory bias for anxiety-relevant adjectives. Anxious patients responded “yes” to far more negative anxiety-relevant adjectives than control subjects in the initial encoding task. But Greenberg and Beck (1989) only reported recall performance in terms of raw scores. Thus the results almost certainly reflect the fact that anxious patients had many more negative anxiety relevant adjectives than controls that they could potentially have recalled, and so it is not appropriate to claim that a negative memory bias has been found.

More convincing evidence of explicit mood congruent memory bias was obtained by McNally, Foa and Donnell (1989). In their study, they presented a self-referent task or threat-related and non-threat-related words to the panic-disordered patients and normal controls. After presenting the words subjects’ performance on explicit memory was assessed by free recall test. There was a significant interaction between group and word valence. The findings of the study clearly demonstrated that the panic-disordered patients recalled more threat-related than non-threat-related words, whereas normal controls recalled more non-threat related words as
compared to threat-related words. However, the patients were significantly more depressed (as well as
anxious) than controls, and so, it is possible that their memory bias was mediated by depression rather than anxiety. The findings provide impressive evidence in favor of explicit mood congruent memory bias.

Another study in this context was carried out by Bower and Mayer (1989). They conducted a series of experiments with a total of 168 college students. In each experiment, subjects learned two or more different word lists in different (happy or sad) mood and were then tested for recall i.e., explicit memory measure in one or the other mood. In five of the six experiments the lists were composed of pleasant and unpleasant items. Faster learning of mood congruent material was observed in experiments that tested it; this effect was modifiable by explicit learning instructions in experiment 3. Mood dependent retrieval i.e., better recall of the list in matching mood, was not observed in the first three experiments where mood was a prevailing background incidental to list learning event. Mood dependent retrieval did appear in the fourth experiment which induced subjects to attribute the cause of their emotional reaction to the material being learned. However, that result failed to replicate in experiment 5. In experiment 6, items to be remembered were subjects generated which also failed to produce mood dependent effect. The inconsistent results on mood dependent retrieval are attributed to the complexities of laboratory experiments on induced emotions. But in each of the experiments explicit mood congruency was observed.

Salovey and Singer (1989) conducted three studies to investigate congruency between mood and recall of childhood verses recent autobiographical memories. Because childhood memories are well rehearsed and perhaps more elaborated, their recall should be less influenced by contextual variables like mood as compared
with more recent memories.
In first study, 60 undergraduates, 30 males and 30 females undergraduates were participated, who were responded to poster advertising a study on imagination. These subjects were induced happy, sad and neutral mood states. Two types of mood induction procedures were used namely, self-generated imagery and guided imagery. Subjects then were asked to recall five memories from the childhood that could be brought to mind. They subsequently rated these memories on a variety of dimensions including specific affect scales. Four subjects at time participated in one experimental session. All the subjects were asked to complete a consent agreement to sign. All the subjects were randomly assigned to one of the three moods conditions and one of two mood induction procedures. The subjects were instructed to give response in a sentence or two. The experimenter read the instructions for mood induction procedure to the subject s and then left them alone in individual cubicles to begin the mood induction task. At the end of the mood induction procedure, subjects were instructed to turn over a packet of papers on their desks and to follow all instructions carefully. The first page of the packet contained the mood manipulation check. On the next page, subjects were given instruction and space to record the first five childhood memories that occurred to them. They were assured that experimenter was not looking for any particular type of memory, whatever came to mind was acceptable. Later, subjects were instructed to rate each memory on the seven 11-point scales and to indicate how many years ago the event in their memory occurred. At the end of the session, subjects were debriefed regarding the true nature of the experiment. Debriefing conversations revealed that subjects were no longer feeling any effects of the induced mood, nor were they suspicious of the intent of the experiment.
The findings of the experiment first showed that subjects did indeed experience the desired mood state, yet the childhood memories they recalled
immediately after the induction procedure showed only the slightest influence of their mood state.

In the second study, the researchers examined the effect of mood on more recent memories. Subjects in study second were 36 undergraduates, 18 males, and 18 females participated. Subjects were again placed in happy, sad and neutral mood states and then asked to recall five autobiographical memories. This time memories requested were confined to experience that occurred within the last. Another variation in study second was that this time researchers employ only the self-generated imagery mood induction procedure because in first study no differences were found in two types of mood induction procedure o. dependent variables. Procedure remained same as in experiment first except in second experiment subjects were instructed to recall memories from the past week that occurred to them.

The findings of the experiment second revealed that happy mood promotes the recall of happier recent memories. Sad mood had less of an effect on memory recall, but tended to increase more fearful memories. This result of sad mood may be a consequence of that experimenter asked students for memories of the past week at the end of the academic year which involved anxiety provoking events. Therefore, the finding of the experiment second provided support to the mood congruency.

The final study was conducted in an attempt to replicate these effects in a single study. A larger group of subject was induced to happy, sad and neutral moods and then asked to recall events from both childhood and the recent past. An interaction between mood condition and memory time-frame was predicted: mood congruent recall was expected to be relatively strong when subjects recalled recent memories and weak or non existent
when they recalled episodes from early childhood. In study third, 66 undergraduates were participated. They were approximately evenly divided by gender,
and 22 subjects were assigned to each of the three mood conditions. The mood induction procedure was identical self-generated imagery technique. Procedure was remained the same as previous studies with few variation as mentioned above but at the end of the study, subjects were given a post-experimental questionnaire that elicited their guesses about the actual hypothesis of the study. Only two subjects correctly guessed the specific hypothesis of the study; their data was not used and they were replaced by two other subjects.

The results of the study third, clearly demonstrated that mood congruent recall is more likely to occur for memories of recent events as compared to childhood events. The results of the study third replicated the findings of first and second study. However, mood congruent recall was as likely for happy recent memories when happy as for sad recent memories when sad; the asymmetries of earlier study were not replicated. There is some generalization to this process: in study 2, sad moods tended to facilitate the recall of fearful memories but in present study, memories of embarrassing events tended also to be recalled while experiencing a sad mood.

In the light of the above experiment we can safely conclude that mood congruency occurred in explicit memory and this effect is found stronger when recent memories are recalled as compared to childhood memories

Bullington (1990) conducted his study on mood congruent memory. Author replicated the affect symmetrical mood congruent effects on memory for autobiographical events. In this study forty-eight subjects participated. All the subjects were selected from introductory psychology courses. All the subjects received course credit for their participation in this experiment. A revised version of Velton mood induction procedure combined with
music was used to induce elated and depressed mood in this experiment. Subjects rated their mood state before and after the mood
induction, subjects were shown cards with 0-100 line scales, on which 0 was labeled “I do not feel happy” and 100 was labeled as “ I feel extremely happy” in happy condition. After the mood rating, each subject was asked to complete a counting task, to be effective in discriminating between depression and elation. For this task, subjects were provided piece of paper and asked to count backwards from 100 by threes for a period of one minute. Subjects were also asked to rate their mood during session by using the profile of mood states.

Each subject was tested individually, on two separate occasions. During the initial session, the subjects were first asked to sign a consent form explaining the purpose and procedures of the study. Next, each subject completed the profile of mood state and finally, a word association task was administered. A word list was presented to subjects. They were asked to retrieve a memory in association to each of the word. Subjects were told that any experience was acceptable, as long as it was an actual experience associated with the stimulus word and not simply a thought or fantasy associated with the word. Then the stimulus words were presented one at a time, and subjects wrote a brief description of each memory on a form provided for that purpose. If the subjects reported that they were unable to retrieve a memory, experimenter proceeded to the next word on the list. This procedure was followed until the subject had produces 25 memories.

In session two, after 24 hours after session one, the subjects were again tested individually. Each subject was randomly assigned to one of four conditions: induction-depression, induction-elation, demand-depression or demand-elation. Subjects in the depression and elation group had rated mood using mood rating scale, the experimenter left the room and instructions for mood induction procedure and subsequent tasks were given via
tape recording. The tasks were presented as, (1) the mood induction
procedure, (2) a mood rating, (3) the counting task, and (4) a free recall task lasting for the period of 15 minutes, during which the subjects were asked to recall all of the memories they had produced in session one. Subjects were also told that the particular mood they would be experiencing had been shown in past (fictitious) research to be effective in improving a person’s memory. At the end of free recall subjects were debriefed and rate the affective tone experienced during session.

The findings suggest that affect-symmetrical as well as information symmetrical mood congruent effects for both depressed and elated moods can be obtained through the use of autobiographical information as stimulus material. Thus the present research provided additional support to the idea that positive and negative moods have symmetrical effects on memory, but particularly where autobiographical memory is concerned. Hence, the finding of the above study clearly indicated mood congruency effect in explicit memory.

Mogg and Mathews (1990) conducted their study on generally anxious patients. They presented self-referent and other-referent task to generally anxious patients and with normal controls. The explicit memory of the subjects was tested by free recall. The findings clearly demonstrated that anxious patients recall more threat-related words, whereas normal control did not. The anxious patients showed evidence of mood-congruent recall, therefore, we can suggest explicit mood congruency among anxious patients. However, there were indications in the data that this finding might simply be due to response bias.

One study which directly compared implicit and explicit memory in mood congruency was examined by Watkins, Mathews, Williamson and Fuller (1992). They published a study that did not find mood congruent bias in
implicit memory. In their study they compared depressed and control participants on implicit memory test and on
explicit memory test. Stem completion test was used to measure implicit memory, while explicit memory was tested by cued recall test. In both memory tests identical cues were used. These two tests were only differed in whether the participants were consciously using memory or not. Watkins et al, found well-demonstrated mood congruent memory bias in explicit memory measure but found no mood congruent bias in implicit memory test.

Denny and Hunt (1992) hypothesized that a dissociation between performance on an explicit and implicit task would provide evidence for an impairment of effort-demanding processing in depressed participants. The explicit free recall test was compared with an “automatic” implicit memory task. Clinically depressed subjects were matched with controls and both groups were given implicit and explicit memory tests. Each participant was given a list containing positively and negatively valence words, which they rated according to the words relevance to themselves (i.e., a self-reference orienting task). Denny and Hunt then had participants performed a word fragment completion task and free recall task. The order to tests was counter balanced across conditions. Although the data seemed to indicate a trend for enhanced priming for depressed participant’s negative words, the differences were not statistically significant. Depressed participants did recall significantly fewer words in free recall task, and the pattern of results indicated a mood congruent memory bias. Thus, the authors concluded that there was no differential effect of word valence by participant group on the implicit memory task. They demonstrated clear evidence in favor of explicit mood congruent memory bias and did not found mood congruent memory bias in implicit memory.

Matt, Vazquez and Campbell (1992) conducted study on Meta analyzed research on mood congruent memory
in normal non depressed, subclinically depressed,
clinically depressed, and induced depressed and induced elated persons. Magnitude of mood congruent recall was estimated, the robustness was examined and extent to which strength of the mood congruent recall was related to self referenced encoding and mood intensity was explored. A symmetrical recall favoring positive stimuli may be part of normative pattern of memory performance among normal non depressed individuals. Sub clinically depressed individuals show symmetrical recall of positively and negatively valence material.

Clinically depressed induced depressed and induced elated subjects displayed mood congruent recall. With the exception of induced elated mood effect estimates derived from different studies were robust. In studies on induced elated mood, self referent processing was associated with stronger mood congruent recall as compared with other studies.

Philpot and Maddona (1993) examined whether learning and retrieval were associated with changes in mood states. In their study 50 college students participated. Subjects were assigned to one of five treatment conditions, Happy-Happy, Sad-Sad, Neutral-Neutral, Happy-Sad and Sad-Happy. Mood was induced via Velton procedure. During the first mood induction phase, subjects were exposed to a serial learning task and recall task, followed by a digit symbol task. In the next phase subjects were given a five minute muscle relaxing exercise and five minute distracting task. In the final phase, subjects underwent a second mood induction phase and a subsequent recall trial and digit symbol task. Mood congruent (i.e. happy-happy, sad-sad) groups performed at higher rate on the subsequent recall trial than did groups who shifted mood, showing mood congruency in explicit memory.

Kwiatkowski and Parkinson (1994) conducted two experiments. 120 psychology students participated in
experiment first and 128 in experiment second, to examine depressed mood on recall of target words and recall of descriptor words either
negatively valence or neutral and were not related semantically to target adjectives. There was no overall
difference in the recall of targets by naturally depressed and non depressed subjects. The finding of Kwiatkowski
and Parkinson demonstrated that the depressed subjects recalled more negative descriptors than did non-depressed subjects. In contrast, when a depressed mood was induced through a Velton mood induction
procedure induced depressed subjects recalled fewer target words than did non depressed subjects and there was
no differential recall of descriptor words by induced depressed and non-depressed subjects.

Danion, Kauffmann-Muller, Grange, Zimmermann and Greth (1995) carried out a study in which explicit and
implicit memory for affectively valenced words (positive, negative or neutral) were investigated in 30 patients
suffering from a major depressive episode (DSM-III-R criteria) and 30 normal control subjects. Explicit memory
was assessed with a free-recall and a recognition task and implicit memory with a word-stem completion task.

Depressed and control subjects recalled more emotional, i.e., positive and negative words than neutral ones.

They recognized less negative than neutral words. In contrast to recall and recognition performance, word-
completion performance was not sensitive to the affective valence of words: depressed and control subjects exhib-
ited equivalent priming of positive, negative and neutral words. These results indicated that, in depressed and
normal subjects, the affective valence of words influenced memory when conscious, intentional recollection was
required but was devoid of effect when such a recollection was not required.

analysis of the association, its pattern, and specificity”. Investigated whether moderator variable determine the
extent of this association, and whether any obtained association is unique to depression.
analytic techniques were used to synthesize data from 99 studies on recall and 48 studies on recognition in clinically depressed and non-depressed samples. Associations between memory impairment and other psychiatric disorders (e.g., schizophrenia, dementia) were also examined. A significant, stable association between depression and memory impairment was revealed. Further analyses indicated, however, that it is likely that depression is linked to particular aspects of memory, the linkage was found in particular subsets of depressed individuals and memory impairment was not unique to depression. Thus memory impairment was found not only among depressed individuals but it was also found among other psychiatric disorders.

Mayor, McCormic, and Strong (1995) provided evidence that every day mood brings about a hypothesized effect on memory, and termed as mood congruent memory (MCM). The MCM effect states that happy people will better remember happy than sad materials whereas sad people will better remember sad than happy materials (or remember such material equally). One preliminary study and three experimental studies were conducted using 737 undergraduate students. The studies provided strong evidence that MCM does occur with every day natural mood. The correlation between pleasant-unpleasant memory retrieval and mood was found across independent task in all three experimental studies. Findings suggest that every time a person retrieves an example of a category or associates one concept to another, that person’s memory will be biased by mood.

Another study in the same year was conducted by Ellis, Varner, Becker, and Ottoway (1995). Who conducted two experiments with a total of 128 undergraduate students, and examined the issue whether induction of a depressed mood would affect prose memory and comprehension and would impair the ability of individuals to
use prior knowledge, activated by way of a title, in remembering an ambiguous passage.
Half of the subjects were given the title of the passage prior to reading the passage. In experiment 1, depressed subjects who were given a title for the passage recalled fewer idea units when compared with natural controlled conditions, but no depressive deficit in recall occurred in the absence of a title. In experiment 2, the same pattern of results occurred when subjects learned two successive passages. Judgment of comprehension predicted passage recall and were better predictors for neutral than depressed mood subjects. A depressed mood state did not affect average judgments of comprehension even when recall was correspondingly impaired.

Sanz (1996) investigated selective processing of emotional information in social anxiety and depression using a self-referent recall task. Depressed, socially anxious and normal subjects completed self-referent recall task to assess potential recall biases towards carefully selected traits adjectives varying along the dimensions of valence (positive vs. negative) and content (depressive, socially anxious, both depressive and socially anxious and both depressive and social anxiety-irrelevant). The findings revealed that the depressed subjects showed an equivalent recall of negative and positive information, whereas, socially anxious and normal subjects showed a positive recall bias. The findings revealed that the depressed subjects recalled more negative information as compared to socially anxious and normal subjects, which demonstrated explicit mood congruent memory bias.

Becker, Roth, Andrich and Margrof (1999) investigated explicit memory in anxiety disorders. They carried out 2 experiments to study selective memory bias favoring anxiety-relevant materials in patients with anxiety disorders. In experiment 1, 32 patients with generalized anxiety disorder, 30 with social phobia and 31 control participants incidentally learned generalized anxiety disorder-relevant words, speech anxiety-relevant words
and strongly pleasant words and words with neutral valence.
The findings revealed that participants did not show any explicit memory bias for threatening material.

In experiment 2, 30 patients with panic disorder with agoraphobia and 30 controls participated. The design of the experiment 2 was similar to the experiment 1. Results of the experiment 2 showed that highly specific selective memory bias for threatening words was found. Words which were describing symptoms of anxiety were better recalled by the panic disorder patients.

Another study on mood congruence in explicit memory was investigated by Murray, Whitehouse and Alloy (1999) conducted their study on memory. Two experiments examined the contribution of reporting biases to mood congruency recall pattern and diminished levels of recall frequently associated with depressed mood states.

In experiment 1, 14 dysphoric and 21 non depressed participants were used. Participants were classified on the basis of scores on Beck depression inventory and profile of mood states made self-referential judgments regarding a series of affectively valenced words. Subsequently they were given an unexpected forced-recall test of explicit memory, which encouraged guessing to meet the output requirement of the test. Non depressed subjects confidently reported more positive words than dysphoric subjects, but later produced significantly more correct guesses of positively valenced words.

In experiment 2, 40 dysphoric and 40 non depressed subjects participated, they performed both self-referent and orthographic judgment of affectively valenced words. Followed by either free or forced recall test. Similar findings were obtained as in experiment 1 and demonstrated explicit mood congruent memory.
Itoh (2000), investigated pattern of mood congruent effect in an autobiographical memory recall task. In this study author used three experimental conditions, namely positive mood, negative mood and control group. Positive and negative moods were induced with music induction technique. In all the three groups subjects were assigned through random selection. Subjects were then presented a list of trait words, which were pleasant or unpleasant. The subjects were instructed to decide whether they could recall any autobiographical memories related to the word, and responded with ‘yes’ or ‘no’ button as rapidly as possible. After the task, they were given five minutes for an incidental free recall test, which is a test of explicit memory.

Results revealed that mood congruent effect was found regardless of whether or not there was an autobiographical memory related to word in both positive and negative mood states.

Another study of explicit mood congruent bias was carried out by Russo, Fox, Bellinger and Nguyen-Van-Tam (2001), who evaluated the status of mood congruent free recall bias in anxious individuals. Explicit memory was tested by free recall test. Following incidental encoding of target words. In experiment 1, 47 high trait anxiety undergraduate students participated and the results showed increased recall of threat-related information after an orienting task promoting lexical processing of target words.

In experiment 2, 88 health care workers and university students, whose aged 20-55 years participated in both lexical and semantic orienting task. Results of the experiment revealed that anxious individuals displayed a mood congruent recall bias only for target information processed at a lexical level but did not find mood congruent recall bias in semantic task.
Other recent study in this context was conducted by Klaassen, Reidel, Deutz and Van Praag (2002), who investigated mood congruent memory bias induced by
tryptophan depletion. Explicit memory was tested by recall method. These authors examined the influence of acute tryptophan (TRP) depletion, which induced low serotonin neurotransmission and a depression of mood.

27 healthy volunteers were participated in their study in which 16 with and 11 without family history of affective disorder.

All 27 subjects received 100g of amino acid mixture with and without TRP according to placebo-controlled, double-blind, balanced, cross-over design. Tests consisted of 30 words list with words of positive, neutral and negative affective valence and a mood questionnaire were assessed at 6 and 24 hr following treatment administration. Results of the study showed impaired delayed recall of neutral and positive words, while subjects showed better performance of negative words on explicit recall test. There was no interaction of family history and treatment and no post hoc association between the influences of TRP-depletion on mood and on affective memory bias. Showing, thereby, that experimentally induced serotonergic depletion in normal individual’s shifts affective memory bias towards negative affective valent verbal stimuli.

Kizibash, Vanderploeg and Curtiss (2002) carried out a study to see the effect of depression and anxiety on memory performance. In their study 3999 Vietnam veterans participated, who had completed the California verbal learning test (CVLT) and MMPI. These subjects were also administered a comprehensive medical, psychological, neuropsychological and diagnostic interview evaluation.

Results of their study revealed that depressive symptoms without anxiety had adverse effect on immediate recall of new information and total amount of acquisition, however, retrieval and retention were unaffected and
high level of anxiety did not have significant detrimental effects on any aspects of memory functioning, assessed
including immediate recall total amount acquired, retention and retrieval of novel information. However, when depression was compounded by anxiety, there was not only an adverse effect on immediate recall and also on amount of acquisition but also on retrieval of newly learned information. Therefore, Kizibash et. al’s finding partially support explicit mood congruent memory bias in depression and anxiety.

One study which provided direct evidence of explicit mood congruent memory bias conducted by Tarsia, Power and Sanavio (2003) who investigated implicit and explicit memory biases in mixed anxiety-depression. These authors compared implicit and explicit memory biases in anxiety, depression and mixed anxiety-depression. In their study 72 out patients were participated, in which 18 were depressed only, 18 were anxious only and 18 were mixed (i.e. anxious and depressed) and were compared with 18 normal controls. Self-report measures and typical experimental tasks assessed memory biases. In their study, implicit memory was tested by word identification task and explicit memory was tested by incidental free recall task. Both the tests were depression relevant, anxiety relevant, emotional positive and neutral words.

The findings suggested depressed group showed a positive implicit memory bias and a mood congruent bias at free recall test i.e. explicit memory test. The anxious group showed an overall higher priming effect in implicit memory test, while mixed group showed no difference in implicit memory test as compared to normal controls, while in explicit test they recalled more anxious relevant words than other types of words.

Jayne and Carolyn (2004), investigated attentional and memory bias in persecutory delusions and depression. This study aimed to investigate attentional bias and implicit explicit memory biases for personally salient and
standardized emotional stimuli in persecutory delusions and depression. 36 participants with 12 in each group.
were interviewed to generate personally salient stimuli to employ within the cognitive tests. Standardized emotional stimuli were additionally employed as a control. Participants completed two probe detection tasks, one included personally salient stimuli and another including standard emotional stimuli. Memory for stimuli presented in this task was assessed by free recall task (explicit memory) followed by word completion task (implicit memory).

Results indicated that both deluded and depressed groups showed comparable retrieval of positive and negative words on implicit memory task. However, on explicit memory task, depressed group demonstrated a bias for negative stimuli, whereas, deluded group showed positive bias. Both groups did not show attentional bias to personally salient information. However, an attentional bias for standardized emotional stimuli was found in depressed group, although it was not specific to either negative or positive stimuli. Therefore, it was concluded that depression and persecutory delusions may share similar patterns of processing at an implicit level but differ at explicit level, because depressed group showed mood congruent bias while deluded group did not.

Lewis, Critchley, Smith and Dolan (2005) investigated brain mechanisms for mood congruent memory facilitation. In their study, they presented negative and positive words at study to the subjects and the subject’s mood were manipulated at test while using functional imaging to monitor brain activity. Subject’s mood ratings and heart rate variability both clearly indicated that mood manipulation was effective and memory performance also showed strong trend towards facilitation in congruent conditions. In functional imaging data, valence-specific conjunctions between encoding activity predicting subsequent memory in a congruent mood and
retrieval activity relating to mood congruent recollection revealed shared responses in subgenual
cingulated for positive valence and posteriolateral orbitofrontal cortex for negative valence, thus, supported the associative model. To elucidate the mnemonic basis of facilitation, independent of valence, they examined the shared correlates of positive and negative congruence and found that parts of episodic memory system were activated by congruence in correct rejection trials, but no part of this system was activated by congruence in correctly remembered trials.

Therefore, we can suggest that mood congruent facilitation occurs at the level of attempted recall rather than that of successful recollection. Hence, the above study showed brain mechanisms involved in explicit mood congruent memory facilitation.

Miranda and Kihlstrom (2005) investigated mood congruence in childhood and recent autobiographical memory. A total 86 undergraduate and graduate students, from age between 17 to 35 years participated in this experiment for pay or for course credit. Participants were assigned to one of the three conditions happy, neutral or sad.

Music for the mood induction included pieces of music used in the previous studies of mood and memory. Each selection was reported once to yield 90 minutes cassette tape for each mood condition two lists of 15 words each (total 30 words) were constructed from standard norms. Cue words were closely matched in terms of concreteness and frequency of use both within and between lists. Participants were randomly assigned to one of three conditions. After giving informed consent, participants reported their current mood on affect dimension, which ranged from -4 “extremely unpleasant” to +4 “extremely pleasant”. There was similar 9-point scale of
arousal, for which subjects were asked to mark about their arousal. After that subjects were listened to one of
three types of musical selection and were asked to feel the mood assigned to them. After listening for 10 minutes
they again reported their mood on affect dimension. Once the desired mood developed experimenter lowered
the volume
of music but allowed it to play until the subjects completed the memory task and subjects sit at the computer and read instructions on the monitor. Stimuli were randomly presented and subjects responses collected on a Macintosh computer running RSVP (“rapid serial visual presentation”) software. Participants were asked to recall the first specific event that they remembered was associated with the each cue, between kindergarten and fifth grade. If the cue preceded by the word “recent” they were asked to recall the memory when they entered in high school until the present moment, accept the anything that had occurred during experiment. As soon as he or she recalled the event, they were asked to press the key board and summarize the event in 1 or 2 sentences.

All the participants were asked to recall the event twice, one when they actually occurred (“then”) and how they remembered it at time of rating (“now”), because memories rated as being unpleasant tended to be rated as more pleasant now. Finally all participants were debriefed by the experimenter.

The purpose of the study was to investigate the mood congruency in explicit retrieval, regardless whether the events remembered occurred recently or in childhood. The results showed memories recalled by happy subjects in response to negative cues were less unpleasant than by sad subjects, and memories recalled by sad participants to positive cues were less pleasant than those recalled by happy subjects. The most pleasant memories were recalled by happy subjects to positive cues, while more unpleasant memories were retrieved by sad subjects in response to negative cues. Showing, thereby, the mood congruency effect in explicit memory in both happy and sad subjects.

Additionally, the findings of the above study provided support to the previous findings of mood congruency
(Bower, 1981 and Bullington, 1990). In contrast to the
findings of Salovey and Singer (1989), a similar pattern of effects was found for childhood memories as for recent memories.

Erickson, Drevets, Clark, Cannon, Bain, Zarate, Charney and Sahakian (2005) studied mood congruent bias in affective go/no-go performance of unmedicated patients with major depressive disorder. Twenty depressed patients and 20 healthy comparison subjects, matched for age, gender, and IQ, performed the Affective go/no-go Task as well as tests of attention and memory for non affective stimuli. Twenty currently depressed subjects, 10 men and 10 women were selected who met DSM-IV criteria for recurrent major depressive disorder and had illness onset before age 40 years. Subjects had not received psychotropic medications within 3 weeks of testing. Four depressed patients were naive to psychotropic medications, and 11 had been medication free for 1 to 8 years. Depression severity was rated by using the Montgomery-Asberg Depression Rating Scale. Twenty medically healthy comparison subjects with no history of psychiatric disorders and no first-degree relatives with a psychiatric disorder were matched to the subjects with major depressive disorder for gender, age, and intelligence. Subjects were excluded if they had ever met DSM-IV criteria for alcohol or substance dependence, or met criteria for alcohol or substance abuse within 1 year, or had a history of hypomanic episodes, or demonstrated full-scale IQ below 85, measured with the Wechsler Abbreviated Scale of Intelligence, or had clinically significant abnormalities on physical or laboratory examination. Written informed consent was obtained from each subject following full description of the study.

Three subtests were also used. The rapid visual information processing test, a continuous performance test, was
used to evaluate attentional processing. The pattern recognition memory test was employed to assess encoding, retrieval, and recognition of
The affective go/no-go task required subjects to respond to either happy or sad words. Eight words blocks, each containing 18 affectively valenced words (nine happy, nine sad), were presented. Single words appeared on a computer screen, and subjects were initially instructed to press the space bar for happy words (e.g., hopeful, serene) but not for sad words (e.g., glum, mistake). After two word blocks requiring responses to happy words, the instructions changed so that the space bar was to be pressed for sad words. Conditions were alternated in an HHSSHHSS pattern to create shift and nonshift response blocks. Each word was presented for 300 msec, followed by a 900-msec inter stimulus interval.

Subjects with major depressive disorder made more target errors during happy than sad word blocks. Healthy subjects showed the opposite pattern, making more target errors during sad than happy word blocks. Subjects with major depressive disorder required more time to respond to happy than to sad words, and healthy subjects required more time to respond to sad than to happy words.

Depressed patients and healthy subjects showed different patterns of performance on the Affective go/no-go task. Depressed patients made more omission errors when responding to happy than to sad words, and they responded more quickly to sad targets than to happy targets. Healthy subjects showed the opposite pattern for both error and response time variables. The mood-congruent processing bias was previously reported in medicated depressed patients, who also required more time to respond to positive words than healthy subjects.

These results thus extend this finding in unmedicated depressed patients. Taken together, the two studies suggeste
d preservation of a mood-congruent attentional bias despite pharmacological treatment.
On the affective go/no-go task, healthy subjects had longer latencies and made more omission errors in response to sad words than to happy words; these data suggested that the normative state is characterized by a positive bias. This phenomenon may conceivably confer resilience against the psychological impact of negative life events. In contrast, unmedicated depressed patients responded more slowly to happy than to sad words and made more omission errors during happy than sad word blocks. Large numbers of omission errors on the rapid visual information processing test suggested a generalized deficit in attention; therefore, this mood-congruent attentional bias occurred within the context of an attention deficit. However, the larger numbers of omission errors on the Affective go/no-go task were not wholly attributable to an attention deficit, because omission errors were not extended across affective valence. Equivalent performance by depressed patients and healthy subjects in response to sad words but impaired performance in response to happy words by depressed patients indicated that salient stimuli affect attentional processing in depression.

Moritz, Glascher, Brassen (2005), investigated the extent of mood congruent false and true memory recognition in depression. A group of 25 patients with depression and 28 healthy controls were participated in this study. Four lists were read to participants in sequence, followed by a recognition task. The words in each list were associated with a central but unmentioned theme word that was either depression-relevant (i.e., loneliness), delusion-relevant (betrayal), positive (holidays), or neutral (window). Whereas, it was expected to replicate the conventional mood-congruent effect in depression (better recognition of depression-relevant items), the available literature did not allow strong predictions to be made on the extent of mood congruent false
recognition in depression. Results showed that depressed patients learned emotionally charged material equally well as healthy participants but forgot
significantly more neutral material. A conventional mood congruent memory bias was not found, but relative to healthy controls, patients with depression committed more false recognition errors for emotionally charged words, particularly for depression-relevant items. The results confirmed that depressed patients are biased toward emotional material. It is suggested that researchers as well as clinicians should pay more attention to mood congruent false recollection, because it may undermine the validity of autobiographic reports in depressive patients and may represent a maintenance factor for the disorder.

Another study of mood congruent memory which found mood congruency in explicit memory was conducted by Gross (2006). The author carried out her research on mood congruent memory: effects on a lexical decision task and on free recall task.

In this study sixty-four university students were participated, among them thirty-eight were women and twenty-six were men, all the participants were not depressed as determined by Epidemiologic Studies Depression Scale (CES-D). The average age of the participants was 21.27 years. Participants were excluded if they had suffered from any mental disorder in their past as determined by self-disclosure, because it is believed that dysfunctional cognition, which relate to mood congruent thought, may result in relapse of depression in those with a history of depression. All the participants had learned English and had normal vision and hearing.

Volunteers received course credit if they were currently enrolled in an introductory psychology course.

Participants were instructed to think of a memory while listening to music presented on headphones. The music was selected from past research. The participants in sad mood induction were instructed to “think of a time in
your life when you felt very sad or depressed”. In natural mood participants were asked to “think of a time in your life when you felt rather overly happy nor overly sad” participants listened to the
Lexical decision task (LDT) was used to measure implicit memory. The LDT was administered on a Pentium 1 computer. The Micro Electronic Laboratory, version 2.0 (MEL 2) software was used to collect the response times and error rates. LDT was composed of a practice block and a test block. The practice block consists of 2 happy words, 2 sad words, 2 neutral words and 6 pseudowords. The test block included 15 happy words, 15 sad words, 15 neutral words and 60 pseudowords. The free recall test was used to measure explicit memory. Free recall task was administered on the same computer set up as LDT and was also presented using the MEL 2 software. This task was composed of practice and test blocks. The practice block included 2 happy words, 2 sad words and 2 neutral words. The test block included 10 happy words, 10 sad words and 10 neutral words. All words were equated in length and imagery. Following each trial the participants wrote down as many words as they could remember in any order on a piece of paper. The time allowed was limited to 3 min in test trial.

Participants were tested individually and were asked to read and sign the informed consent form. A demographic questionnaire, the CES-D Scale, and the first set of VASs was then administered. As the participant was completing the VAS the experimenter scored the CES-D to assess if the participant met the criterion for not being depressed. These measures took approximately 5 min to complete.

Upon completion of these tasks, the participant was told that she/he would now listen to a selection of classical music and was given memory instructions to think of an
event in his/her life. It was indicated that the participant would listen to the music and think of the memory for 7 min at which time the experimenter would return to and the computer testing would then begin. Then experimenter administered the second set of VASs. While the participant was completing the scale the music volume was decreased, then the participant was informed about the LDT. The experimenter remained in the room for the duration of the practice block, asked the participant if she/he had any questions, and then left the room. The participant exited the testing room to retrieve the experimenter once the LDT test trial was completed.

At this point the third set of VASs was completed. The participant was then informed that the next test would be a free recall test and experimenter asked to recall them and write the words on a piece of paper in any order that she/he choose. The time limit to recall was 3 min. the experimenter remained in the room in order to control the output time allowed.

Following the free recall task the fourth set of VASs was administered. While the participant was completing the VAS, the experimenter removed the headset plug and changed the music to the happy selection. The participant was debriefed and a final set of VASs was administered.

The results of the study showed that the majority of participants were induced into the desired mood and the interaction between mood condition and word type for average response time in the LDT was not significant. There was a significant main effect of word type. Pair wise comparisons indicated that happy words were identified as words significantly faster than neutral words and sad words. All other comparisons failed to reach
significance.

Additionally, the interaction between mood condition and word type for accuracy of response in the LDT was not significant. There was a significant main
effect for word type. Pair wise comparisons indicated that words were identified more accurately than pseudowords. Moreover, happy words were identified significantly more accurately than sad words but not more accurately than neutral words. All other comparisons failed to reach significance.

So far as free recall is concerned, the interaction between mood condition and type of word recalled was not significant though it showed strong tendency towards mood congruency because those in sad condition recalled more sad than happy and neutral words and participants in neutral condition recalled more neutral and happy words than sad words. There was no main effect of word type. Finally, there was a significant interaction between mood condition and mood of false alarms produced. There was no main effect for mood of false alarm produced.

Another study of mood congruent memory in explicit memory was conducted by Direnfeld and Roberts (2006). They investigated mood congruent memory in dysphoric subjects. Biases in incidental memory for self-referent adjectives and intentional memory were compared across nondysphoric, experimentally induced dysphoric and naturally dysphoric subjects. 48 subjects served as nondysphoric, 49 for experimentally dysphoric and 48 were served as naturally dysphoric subjects. Participants were selected from testing sessions in introductory psychology classes. Subjects were selected on the basis of scores on Beck depression inventory (BDI) for the study. On the day of the study participants again completed the BDI, if the participant’s depression states changed, they did not participate in study. The final sample comprised of 146 college students with mean age of 19 years.
Participants who scored 15 or above on BDI were assigned to the naturally dysphoric group, while those who scored 1-5 were randomized to the experimentally induced dysphoric group or non-dysphoric group. The naturally dysphoric group
received a neutral mood induction whereas experimentally induced dysphoric and non-dysphoric group received neutral or negative mood induction. Mood was assessed by Mood Visual Analogue Scale (MVASs).

Incidental memory was tested by presenting 21 adjectives with negative valence and 21 were positive. These words were individually presented on a computer monitor for 2000 ms in a random order generated individually for each participant. Participants were not told that they would need to recall these words until after they had been presented. Intentional memory task, involved 21 positively valenced words and 21 negatively valenced words. As in incidental memory task, words were individually presented for 2000 ms in a random order generated individually for each participant. Prior to the presentation of those stimuli, participants were instructed that they should try to memorize these words.

In order to establish a baseline level of mood, all participants completed the seven MVASs at the beginning of the study. Velten mood induction procedure was used to induce mood among the subjects. Instructions and mood induction statements were presented on a video display terminal. Each mood induction statement was presented on the display for a period of 15 sec. Following mood induction procedure MVASs was again completed to assess the effectiveness of the mood manipulation. In incidental recall subjects were instructed to decide as quickly as possible whether or not words displayed on the computer screen were self-descriptive by pressing “yes” or “no” keys. Following completion of the rating task, participants were told that they had 3 minutes to type as many words as they could remember from the previously presented list of words. After completing incidental memory task, mood was re-induced and participants again completed MVASs.
Participants next completed an incidental memory task involving 21 negative and 21 positive nouns. After intentional memory
task, mood was re-induced and participants again completed the MVASs. Finally subjects were asked to complete a battery of questionnaires including cognitive style, personality etc.

The findings of the Direnfeld and Roberts suggested that the effects of dysphoria on memory vary as a function of nature dysphoria, the valenced of the stimuli, i.e, negative or positive self-evaluative words, and the nature of the memory task, namely incidental versus intentional. The findings suggested that dysphoria has little effect on intentional memory and it appeared to be more strongly associated with incidental memory. In particular dysphoria was associated with impaired incidental memory for positive stimuli, in both induced dysphoria and those with elevated depressive symptoms and enhanced incidental memory for negative stimuli in subjects with elevated symptoms but not with induced dysphoria.

Relative to nondysphoric subjects with either elevated levels of depressive symptoms or with experimentally induced dysphoric mood states tended to experience deficit in incidental memory for positively valenced stimuli. These findings suggested that dysphoric mood states even a brief and transient nature can contribute to difficulties in the processing of positive information. On the other hand, enhanced incidental memory for negative information was only present among individuals with elevated level of depressive symptoms. Experimentally induced dysphoric mood states did not significantly differ from nondepressed individuals in terms of memory with negatively valenced stimuli.

Reid, Salmon, Lovibond (2006), investigated cognitive biases in childhood anxiety, depression and aggression. Their study was aimed to examine the extent to which children’s negative information processing biases are perv
asive across the cognitive modalities of attention, judgment and memory and further, whether such
Biases are specifically associated with anxiety, depression and aggression. 133 children between the ages of 8 to 14 years participated in their study. These subjects were assessed on an attention allocation task, a vignette interpretation measure and an explicit recall task. These children’s were also completed anxiety depression inventories and were rated by teachers on a measure of aggression.

The findings of Reid et al., a predominantly pervasive negative bias associated to childhood psychopathology. The results also showed that the high levels of anxiety depression and aggression were also associated with biases: attention to negative information and interpretation of ambiguous situation as negative and preferential recall of negative words.

One recent study was conducted by Ramel, Goldin, Eyler, Brown, Gotlib and McQuaid (2007). This study examined whether amygdala modulates memory for negatively valenced words before and after a sad mood induction in healthy individuals with and without a history of recurrent major depression.

Fourteen unmediated remitted depression (RD) and fourteen matched never depressed (ND) individuals were scanned using functioning magnetic resonance imaging (fMRI) while performing a self-referent encoding/evaluation task (SRET) preceding and following a sad mood challenge. After each SRET, participant’s explicit memory was assessed by free recall.

Fourteen RD and fourteen ND participants were matched on age gender and years of education and handedness, structural clinical interview for DSM-IV (SCID) was administered by trained raters to determine diagnostic status. Participants were excluded if they met criteria for a psychotic disorder in the last six months.
and never depressed control participants did not meet on any DSM-IV criteria on the SCID.
Approvals for procedures used in this study were obtained from Internal Review Board. Participants were recruited through web based community listing’s, posters and out patient psychiatry clinics at Stanford university. Following an initial telephone screening interview, potentially eligible participants came to laboratory. The questionnaires included the emotional-regulation questionnaire (ERQ), NEO-five factor inventory, short form (NEO-FFI), Response Style Questionnaire (RSQ) and state trait anxiety inventory (STAI).

Between 1 to 2 weeks later, eligible participants attended a scanning session, with the majority being scanned in the evening. Before the scan, participants completed questionnaires and interviews assessing mood (BDI-II and HRSD), affective state-positive and negative affect schedule-state version (PANAS-S) and sleepiness Stanford Sleepiness scale (SSS) and practiced the scanned task as in non experimental word stimuli. Participants were scanned as they completed a Self-Referent Encoding /Evaluation task (SRET) before and after sad mood induction (MIR). Visual Analogue scale (VAS) were used to assess current mood state-four time during scanning session. After each SRET, participants performed a free recall task to measure explicit memory. While the scanner was offline, following scanning participants completed questionnaires about their affective state, scanning experience and level of sleepiness and were debriefed and to assure that participants mood had returned to average level before they left.

The results indicated that sad mood induction, bilateral amygdale response during encoding of valenced words predicted increased recall of negative self-referent words for a subset of RD participants. This association was not present before the sad mood induction and was not evident in individuals without a history of depression,
regardless of mood state. These results suggested a role of amygdala in modulating
mood congruent memory during transient sad mood in individuals who are vulnerable to depression relapse.

Gillihan, Kessler, Farah (2007) conducted their study on memories affect mood. One of the fundamental assumptions about the relation between thought and feeling is that memories and mood affect one another. Generally the effects are assumed to be reciprocal: An individual’s mood influences the valence memories of the person recalls and thinking about memories with a certain valence can also affect person’s mood. Gillihan et.al, selected adults waiting for trains at the main train station in a large city in the eastern. Experimenters approached every subject who appeared to be over 18 years of age and was not obviously busy. The experimenters explained that they were conducting a research study and asked whether the individual would be willing to take “3 or 4 minutes to fill outa questionnaire for the study.” If the potential participants asked what the study was about the, experimenter explained that the questionnaire asked about the person’s memories about different experiences from the person’s life. The full sample comprised 326 individuals in which 56% were female. Of the individuals who reported their ethnicity, 75% white and non-white were 18% and 5% were Asian. The mean age was 39.6 years. There were three versions of questionnaires, namely, neutral, positive and negative. Each version of the memory questionnaire comprised of 19 questions about memories from the person’s life-mostly episodic memories, although each version included some personal semantic memory questions. Participants were instructed to make a single vertical mark on a 100 mm horizontal line to indicate their present mood. The line was anchored with “Worse than average” on one end, “Better than average” on the other, and “Average” in the middle.
The results indicate that only a small number of participants, 3.6% correctly guessed the hypothesis of the study and participants who correctly guessed the
hypothesis were excluded from the subsequent analyses and final sample size was 314 subjects. The results of the mood manipulation indicated that significant main effects of mood were found. Better mood reported in positive versus neutral memory condition, and better mood in neutral versus negative condition. The contrast between the positive and negative conditions revealed a highly significant difference. Therefore, the investigators rejected the hypothesis that valence of recalled memory had no effect on subsequent mood as well as the competing hypothesis of a memory incongruent effect on mood.

As predicted, individuals who were induced to recall more positive memories reported better mood than those induced to recall neutral or negative memories. The above study distinguished between mood-altering effects of memory recall per se and other factors such as motivational components that are involved in more explicit effort to use memories to influence one’s mood.

The foregoing review reveals that a good number of researches have clearly demonstrated evidence in favor of explicit mood congruent memory but found absence of mood congruency effect in implicit memory. Therefore, we can safely conclude that mood congruency occurred in explicit memory. But still there are some striking researches which demonstrated this effect in implicit memory. Hence, it will be reasonable to review such researches in the next section of this chapter. The next section will review all those researches which demonstrated mood congruency effect in implicit memory but not in explicit memory.

SECTION III

MOOD CONGRUENCY EFFECT IN IMPLICIT MEMORY
In the previous section of this chapter we reviewed a substantial body of evidence which provided support to explicit mood congruent memory. But still there
are some striking findings of the studies which clearly demonstrated mood congruent memory effects in implicit memory. Here we will review all those relevant studies which found this effect in implicit memory.

Section third of this chapter is devoted to those relevant studies which are concerned with mood congruency effect in implicit memory. Here we review all those studies which directly or indirectly provide support to mood congruency effect in implicit memory.

The first study in this context was carried out by Mathews, Mogg, May and Eysenck (1989). They conducted their study on anxious patients. They made use of an implicit memory test requiring word completion. Subjects were simply instructed to complete a word stem, with the first word that came to mind, and the extent to which the previous presentation of list words increased the tendency to produce list words as completions was the measure of implicit memory. The currently anxious patients produced more word completions than the normal control that corresponded to threat-related list words, but fewer word completions corresponding to nonthreatening list words. In other words, the currently anxious patients exhibited a negative memory bias in implicit memory. Mathews et.al included a group of recovered anxious patients. The performance of these patients on the word-completion task was closer to that of the normal controls than that of the currently anxious patients. This suggested that a clinically anxious mood state is required in order to obtain a negative memory bias in implicit memory.

Another study which suggested implicit mood congruent memory bias was conducted by MacLeod (1990). In this study both implicit and explicit memory was tested. This study was also conducted with anxious patients
and normal controls. In the first part of the experiment, threat related and neutral words were presented in a
modified stroop paradigm in which the colors in which the words were printed had to be named. Explicit memory was tested by recognition memory test and implicit memory was tested by assessing perceptual thresholds for words that had and had not been presented on the modified stroop. The extent to which perceptual thresholds were lower for previously presented words was the measure of implicit memory.

The findings of the present study revealed that anxious patients had significant negative memory bias on implicit memory but no evidence of memory bias was found on explicit memory.

Tobias, Wunderlich and Kihlstrom (1990), developed a set of novel implicit memory tasks that both minimized experimenter-supplied nominal cues and were classifiable as conceptually driven, in the hope that they would prove more sensitive to context cues. The subjects first studied a list of positive, negative and neutral words, about which they made either structural or semantic judgments. Following this encoding activity, they listened to 15 minutes of tape recorded mood music. Subject who were assigned for implicit memory condition, were then falsely informed that the tape was of “subliminal perception” variety, in which a list of words had been masked by the music. In order to determine whether the words had been subliminally perceived, they were asked to perform one of four tasks.

The first group was tested for free recall test, second was tested for cued-recall test in which first letter of the target was presented, third group was provided with cues representing broad conceptual categories, in the form of phrase completions: “the person felt__________” or “ the person bought the__________”. The fourth group was prompted with standard three-letter stems.
In all the conditions subjects were asked simply to list the first word that came to mind. A comparable set of cued recall memory tasks was also administered, in which subjects were specifically instructed to list items from the wordlist they had studied.

The findings revealed that there was a significant priming effect in each of the implicit memory task i.e., significantly more target than baseline words were appeared in the subjects lists. Moreover, cued recall test was affected by the level of processing at the time of encoding, but priming was not. The findings of the study provide evidence in favor of implicit mood congruent memory.

Richards and Whittaker (1990) completed a study, in which normal high and low in trait anxiety participated. Investigator presented a list of words to the subjects. Implicit memory was tested by word fragment completion task, in which subjects were asked to write down any word. They thought that fitted in the presented fragment.

The finding suggested that the high trait anxious subjects showed negative memory bias on implicit memory test. However, when an explicit memory test was used, there was no memory bias. Thus Richards provided clear evidence in favor of implicit mood congruent memory.

Bradley, Mogg and William (1994) investigated implicit and explicit memory for emotional words in 53 non-clinical subjects. The implicit memory test was a primed lexical decision task, which included anxiety and depression relevant words, and supraliminal and subliminal priming conditions. The explicit memory test was incidental free recall following a self-referent encoding task. Subjects were divided into high and low negative affect groups, differing in traits and state anxiety, and depression scores. The high negative affect group showed
greater subliminal priming of depression-relevant than neutral control words compared with the low negative affect group. This selective priming was more closely associated with depression than anxiety.
Mathews et.al (1989) obtained significant support to the prediction that anxious subjects will show an implicit but not an explicit memory advantage for threat related information. However, neither the reliability nor the generality of these findings have been established. In order to provide conceptual replication of Mathew’s et.al study MacLeod and McLaughlin (1995) conducted their study using different tests of implicit memory and explicit memory and an alternative type of encoding task. In their study tachistoscopic identification task was used as an implicit memory task, recognition task was used to measure explicit memory and colour naming stimulus words was used as encoding task.

These investigators used 16 generalized anxiety disorder patients and 16 non-anxious control subjects. As predicted, the anxiety patients showed a relative implicit memory advantage for threat related stimulus words, while the two subject groups did not differ in their explicit memory performance. The findings of the study provide support to implicit mood congruent memory bias.

One study which demonstrated mood congruency in implicit memory was undertaken by Bradley, Mogg and Miller (1996). They examined implicit memory in clinical and non-clinical depression. They studied implicit memory for depression relevant information. These authors carried out two experiments. In experiment 1, they investigated non-clinical subjects with high and low levels of dysphoria. In experiment
2, subjects who met DSM-III-R diagnostic criteria for depression were participated and their performance was compared with normal controls. Implicit memory was tested by primed lexical decision task, in which depression relevant and neutral words were used and suprathreshold and sub threshold priming was also assessed.

The findings of the experiment 1 revealed, dysphoric subjects showed greater subthreshold priming of depression words than non-dysphoric subjects. The findings of the experiment 2, showed that clinically depressed subjects showed greater subthreshold and suprathreshold priming of depression words than normal controls. The findings of the study clearly demonstrate implicit mood congruency in clinical and non-clinical depression.

The first and very important study which demonstrated the implicit mood congruent memory with conceptually driven tests conducted by Watkins, Vache, Verney, Muller and Mathews (1996). These researchers investigated implicit mood congruent memory bias in clinical depression. In their study clinically depressed and normal control subjects were participated. At study participants were randomly assigned to study one of two word sets. Each word set contained positive, neutral and negative words. Participants then completed a brief interference task. A free association task followed, which included association cues that were related to words from their studied word set and their unstudied word set.

They used two groups of participants in their study; clinically depressed individuals and non depressed controls. Depressed individuals were recruited from undergraduate psychology classes. A screening study was
conducted where students were administered the BDI along with a number of instruments relating to various psychological issues. Individuals with BDI score of at least 16 were scheduled for the experiment. Depressed participants had to have a BDI score of at least 16 at both
screening and the experimental session. They tested 33 individuals through the experimental protocol as potential depressed group participants, 13 actually met the criteria described above and were included in the depressed group. No participants were taking psychotropic medications.

Control participants were defined as those individuals who had BDI scores of 5 or less and who did not meet the DSM-III-R, diagnostic criteria for any mood disorder. They also did not report a significant history of depression as measured by Past Accounts of Sadness Test (PAST) confirmation of diagnosis was conducted through interview with the SADS-C. Controls included in the analyses were matched to depressed participants with regard to gender, and they also attempted to match for age as closely as possible. Each group contained 10 women and 3 men. Mean ages of depressed and control groups were 19.62 and 19.15, respectively. Both control and depressed participants who were recruited from psychology classes received partial course credit for their participation.

Following the screening study, appropriate participants were called and scheduled for the experimental sessions. After reading and signing the consent form, they were introduced for the study phase of the experiment. They were first randomly assigned to one of the two word sets. The set they were assigned, served as their studied (primed) word set, and the set they were not assigned were served as their unstudied word set (unprimed).

The word stimuli were presented on an IBM-compatible computer. Likewise, the distracter task and association were also presented through computer. The presentation of stimuli was programmed through the
Micro Experimental laboratory Software package. Participants were told that a number of words would appear on the screen, one at a time, and they were asked to imagine themselves in a scene that
involved themselves and the word presented. They were asked to press a button on the key board “as soon as you have a clear image of the scene”. Following a 1 sec “get ready” prompt, each stimulus word appeared on the screen for 15 sec. after imaging each scene the participants were asked several questions about the scene: whether the scene was an actual scene of their past or imaginary one, whether they were principal character of the scene, they were asked to rate the vividness of the scene on a 9 point Likert-type scale, they were asked to rate the pleasantness and unpleasantness of the scene on a 9-point Likert type scale.

Following this sequence, the next stimulus word was presented. Five practice trials were presented, followed by the experimental trials. The stimulus words were presented in random order. After presenting 24 words in the study phase, all participants were exposed to the brief distracter task. They were shown an array of numbers or letters, or both on the screen, and their task was to determine as quickly as possible whether the letter m was located in the array. This task took approximately 30 sec to complete.

Participants were then introduced after the test phase. In the introduction of this phase an attempt was made to disassociate study and test. They were asked to participate in a “developmental experiment” and were told that we needed to “develop some materials for future experiment.” They were told that their task was to produce as many one-word associations to the cue words as possible and that for some words (categories) the best way to produce associations was to list as many instances of the category as possible. However, other cues were not clearly categories, and with these words “you will probably produce more associations if you think of words that are closely related to the words (like synonyms)”. In each trial a ‘get ready’ prompt appeared on the screen
along with a tone (to reorient the participants). Following the
prompt, a cue appeared on the screen and participants were asked to produce as many associations to the word as possible. Each cue remained on the screen for 30 sec participants were given one practice trial which was, then followed by 48 experimental trials. 48 experimental cues words were presented either from studied or unstudied word lists. Responses were recorded through audio tape, and the experimenters were also made a written record of the critical responses.

After the free association task, participants were administered BDI and other measures and finally they were debriefed. The debriefing interview included open ended questions regarding the participant perceptions of the purpose of the study, how they came up with the associations in the free association task and their awareness of implicit memory task. The authors finally, asked a question regarding estimation of percentage of positive and negative words in the encoding task.

Results of the study showed that all the participants produced a large number of associations to neutral cues. The mean positive association bias score for control was much higher than for the depressed participants. In the priming analyses, a main effect of valence was found. Participants produced more neutral unstudied targets than positive or negative. A strong effect of priming was found, which showed implicit memory effects. And neutral words were not primed easier than positive and negative words. More importantly, the control group had significantly higher priming of positive targets as compared to depressed participants, and conversely, depressed participants had significantly higher priming scores of negative targets. And the groups did not differ on the priming of neutral targets.
Overall, this study represents the first demonstration of mood congruent memory bias on a conceptually driven implicit memory tests. Depressed participants
were found to have greater priming of negative words and less priming of positive words than control.

Bazin, Perruchet, Feline (1996) investigated mood congruence effect in explicit and implicit memory tasks. These authors compared depressed, schizophrenic and controls. 23 patients fulfilled DSM III R criteria for major depressive disorder. Performances were compared to those of 15 in or outpatients fulfilling criteria for schizophrenia and 37 normal subjects serving as euthymics controls. All subjects were submitted to a standard cued recall test and to a word stem completion test devised to assess the effect of the initial presentation without the explicit retrieval of the words being necessary. The material consisted of emotionally negative and positive words.

The findings of the study showed mood congruence effect in the implicit memory task while leaving the explicit memory unaffected but this effect was found only in patients who had recovered from their major depressive episode. This effect was not found in depressed patients and schizophrenic patients and in controls. These results clearly demonstrated mood congruency in implicit memory.

Watkins, Martin and Stern (2000) investigated mood congruent memory in depression using four implicit memory tests. Two tests were perceptually driven tests and two were conceptually driven tests. They tested depressed and non depressed participants in one of the four implicit memory tests. Participants studied negative and positive adjectives. Each adjective was studied in either a perceptual or a conceptual self-referent conceptual manner. Following two distracter tasks, participants completed one of four implicit memory tests. Two perceptually driven tests were word stem completion test and word identification test and two conceptually
driven tests were free association test and word retrieval test. 67 clinically depressed and 67 non depressed
controls participated in this study. In each group 15 male and 52 females participated.
All the participants were undergraduate students and received course credit or financial compensation for their participation. Depressed participants scored at least 15 on the Beck depression inventory (BDI) at both screening and testing and also met the diagnostic criteria for either major depression or dysthemia on DSM-IV.

Participants diagnosed with bipolar depression were excluded from the study. Non depressed controls were defined as those individuals who had BDI scores less than 6, reported fewer than two episodes of unipolar depression in the past and no dysthemia history, and did not meet the diagnostic criteria for major depression or dysthemia. Investigators matched the control subjects to depressed participants with regard to gender, age and other variables.

Participants were tested individually, and told them the experiment “involves some computer tasks which are designed to investigate how you process certain words”. After signing the informed consent, all participants participated in the study task. Words were presented serially, participants were required to respond to one of two questions with each word designed to tap different level of processing. In the structural encoding condition, they asked participants to count the number of ascending and descending letters in the word. Subjects were instructed to respond by pressing the key corresponding with their responses. In semantic encoding condition, investigator told them “with some words we will ask you to relate them to yourselves. We will ask you to estimate when was the last time you experienced something related to the word.” 40 words were presented to the subjects. Half of these words were presented in the structural encoding condition and half in the semantic condition. Following the study task, participants completed the two distracter tasks to dissociate between study
task and implicit memory task. Implicit memory task were introduced in the following
manner “we need to develop some materials for a future study”. Finally the participants were then debriefed and awarded compensation for their participation.

The findings indicated that no mood congruent memory bias was found in the perceptually driven implicit memory tests, and no mood congruent memory bias was demonstrated in one of the two memory tests namely word recognition test, but only for words that were encoded conceptually. For words studied conceptually, the four implicit tests showed significantly different pattern of mood congruence. No reliable implicit mood congruent memory differences were found between tests for perceptually encoded words. Reliable priming was demonstrated on all four tests, but perceptually encoded words do not show significant priming of the two conceptually driven tests. All the four tests showed depth of processing effect. Results support that mood congruent processes are limited to conceptual processing. The findings supported the mood congruency in implicit memory tests.

Another study was reported by Jenkins and McDowall (2001). They investigated implicit memory in depression. These authors examined implicit mood congruent memory with conceptually driven and data driven or perceptually driven tests. In their study ten participants diagnosed with depression were participated. These patients were tested for implicit and explicit memory tasks. Which were designed to tap either predominantly perceptual or conceptual processes. Their performance on implicit and explicit memory tasks were assessed by either with conceptually driven or data driven tests.

The findings showed that depressed participants demonstrated performance deficits on both implicit and
explicit conceptual tasks, i.e. category association and free recall task, but showed intact performance in the word fragment completion task which was used as implicit perceptual task. These results suggested that people with severe
depression showed deficits occur in conceptual processing under both explicit as well as implicit tasks.

In another study Watkins (2002), investigated implicit memory in depression. Author described research conducted in his laboratory concerning implicit mood-congruent memory bias in clinical depression. The authors described that implicit mood-congruent memory does not appear to exist when perceptually driven tests were used. Implicit mood congruent memory was found when conceptually driven tests were used, but not all conceptually driven tests demonstrated implicit mood congruent memory bias. Therefore, He concluded that conceptual processing was necessary, not sufficient for demonstrating implicit memory bias in depression.

Another important study in this context was carried out by Ellwart, Rinck and Becker (2003). They investigated memory impairment and mood congruent memory bias in depression. Participants were tested for implicit memory as well as explicit memory performance. Thirty-six severely depressed inpatients that fulfilled DSM-IV criteria for major depressive disorder and thirty-six healthy controls were participated in the study. All the participants were matched for sex, age and educational level. Explicit memory was tested through free recall test and implicit memory was tested through anagram solution task.

Ellwart et.al. suggested that depressed patients and controls differed in explicit memory performance, depending upon the amount of cognitive distraction between incidental learning and testing, while implicit memory was unaffected. Moreover severely depressed patients showed a mood congruent memory bias in implicit memory but not in explicit memory. Therefore, Ellwart et.al, clearly demonstrated mood congruent memory bias in implicit memory and failed to find this effect when explicit memory was tested. An extensive
review of studies on implicit mood congruence
memory was done by Barry, Naus and Lynn (2004). These authors reviewed the depression and implicit memory literature emphasizing studies addressing possible mood congruent memory biases in depression.

Although some studies indicated this effect in implicit memory while others failed to find this effect. These studies differed in terms of variety of dimensions like, participant’s population, sample size, implicit memory task, depression status, etc. A thorough review of the literature suggested that these are not important considerations for presence and absence of this effect, rather, the cognitive framework of transfer appropriate processing may be used as a tool to organize and explain these findings. In particular the role of conceptual and perceptual cognitive processes by depressed participants performing implicit memory task were examined in the context of perceptual and conceptual task demands. Examining unconscious influences on emotion could have important implications for understanding and treating depression.

Colombel (2007) conducted his research on memory bias and depression. Due to the discrepant evidence of implicit memory bias, few authors decided to investigate the issue further and used a primed lexical decision task with both sub and suprathreshold priming as a measure of implicit memory. It permits to separate the contributions of implicit and explicit memory processes. Colombel, used a non-clinical sample and confirmed the results obtained by Bradly et.al (1994) suggesting that the lack of depression-congruent effect in suprathreshold priming for non-clinical subjects might be due to the use of explicit processes which counteract the negative bias in implicit priming found in the subthreshold condition.

The findings of the above researches demonstrated mood congruency effect in implicit memory, and found
absence of this effect in explicit memory. However, there are some researches which provide striking evidence of mood congruency in both types.
of memory i.e, implicit as well as explicit memory. Therefore, here we would review those studies which demonstrate mood congruency effect in both types of memory.

Ruiz-Caballero and Gonzalez (1994) conducted their study on implicit and explicit memory bias in depressed and nondepressed subjects. Two experiments was carried out to investigate a possible mood congruent memory bias in explicit memory (free-recall test) and implicit memory (word-stem completion task) for positive and negative words in depressed and non depressed college students. A comparison of implicit and explicit mood congruent memory bias should help to reveal cognitive processes involved in this effect. The results of both experiments indicated that depresses subjects showed a memory bias not only on the traditional explicit memory task, but on the implicit memory task as well. Therefore, mood congruent memory was found on both types of memory.

Another study which found mood congruency in both types of memory was undertaken by Bradley, Mogg and Williams (1995). They examined implicit explicit memory biases in 19 clinically depressed, 17 clinically anxious and 18 normal controls. All the subjects were between the ages of 18 and 65 years. The implicit memory test was a primed lexical decision task, with anxiety and depression relevant words and subthreshold and suprathreshold primes. The explicit memory test was incidental free recall test of self referenced words. The depressed group showed greater suprathreshold and subthreshold priming effects for depression words and recalled more depression words than the other two groups. Results suggested that clinical depression but not clinical anxiety is associated with mood congruent biases in both types of memory processes.
Bradley, Mogg and Miller (1996) conducted two additional experiments, in which they combined features of each of their studies discussed above. Bradley et al.
(1996) hypothesized that dysphoric individuals would show less priming for neutral words than for depression
words, in comparison with nondysphoric individuals, especially in the subliminal condition. Their results
supported this hypothesis, showing subliminal priming of depression-related words by non-clinical dysphoric
participants. In Experiment 2, they hypothesized that clinically depressed individuals would show the same
pattern of results as the dysphoric individuals from Experiment 1. In addition, they predicted that the enhanced
priming of depression-related words by depressed individuals would also extend to supraliminal priming.
Bradley et al. (1996) found enhanced subliminal priming and supraliminal priming of depression-related words
in clinically depressed participants. Together, these results replicated their previous findings, and they concluded
depression-congruent effects in automatic memory processes seems more consistent with the schema and
network theories. In other words, because certain implicit tasks rely on perceptual priming, whereas others rely
on conceptual priming, this distinction needs to be experimentally manipulated with regard to depressed
participants. Further, Bradley et al. noted that purely perceptual priming implicit memory tasks may mask
possible mood-congruent effects if the perceptual priming effects are masking “emotion-congruent priming
effects”.

Ruiz-Caballero and Gonzalez (1997) carried out a study in which they investigated the effect of level of
processing on implicit and explicit memory in depressed mood. The main aim of this experiment was to assess
the presence of a bias for negative information in explicit memory and implicit memory tasks among
subclinically depressed subjects as compared to non-depressed subjects, using the typical levels of processing
manipulation. To measure explicit memory free recall test was used and implicit memory was assessed by stem-completion test. The results of
their study showed the existence of a mood-congruent memory bias for both implicit and explicit memory in depressed subjects.

A thorough review of the literature reveals that there are numerous researches which demonstrated mood congruency effect in explicit memory but not in implicit memory whereas considerable number of researches demonstrated mood congruency in implicit memory but not in explicit memory and still few studies showed mood congruency effect in both types of memory. In order to resolve the existing controversy it is highly reasonable to explore another variable which may have differential effect on implicit and explicit memory. The types of tests used in these researches for instance, may be an important variable to dissociate implicit and explicit memory. The present research also assesses the composition of tests in these researches. The next section of this chapter will review all relevant studies which demonstrate the differential effect of conceptually driven and perceptually driven tests on implicit and explicit memory.

SECTION IV
DIFFERENTIAL EFFECTS OF PERCEPTUALLY DRIVEN AND CONCEPTUALLY DRIVEN TESTS ON IMPLICIT AND EXPLICIT MEMORY

As stated earlier, the fourth section of this chapter reviews those studies which demonstrates the differential effects of perceptually driven and conceptually driven tests on implicit and explicit memory.

Conceptually driven tests require participants to activate conceptual processes to complete the task. If a test requires the participants to attend to the meaning of test cues, it is said to be conceptually driven test. Conceptually driven tasks rely on the semantic meaning of the study items and less upon perceptual
characteristics of the items.
In contrast to the conceptually driven tests, in perceptually driven tests cognitive processes of the participants are guided by perceptual feature of the stimuli. Perceptually driven tests challenge the perceptual systems. Perceptually based tasks rely on processing the physical features of the presented stimulus in order to perform the tasks.

Tenpenny and Shoben (1992) conducted three experiments to test the conceptually driven and perceptually driven distinction with respect to implicit and explicit memory.

In experiment 1, subjects performed either semantic cued recall or category membership verification task, after studying the target words in a variety of contexts. Memory was then tested using either semantic cued recall or verification. Subjects in semantic cued-recall group used either a typical or an atypical member of target’s category as a cue for the target. Subjects in verification group saw a category label followed by the target and a typical or atypical member of the same category. Subjects then pressed a key to indicate whether both items belonged to the given category. If semantic cued recall and category verification are both conceptually driven tasks and if typicality influences conceptually driven processing then conceptually driven or perceptually driven view predicts that the two tasks should show similar effects of typicality.

24 subjects participated in this study. Fifty-four nouns, 1 or 2 from each of 35 categories, served as critical target words. Subjects were informed that they would see a list of nouns and would be tested later on their memory for them. Subjects were seated in front of IBM personal computers. The computer displayed the first context word in the center of the screen for 3,250 ms and then replaced it with the target word for 3,250
ms. Then the screen cleared and remained blank for 750 ms before the next trial began. This continued until all 81 study items had been presented.

In semantic cued-recall, subjects were instructed to try to recall a word that was similar in meaning to the provided cue. In verification task, subjects were instructed to that they would be given a category name followed by two words and that they should decide whether both items were members of the category. They were also told that some of the items would be from study list and some would not.

The findings of the experiment 1 showed that the two conceptually-driven tasks were affected differently by the typicality manipulation, performance on both tasks was best when study context and test cue were the same. Contrary to predictions of the conceptually-driven and perceptually-driven view, test-cue typicality had opposite effects on category verification and semantic cued recall. This dissociation suggests that conceptually-driven and perceptually-driven distinction misses some important differences between the two tasks.

Although the first study indicated that two conceptually driven tasks will dissociate on typicality, it remained to be seen whether similar dissociation can be found among perceptually driven tasks. Consequently, second experiment was an attempt to find dissociation between two perceptually driven tasks. Subjects studied the target words in several different contexts, neutral context, graphemic context and semantic context. At test subjects performed one of the three tasks: graphemic cued recall, semantic cued recall and fragment completion. If the conceptually driven and perceptually driven distinction is correct then encoding manipulations should have similar effect on fragment completion and graphemic cued recall but different effect on semantic cued recall.
In experiment 2a, 36 subjects participated. All the participants were students and were native speakers of English and were paid $3.50. Ninety-six nouns, 2 from each of 48 semantic categories, served as test items. Study phase remained same as in experiment 1. Subjects in the graphemic cued recall condition were asked to recall a target word similar in spelling to be presented cue, subjects in semantic cued recall condition were asked to recall a target word similar in meaning to be presented cue. Subjects in fragment completion test were informed that some of the fragments were fragments of target words and other were fragments of words they had not studied. They were asked to complete as many fragments as possible regardless of whether the response word had been studied.

The findings revealed that graphemic cued recall facilitation was greatest for the words studied with a graphemic context words but semantic cued recall facilitation was greatest for words studied with a semantic context word. Graphemic cued recall and fragment completion are assumed to be perceptually driven tasks which showed encoding context had a marked effect on performance in graphemic cued recall and it had no effect on fragment completion. Thus fragment-completion priming was unaffected by encoding context, graphemic cued recall on the other hand showed a mixed advantage for targets studied with graphemically similar words.

A possible criticism of the above experiment is that the superiority of both the graphemic encoding condition in graphemic cued recall arose from the fact that study and test cues were identical in those conditions. Hence, one could interpret above results as simply demonstrating an advantage for intralist cues over extra list cues. To
rule out this alternative interpretation authors conducted experiment 2b. In this experiment authors repeated the cued recall portion of the experiment using extralist test cues. 24 students participated in this study. Each subject was paid $3.50. The target
words and study context words used in experiment 2a were also used in experiment 2b but new graphemic and semantic test cues were generated. Procedure remained same as in experiment 2a. The results of the study replicated semantic cued recall results of experiment 2a. But in contrast graphemic cued recall task was about equal in graphemic and neutral context condition and somewhat lower in semantic context conditions. However, these results were not statistically significant.

After these findings investigators felt that graphemic cued recall merited further investigation particularly because it is a relatively new task and has not been studied as much as has fragment completion. In experiment 3, investigators examined the effect of word frequency on three tasks that have been classified as perceptually driven: fragment completion, graphemic cued recall with highly similar cues and graphemic cued recall with less similar cues.

27 subjects participated in this study, all the subjects were students who participated to partially fulfill a requirement for their introductory psychology course. The instructions and procedures for the study phase were similar to those used in experiment 2a and 2b. Subjects were told that the word preceding the target would (a) sometimes be very similar to it, matching to almost all of its letters (b) sometimes be moderately similar matching on just first three letters and (c) sometimes be dissimilar to it matching only on the first letter.

The findings of the experiment 3, showed that the three test tasks were dissociated with respect to word frequency. In the high similarity graphemic cued-recall task, there was advantage for low-frequency targets, but in the fragment completion task there was an advantage for high-frequency targets. Facilitation on the moderate-
similarity graphemic cued-recall task was nonsignificantly greater for low frequency targets.
Overall, results provided little support for the conceptually and perceptually driven distinction. In all three studies, authors found dissociation between tasks believed to emphasize the same kind of processing.

Craik, Moscovitch and McDowd (1994) conducted their study on the contributions of surface and conceptual information to performance on implicit and explicit memory tasks. Four experiments examined the effects of perceptual and conceptual processing operations on 2 implicit and 2 explicit memory tasks. Results showed an advantage of visual over auditory presentation for word-fragment completion, word-stem completion, and word-stem cued recall; there was no such advantage in recognition memory. Conceptual processing had no effect on the implicit tasks, a small effect on word-stem cued recall and a large effect on recognition. It was concluded that there is no necessary trade-off between the two types of information. Speculatively, the use of perceptual information may be all or none and relatively automatic, whereas the use of conceptual information appears to be graded and more under conscious control.

Another study in this context was examined by Small, Hultsch and Masson (1995) examined the pattern of age differences on one conceptually based (fact-completion) and one perceptually based (stem completion) implicit test of memory, as well as two explicit tests of memory (fact and word recall). Tasks were administered to 403 adults from three age groups (19-34 years, 58-73 years, 74-89 years). Significant age differences in favor of the young were found on stem completion but not fact completion. Age differences were present for both word and fact recall correlational analyses examining the relationship of memory performance to other cognitive variables indicated that implicit tests were supported by different components than the explicit tests,
as well as being different from each other.
Nyberg and Nilson (1995) investigated the role of enactment on implicit and explicit memory. Enactment during the encoding of simple imperatives has been found to improve substantially performance on conceptually driven explicit-memory tests. In two experiments the effect of this manipulation on a conceptually driven implicit test (category association) was studied. A conceptually driven explicit test (free recall) was also included. In Experiment one three different study conditions (enactment with real objects, reading, and generation) were considered. In Experiment two there were two study conditions (enactment with imaginary objects and reading). Compared to reading, generation was found to improve the performance on both free recall and category association, whereas enactment affected free recall only. In a final experiment subjects imagined that they performed the tasks and this manipulation was found to improve the memory performance on both tests. Taken together, this pattern of results is interpreted as suggesting that free recall and category association have a process in common that is sensitive to semantic processing at study (promoted by generation and imagery, but not by enactment), and that free recall involves a retrieval process in addition that is facilitated by a rich encoding environment (provided by enactment). Therefore, we can suggest similar effects of conceptually driven tests on implicit and explicit forms of memory.

Mulligan (1996) conducted their study on the effect of perceptual interference at encoding on implicit memory, explicit memory and memory for source. Interfering with stimulus identification can enhance later explicit memory performance. This counter intuitive phenomenon was investigated in 5 experiments. Perceptual interference enhance category-cued recall (a conceptually driven explicit test) but had no effect on a comparable
implicit memory test, category-exemplar production. This dissociation was obtained across higher levels of priming and with high frequency as
well as low-frequency exemplars. Furthermore, although perceptual interference enhanced old-new recognition memory, it did not enhance rhyme recognition (a data-driven explicit test) or source discriminability.

Explanations based on enhanced semantic elaboration or enhanced encoding of spatio-temporal context do not account for the perceptual-interference effect. An account based on compensatory processing of higher level perceptual representations remains viable and was discussed in terms of the transfer-appropriate processing framework and the item-specific-relational distinction.

Weldon and Coyote (1996) conducted a study entitled failure to find the picture superiority effect in implicit conceptual memory tests. Five experiments test the hypothesis that pictures engage more meaningful processing than words, authors predicted that pictures would produce more priming on category production and word association, as they do in free recall.

In all the five experiments participants were undergraduates. Most of were volunteers who participated for credit in lower division psychology courses but those in experiment 1 b were paid $ 5.00 for their participation. All were native English speakers, had normal vision and participated in only one of the reported experiments. Materials for category production test and word association test was 48 target items selected from past researches.

Participants were told that they were taking part in a study to help prepare material for future experiments on perception and problem solving. During encoding phase they were instructed to pay attention to each item and were not told they would receive a memory test. Item were presented for 5 sec each either on slides or by computer.
After encoding phase participants were given a filler task either completing two Meta cognition questionnaires for 9 min or rating truthfulness of proverbs for 7 min.
Participants were then administered the test. For the implicit category production test (experiment 1 and 4), they wrote the first eight exemplars of the category that they could generate. For the implicit word-association test, participants wrote the first one or two words that came to mind that was related to stimulus item. For explicit tests (experiment 3), participants were told they were receiving a memory test and should use the category label or stimulus term to help them remember the pictures and words from the study list. After completing the category or association test all the participants were given a free recall test and were asked to recall as many pictures and words as possible. This was included as a manipulation check for the picture superiority effect on a standard free-recall test.

Experiment 1 was conducted to determine whether the picture superiority effect could be obtained on the category production test, which have characterized as an implicit conceptual test. The results showed failure to provide evidence for a significant picture superiority effect on the implicit category production task.

Experiment 2 was carried out to determine whether picture produce more priming than words on implicit word association task, which have characterized as an implicit conceptual test. Again there was no evidence for picture superiority effect on implicit word association test.

Experiment 3 was conducted to test the possibility that the items used in previous experiments were not able to detect differences between pictures and word processing. To examine this idea, the tests were administered as explicit tests in which participants were instructed to use the category label or stimulus cue term as a clue to help them recall the words and pictures they studied earlier. The findings of the experiment 3, revealed that when
administered as explicit tests both the category production and cued associate tests showed significant picture
superiority effect,
indicating they are sensitive to differences in picture and word encoding. Thus picture and word produce
dissociation between the implicit and explicit tests, suggesting that different processes are engaged on these
types of test. Hence conceptual implicit memory tests and conceptual explicit memory tests have different
processes.

Experiment 4, a second possible explanation of failure to obtain picture superiority effect on the implicit catego
ry production and word association tests is that they have been incorrectly characterized as conceptual tests. That
is these tests may be not sensitive to meaningful or conceptual encoding operations. Thus, it was important to
demonstrate that these particular study and test items were in fact able to reveal differences in conceptual
processing. To do this level of processing manipulation was used. For the deep processing task participants
rated the pleasantness of each item. For shallow processing task instructions depended on the stimulus type. The
results showed that the implicit category production test is sensitive to manipulations of meaningful processing at
encoding. Of course cross-experiment comparison once again failed to obtain any notable advantage of picture ove
r words.

Experiment 5 was conducted to determine whether word association is sensitive to conceptual processing. It
was conducted like experiment 4, except that participants performed the implicit word association test. Overall
evidence suggests that the word association materials used in the experiment was sensitive enough to detect
differences in meaningful processing.

The results can be summarized simply. Contrary to author’s predictions, in the first two experiments, they
obtained no reliable evidence of a significant picture superiority effect on the implicit conceptual tests. In experiment 3, they demonstrated that this was not because the materials were insensitive to differences in picture and word processing, because when the tests were administered as explicit cued recall tests,
pictures were recalled better than words. In experiment 4 and 5, they demonstrated that the initial findings were not due to insensitivity to conceptual processing, because the implicit tests exhibited significant level-of-processing effects.

Mulligan and Hartman (1996) conducted their study on divided attention and indirect memory tests. In two experiments they investigated the effects of dividing attention during acquisition on conceptually driven and perceptually driven indirect memory tests. Subjects read a list of words with or without distraction. Memory for the words was later tested with an indirect memory test or a direct memory test that differed only in task instructions.

In Experiment 1, they examined the effects of divided attention on the conceptually driven test of category exemplar production and two variants of category-cued recall. During the study portion of this experiment, subjects were presented with a randomized list of 48 words, consisting of six exemplars from each of eight taxonomic categories. The study list was presented under either full or divided attention conditions. On the memory test, subjects were presented with a set of category names to use as memory cues. In the category-exemplar production task the subjects were presented with 16 categories cues (8 studied categories and 8 new categories) and asked to produce 8 exemplars from each category.

The subjects were 84 undergraduates. Subjects participated as part of an introductory class requirement. Subjects were tested individually. The experiment consisted of three parts: a study task, a distracter task, and a memory test. At the beginning of the experiment, subjects were informed that they would perform several
different tasks some having to do with memory and some having to do with language abilities and problem solving.
During the study task, each study item was displayed in the center of a computer screen for 3 sec. Subjects were instructed to read each word loud and to try to remember the words for a later memory test. Subjects in the divided-attention condition simultaneously performed the digit-monitoring task. These subjects were told to monitor the digits for strings of three odd numbers in a row and to tap a pen on the desk whenever they detected a target string.

Following the presentation of the words, subjects completed a 3-min distracter task. The distracter task used was a stem completion task with city names. After the distracter task subjects were given one of the three memory tests. In the category-exemplar production task the 16 category names were displayed one at a time on a computer screen. Subjects were instructed to say aloud as rapidly as possible the first eight category exemplars that came to mind. An experimenter recorded the subject’s responses and no time limit was imposed. When eight exemplars were produced the experimenter signaled the subject to proceed to the next category by pressing the space bar on the computer keyboard. After subjects completed the category-exemplar production task they were asked a series of questions (the awareness questionnaire) to assess whether they had noticed the relationship between the study task and the memory test and the extent to which they had deliberately tried to retrieve study items.

The modified category-cued recall was identical to the category exemplar production task in all but instructions. As in the category exemplar production task, subjects were presented with the 16 category names (8 studied and 8 new) one at a time. They were told that this was a memory test. In the category-cued recall test
subjects were presented with the eight category names that corresponded to the study list. The category names were displayed, one at a time on a computer screen. The
subjects were instructed to use the category cues to recall members of the category that had been studied previously. No time limit was imposed.

The results of the experiment 1 suggested that subjects in the divided attention condition were able to identify virtually all study words while simultaneously identifying most of the target sequences. The results from category exemplar production task indicate significant overall priming in that more studied words than new words were produced, however, dividing attention decreased the amount of priming. The data from modified category cued recall test indicate that studied items were produced more frequently than were nonstudied items, but that dividing attention decreased the differences between studied and new items. In other words, divided attention also affected the direct version of the category-exemplar production task. The results of the current study indicate that divided attention has the same effect on a direct and on indirect version of the category-exemplar production task.

Divided attention did not produce dissociation between direct and indirect versions of a conceptually driven memory test. The complementary prediction is that divided attention will produce dissociation when a perceptually driven indirect test is compared to a direct version of the same task. In experiment 2 authors examined the effects of divided attention on the word-fragment completion test and its direct test counterpart, word-fragment cued recall. The word-fragment cued recall test consisted of the identical test cues and types of responses as word-fragment completion differing only in the instructions to the subject. The subjects were 56 undergraduates, who participated as part of an introductory class requirement.
Subjects were tested individually. The experiment consisted of three parts: the study task, the distracter task and a memory test. The study and distracter tasks were identical to those in Experiment 1. After the distracter task subjects were given one of
the two memory tests. For both tests, subjects were given a sheet of paper with the 104 fragments that were
numbered and arranged in three columns. In the word-fragment completion task, subjects were asked to try to
complete each word fragment with an appropriate word. No mention was made of the relationship between this
task and the study task. In the word-fragment cued recall test the subjects were told that their memory was being
tested. They were also informed that some of the fragments corresponded to words from the study list and some
did not. The subjects were asked to try to recall words from the study list that completed the fragments and told
that if they could not do so to complete the fragment with any appropriate word that came to mind. These
guessing instructions were used in an attempt to equate response bias across the direct and indirect tests.

The findings of the experiment 2 suggested that dividing attention had no effect on priming in the word
fragment completion test but a significant effect on performance in the word-fragment cued recall test, and
demonstrated that divided attention produces dissociation between a direct and an indirect memory test. Results
of both experiments showed that divided attention decreased priming in the category-exemplar production test
but not in the word fragment completion test. In other words divided attention produced dissociation between
these two indirect memory tests. In contrast, divided attention had similar effects on performance in the direct
versions of both tests. Thus the findings indicated that with regard to the effects of attention, a conceptually
driven indirect memory test is more similar to direct tests of memory than to a perceptually driven indirect test.
The finding of the present study clearly demonstrated the differential effects of perceptually driven and
conceptually driven tests on implicit and explicit memory.
Monti, Gabrieli, Reminger, Rinaldi and Wilson (1996), the effects of aging and Alzheimer’s disease (AD) on conceptual explicit and implicit memory were examined by Monti, Gabrieli, Reminger, Rinaldi and Wilson (1996). Three groups of participants: patients with AD, age-matched, older control participants and younger control participants made deep (semantic) or shallow (non semantic) judgments about low-dominant category exemplars. Explicit memory was measured by category cued recall and implicit memory was measured by category cued recall and implicit memory was measured by priming on a category-exemplar generation task. Younger participants had enhanced cued recall and priming following deep, relative to shallow, encoding; this indicated that both memory measures were conceptually driven. Aging reduced explicit, but not implicit, test performance, and it did not reduce conceptually driven processes for either test. In contrast, AD reduced explicit and implicit test performance, and it impaired conceptually driven memory processes for both tests.

Vaidya, Gabrieli, Keane, Monti, Gutierrez-Rivas and Zarella (1997), authors examined effects of encoding manipulations effects on four conceptual implicit memory tasks namely word-cued association test, category-cued association test, category verification test and abstract/concrete classification test. In their study eight experiments was conducted.

Experiment examined word-cued association priming following a read/generate encoding task to distinguish perceptual and conceptual priming. 48 undergraduates participated in this experiment each paid $5 for their participation. In all experiments of this study participants were tested individually while seating facing an Apple Macintosh IIci monitor for experiments with accuracy as a dependent measure, the experimenter recorded
participants responses on the answer sheet. For experiment with latency, oral responses were recorded by a microphone connected to a voice-activated
relay. In the study phase each trial began with a fixation dot presented for 500 ms. after an interval of 500 ms single word or incomplete sentences appeared and remained on the screen until participants responded.

Participants were instructed to read aloud each word (read condition) and to compare each sentence with the appropriate word (generate condition). Following the study phase participants performed either word-cued association or a cued recall test. Results indicate that in word-cued association participants produced more studied words than non studied words in both read and generate condition. Priming was identical in the read and generate condition. In word cued recall, participants recalled more words that they had generated than they had read. The number of studied words produced as responses under cued recall instructions were considerably higher than word-cued association instructions.

Experiment 2 investigated word-cued association priming following by level of processing. 32 undergraduates enrolled in introductory psychology course received course credit for their participation. For deep processing participants saw a question about semantic category of the target word and for shallow processing participants saw a question about physical appearance of the target word. Results showed word cued association produced more studied than nonstudied target words both shallow and deep conditions while explicit recognition scores showed that participants recognized studied words more accurately following deep than shallow processing.

Experiment 3, the authors examined word-cued association priming for weakly associated word pairs following deep and shallow processing at study. If conceptual elaboration enhance priming for weakly associated cue-target pairs, priming should be greater after deep processing than after shallow processing. 32 undergraduates
participated to fulfill introductory psychology course requirement. The procedure of experiment 3 for study and test phases was identical as in experiment 2. The findings
revealed that word-cued association priming with weakly associated word pairs was greater following deep processing than following shallow processing.

In experiment 4 A and 4 B, investigators examined whether this finding extends to category-cued association task. 40 students were participated in experiment 4 A and 18 participated in experiment 4 B. Study procedure remained the same as in experiment 2. The findings did not support the notion that level of processing effects on conceptual priming always depend on the strength of cue target associations. Category-cued association priming was enhanced by deep relative to shallow processing regardless of the strength of cue target associations. Experiment 4 B, examined level of processing effects on category-cued association priming for strongly associated exemplars of categories. The results of experiment 4 B replicated the findings of experiment 4 A.

Experiment 5 examined the effects of deep and shallow level of study phase processing on category verification priming. 48 students participated in this experiment received $7 for their participation. In study phase participants were told that they would be answering question about a word’s meaning or physical appearance. Each trial began with a fixation cross for 500 ms followed by an interval of 500 ms, a deep or shallow processing question for 2 sec and then a word that remained on the screen until participants answered the processing question by saying “yes” or “no”. The experimenter recorded each participant’s response and initiated the next trial. The findings showed the level of processing did not affect priming on the category verification task despite its similarity to category cued association.

In experiment 6 authors varied the modality of stimulus presentation from study to test phases to assess the
contribution of perceptual processes to category verification priming. 32 undergraduates were paid $ 7 for their participation in this experiment. The procedure was the same as in experiment 5 with two exceptions in the study phase. A
category verification question preceded each exemplar and the exemplars were presented either visually or auditory. The main finding of the experiment was that the magnitude of priming did not differ following visual and auditory study presentation.

In experiment 7 investigators investigated the effect of level of processing on an abstract/concrete classification task in which participants judged whether words represented abstract or concrete concepts. 36 undergraduates were received either course credit or $10 for their participation. Each participant performed four tests: abstract/concrete classification and recognition memory tests each after a shallow processing study phase and after a deep processing study phase. The results found that the priming on the abstract/concrete classification test was unaffected by conceptual elaboration encoding. Authors were failed to find level of processing effect on this conceptual test is consistent with the findings on category verification (experiment 5) and on word-cued association with strong associates (experiment 1 and 2) but inconsistent with findings from other conceptual tests, such as word-cued association with weak associates (experiment 3) and category-cued association (experiments 4A and 4B and 5).

Finally experiment 8, examined the effect of variation of modality of stimulus presentation from study phases to assess the contributions of perceptual processes to abstract/concrete classification priming. 24 participants participated in this experiment. Each participant performed a visual abstract/concrete classification test after a visual study phase and after an auditory study phase. The study phase procedure was similar to that of experiment 7 with a few modifications. For visual study phase participants were told that they would see a series of words
and that they were to decide as quickly as possible if each word named something that was concrete or abstract.

For auditory study phase, participants were told that they would hear the series words and were to
decide as quickly as possible if each word named something that was concrete/abstract. The procedure was identical as in experiment 7. The main finding of the experiment 8 was that abstract/concrete classification priming was unaffected by a modality manipulation and therefore was not mediated by perceptual processes.

Thus conceptual elaboration failed to affect priming as often as it affected priming on conceptual tasks. Conceptual elaboration during encoding does not have uniform effects on all conceptual implicit tests.

Schmitter-Edgecombe (1999) investigated effects of divided attention on perceptual and conceptual memory tests. In 2 experiments, the nature of the relation between attention available at learning and subsequent automatic and controlled influences of memory was explored. 144 college students studied word lists in full and divided encoding conditions. Memory for the word lists was then tested with a perceptually driven task (stem completion) in experiment 1 and with a conceptually driven task (category association) in experiment 2. For recall cued with word stems, automatic influences of memory derived using the process-dissociation procedure remained invariant across a manipulation of attention that substantially reduced conscious recollection for the learning episode. In contrast, for all cued with category names, dividing attention significantly reduced the parameter estimates representing both controlled and automatic memory processes. These findings were similar to those obtained using indirect test instructions. The results suggested that in contrast to perceptual priming, conceptual priming may be enhanced by semantic processing and this effect is not an artifact of contamination from conscious retrieval processes.

The very relevant and important study was conducted by Watkins, Corby, Martin and Stern (2000). They
conducted a study entitled “unconscious memory bias in depression: perceptual and conceptual processes”.

Mood congruent memory bias in
depression was investigated in their study. Watkins et al. (1996) demonstrated an implicit memory bias using a conceptually driven test. The findings of their study supported Roediger and McDermott’s (1992) prediction that mood congruent memory may be found in implicit tests that require conceptual processes but not in perceptually driven tests.

Watkins et al (2000) tested clinically depressed and nondepressed controls for one of four implicit memory tests. Participants studied positive and negative adjectives. Each adjective was studied in either a perceptual or a self-referent conceptual manner. Following two distracter tasks, participants completed one of four memory tests. Two of tests were perceptually driven and two were conceptually driven. The two perceptually driven tests were word completion test and word identification test and two were conceptually driven tests were free association and word retrieval.

Participants first studied positive and negative adjectives in structural and semantic coding conditions. After completing two filler tasks, participants completed one of four implicit memory tests. All implicit tests included cues from both studied and unstudied adjectives. 67 clinically depressed and 67 non depressed controls participated. In each group 15 male and 52 females participated. All participants were undergraduate students, who received either course credit or financial compensation for their participation. Depressed participants were scored at least 15 on the beck Depression Inventory (BDI) at both screening and testing and also met the diagnostic criteria for major depression or dysthemia from the Diagnostic and Statistical Manual for Mental Disorders (DSM-IV). Participants diagnosed with bipolar depression were excluded from the study. Non depresse
controls were defined as those individuals who had MDI scores less than 6, reported fewer than two episodes of unipolar depression in the past and no dysthemia history and did not meet the diagnostic criteria for major
depression or dysthemia. The authors matched the non depressed controls to the depressed participants with regard to gender, word set exposure and implicit memory test and attempt was also made to match age as closely as possible.

Words used in this research were adjectives chosen to represent positive (pleasant) and negative (unpleasant) affective valence. These words were derived from the past mood congruent research. The words were divided into two sets consisting of both positive and negative words. One set served as studied or primed set and other as unstudied set for each subject. Each set consisted of 20 positive and 20 negative adjectives. The two sets were roughly equivalent in terms of word length and frequency.

The authors presented study targets on an IBM-compatible personal computer. Three of the four memory tests (WI, FA and WR) were also presented by the computer. The study task and three implicit memory tests were programmed on the computer through the assistance of the Micro Experimental Laboratory.

Watkins et al tested participants individually and told them that the experiment “involves some computer tasks which are designed to investigate how you process certain words”. After signing the informed-consent from all the participants, participated in the study task. Words were presented serially and participants were required to respond to one of two question with each word designed to tap different level of processing. In perceptual encoding condition, authors asked the participants to count the number of ascending and descending letters in the words. Investigators asked the participants to press the button on the computer keyboard corresponding with their responses. In semantic encoding condition investigators told participants "With some
words we will ask you to relate them to yourselves. We will ask you to estimate when was the last time you experienced something related to the word". Authors presented 9-
point Likert-type scale ranging from right now (1) to never (9). Authors presented 40 words to the subjects. Half of them were presented in perceptual encoding condition and half of them were presented in conceptual encoding condition. Following the study task, participants completed two distracter tasks designed to dissociate the study task from the implicit memory tests.

Authors introduced the implicit memory tests to the participants in the following manner. “We need to develop some material for a future study”. Following this, authors provided instructions for the appropriate implicit memory test.

After the implicit memory test, the experimenter administered the memory awareness interview. Free recall and cued recall explicit tests were next administered and participants then completed the BDI and PAST. Finally, the participants were interviewed with the SAD-C. Participants were then debriefed and awarded compensation for their participation.

The overall results demonstrated that, no mood congruent bias was found in the perceptually driven implicit memory tests and mood congruent memory was demonstrated in one of the two conceptually driven tests (i.e., WR) but only for words that were encoded conceptually. For words studied conceptually the four implicit tests showed significantly different patterns of mood congruence. The authors found no reliable implicit mood congruent memory differences for perceptually encoded words. Reliable priming was demonstrated on all four tests but perceptually encoded words did not show statistically significant priming on either of the two conceptually driven tests. All four tests showed a significant depth of processing effect. However, the
conceptually driven tests showed more depth of processing than perceptually driven tests. The pattern of results did not support the hypothesis that implicit mood congruent memory would be found if conceptually driven implicit tests were used. Although
mood congruent memory was demonstrated with one conceptually driven test and no memory bias was demonstrated with one conceptually driven test, no memory bias was found in the word retrieval free association test.

The above study clearly demonstrated differential effects of perceptually driven and conceptually driven tests on implicit memory. In the above study authors demonstrated a conceptually driven implicit mood congruent memory bias in the absence of a perceptually driven mood congruent memory bias. However, one of the two conceptually driven tests showed no evidence of mood congruent memory. Thus conceptually driven tests may be necessary but do not appear to be sufficient to demonstrating implicit mood congruent memory in depression.

In the same year Hamilton and Rajaram (2000) investigated the effect of concreteness on implicit and explicit memory tests. Four experiments were conducted to examine the concreteness effect in implicit and explicit memory measures. In experiment 1, was conducted to examine the imagery effect on implicit conceptual memory test, 83 undergraduate participants were participated for credit as partial requirement for course work. The undergraduates were recruited from the psychology department human subject pool and informed consent to participate in the study was obtained. Of these 83 participants, 35 took part in naming study and 48 took part in experiment. Participants were tested in groups of one to three. Items were presented on Zeos 486 computers using Micro- Experimental Laboratory (MEL; Version 1.0). Participants took part in both a study and a test phase. All participants were presented with 40 words during study for 5 sec each. Twenty of the words were
presented with imagery instructions. Specifically, participants were instructed to form a mental image of the item’s referent. The participants were asked to hit a specially marked “Y” key as soon as they had formed a mental representation of the item. They were told that the
word may still remain on the screen for a predetermined amount of time and that during this time they should keep the image in their mind. The remaining 20 items were presented with non imaged instructions. Participants were told to simply read the words. Again they were instructed to hit the specially marked “Y” key as soon as they had read the word. Participants were asked to read neither slowly nor quickly than they normally do. The test phase was presented as a different experiment to help ensure that the participants did not associate the study and test phase. Participants were told that for the second experiment they would have to answer trivia questions. They were instructed that the majority of the questions had multiple solutions, and therefore, there were no right or wrong answers. Participants were instructed to answer the questions with the first word that comes to mind that answers the question appropriately. All participants took part in a practice session prior to the test. Test instructions and practice lasted approximately 10 min.

During the test phase the participants were presented with 80 general knowledge questions, one question at a time. Half of the questions had target answers from the earlier study list (half from the imaged condition and half from non imaged condition). The other half of the questions had non studied target answers. At the end of the testing phase, participants debriefed and questioned about their awareness of any relationship between the study and test phase. The findings of the experiment 1, revealed significant priming and significant imagery effect on implicit conceptual memory test of general knowledge.

The authors found the imagery effect on the implicit conceptual test of general knowledge, the authors proceeded to examine the central question of interest, i.e., the effect of studying concrete versus abstract nouns on
conceptual implicit memory. In Experiment 2 included five memory tasks to examine the concreteness effect on
memory. They included a free recall task in order to replicate concreteness effect on an explicit memory task.

They also included two widely used perceptual tasks, the implicit word fragment completion task and its explicit version of fragment cued recall. In Experiment 2, they also included the levels of processing manipulation in their experiment to confirm the typical assumptions regarding the processing nature of these five tasks. A total of 324 undergraduates participated in this experiment for credit needed for partial fulfillment of a course requirement. Of these, 108 participants took part in the norming study and 216 in one of the five experimental test conditions. Of these 216 participants, 40 each took part in four different tasks, free recall, question cued recall, implicit word fragment completion, and fragment cued recall and 56 participated in implicit general knowledge task.

Participants were tested in groups of one to three. A given participant took part in only one of five test conditions. In the free recall, explicit question cued recall, implicit word fragment completion, or the explicit word fragment cued recall test conditions, participants saw single presentations of items in the study phase. During the single presentation, each word appeared on the computer screen for 3 sec. Following the word, a question that required a yes/no response appeared on the screen for 2 sec. Participants were asked to respond by hitting the specially marked “Y” or “N” keys. In the shallow processing condition, participants were instructed to read the word carefully, pay attention to the letters, and answer the graphemic question. In the deep processing condition, participants were instructed to read the word carefully, pay attention to the meaning of the word, and answer the semantic question. After the study condition, participants had 10-min retention. Following the
retention interval, participants in the free recall condition were instructed to write down in any order all the
words they could recall from the earlier study lists. For the remaining four tests, test
items appeared on the computer screen one at a time with the prompt, “If you have a solution, press “Y.” When the participants pressed the “Y” key, they were asked to type in the solution and press the enter key. For the explicit tests (i.e., word fragment cued recall and question cued recall), participants were instructed to try to solve the items presented in the allotted time. For the implicit tests participants were instructed to solve the items presented in the allotted time with the first word that came to mind. In the general knowledge tasks participants were urged to give one word solutions. For all five groups, the entire procedure took less than 1 hr.

The findings of the experiment 2, showed that the authors did not found an effect of the conceptual manipulation of concrete and abstract nouns on perceptual tests. Furthermore, conceptual tests of free recall and the explicit question cued recall did produce the concreteness effect. The finding of major interest in this experiment was that the authors failed to obtain a concreteness effect on the implicit general knowledge test. However, they found levels of processing effect on the implicit general knowledge test, thereby illustrating that the test is sensitive to a conceptual manipulation. However, they failed to find a concreteness effect on this task. The findings of the experiment 2, clearly showed the differential effect of concreteness on conceptually driven and perceptually driven tests of memory.

Experiment 3 was carried out to examine whether the concreteness effect would arise on a conceptual implicit task if we did not use the levels of processing manipulation at study. 56 undergraduates participated in the experiment to obtain credit needed for partial fulfillment of a course requirement. All materials and procedures were identical to that of Experiment 2 with the following changes. Authors used only the implicit general
knowledge test and did not use the levels of processing
manipulation. Once again the authors failed to find a concreteness effect on a conceptual implicit test.

The goal of Experiment 4 was to determine whether the larger size of associated responses to concrete nouns had diminished the production of target concrete words in an open ended task such as implicit general knowledge in their prior experiments. They tested this idea by holding constant the meaningfulness scores for concrete and abstract nouns. They predicted a concreteness effect on conceptual implicit task in Experiment 4 because this measure of meaningfulness was controlled. 86 undergraduates participated for credit needed for partial fulfillment of a course requirement. A pool of 60 items (30 concrete and 30 abstract) was selected from both Experiment 2 and Paivio et al.’s (1968) norms such that the abstract and concrete items only varied on the imageability and concreteness scales and not the meaningfulness scales. All procedures were the same as in Experiment 3 except that the participants saw 30 items at study (15 concrete and 15 abstract) and 60 items at test (30 old and 30 new).

Authors did not find a concreteness effect on the conceptual implicit test even when they equated for the number of meaningful for concrete and abstract words.

The findings of the above experiments provided evidence in favor of differential effect of perceptually driven and conceptually driven tests on implicit and explicit memory. And the findings of the experiments showed that the authors did not find an effect of the conceptual manipulation of concrete and abstract nouns on our perceptual tests. Furthermore, conceptual tests of free recall and the explicit question cued recall did produce the concreteness effect. Thus the result of the study clearly demonstrated the differential effect of perceptually
driven and conceptually driven tests on implicit and explicit forms of memory.
MacLeod and Masson (2000), conducted a study entitled repetition priming in speeded word reading: contributions of perceptual and conceptual processing episodes. Five experiments investigated repetition priming on an indirect speeded word reading (naming) test, a task intended to circumvent conscious recollection. Reading a word or generating it from a semantic cue (either a phrase or an antonym) produced reliable priming of similar magnitude on this indirect test of memory. Efforts to encourage conscious recollection elevated response latencies in speeded reading and improved performance on a direct test of recognition memory, without creating a difference in the amount of priming observed in the read and generate conditions. Authors also found more priming for visually than for auditorily studied words, consistent with the standard pattern for indirect tests assumed to be perceptually-driven. Speeded word reading provides a good measure of repetition priming because the fully exposed target word recruits both perceptual and conceptual aspects of the initial interpretive encoding episode.

Maki, Bylsma and Brandt (2000) examined and compared the perceptual and conceptual implicit memory in Huntington’s disease and to characterize the relationship between tests of frontal lobe functioning and conceptual implicit memory. Sixteen Huntington’s disease patients and 16 normal controls completed structurally parallel tests of perceptual implicit memory and conceptual implicit memory (i.e., rhyme and category exemplar generation), tests of explicit memory, and verbal fluency. Huntington’s disease patients showed intact implicit memory for both rhyme and category exemplars, despite evidence of frontal dysfunction on other tests. An unexpected finding was that patients showed a deficit in cued rhyme generation that correlated
with severity of neurological impairment. The authors replicated findings in controls by computing correlation between letter fluency and conceptual implicit
memory but found no relationship in patients. Frontal dysfunction in Huntington’s disease may lessen the influence of generative strategies on tests conceptual implicit memory without compromising performance.

McBride and Shoudel (2003) conducted their study on conceptual processing effect on automatic memory. In their study influences of conceptual processing on implicit memory was investigated, using category production task. They employed process dissociation and fits of multinomial models to estimate implicit and explicit memory for semantic and graphemic study tasks. 39 undergraduates participated in their study. Memory estimates from a generate-source model indicated more implicit memory for semantic than for graphemic items on the category production task. These results provide support for conceptual processing influences on implicit forms of memory.

Stuart, Patel and Bhagrath (2006) conducted a study entitled aging affects conceptual but not perceptual memory processes. Age effects commonly occur in tests of explicit memory, tests of implicit memory often show age invariance. In two experiments, the traditional confounds between test type (implicit vs explicit) and retrieval process (conceptually driven vs perceptually driven) was removed by using conceptually driven and perceptually driven tests of both implicit and explicit memory. Experiment 1 revealed a significant age effect for conceptually driven retrieval and no age effect for perceptually driven retrieval, regardless of the type of memory being measured. Experiment 2 highlighted a difference between the two age groups in their ability to utilize semantic encoding in a nominally perceptually driven explicit memory test. The authors concluded that although perceptually driven processing is stable over
age, particular care must be taken to minimize contamination from conceptually driven retrieval processes in such investigations. The authors clearly
Hupbach, Melzer, Hardt (2006) provided evidence for color effects in perceptual implicit memory tests. Priming effects in perceptual tests of implicit memory are assumed to be perceptually specific. Surprisingly, changing object colors from study to test did not diminish priming in most previous studies. However, these studies used implicit tests that are based on object identification, which mainly depends on the analysis of the object shape and therefore operates color independently. These authors showed that color effects can be found in perceptual implicit tests when the test task requires the processing of color information. In experiment 1, reliable color priming was found in a mere exposure design (preference test). In experiment 2, the preference test was contrasted with a conceptually driven color-choice test. Altering the shape of object from study to test resulted in significant priming in the color-choice test but eliminated priming in the preference test. Preference judgments thus largely depend on perceptual processes. In experiment 3, the preference and the color-choice test were studied under explicit test instructions. Differences in reaction times between the implicit and the explicit test suggested that the implicit test results were not an artifact of explicit retrieval attempts. In contrast with previous assumptions, it was, therefore concluded that color is part of the representation that mediates perceptual priming.

Soler, Ruiz, Fuentes and Tomas (2007) compared the performance of schizophrenic patients and normal controls on implicit memory tests. Twenty-nine schizophrenic outpatients (26 males and 3 females) were included in their study. The diagnosis of schizophrenia was made according to the Diagnostic and Statistical
Manual of Mental Disorders (DSM-IV) criteria. The mean age for the group was 37.9 years. The mean number of years of full-time education was 7.79. The mean time since first symptoms was 17.5 years. Four of schizophrenic patients received typical antipsychotic, 11 of the schizophrenic patients received atypical antipsychotic, and 14 of schizophrenic patients received both antipsychotic medications. From previous experiments with word fragment completion and category production tests, authors selected two groups of subjects, who received extra course credit. None of these subjects had history of any head injury or major psychiatric disturbance. Thirty-four subjects were selected for comparison on the word fragment completion test.

A separate sample of thirty-nine was selected for the word production from semantic categories test.

Participants were administered two implicit memory tests: the word fragment completion test and the word production from semantic categories test. Word fragment completion test was perceptually driven implicit memory test while word production test was conceptually driven implicit memory test.

For the word fragment completion test, 56 word fragments were selected from past research. The 56 word fragments selected for the experiment had a moderate difficulty level of completion (mean of 0.40). Of the 56 word fragments, 28 corresponded to high frequency words (frequency mean of 62 per million), and the other 28 corresponded to low frequency words (frequency mean of 4 per million).

In the first phase of the test, subjects were required to judge the familiarity of 28 words on a scale ranging from 1 (extremely unfamiliar) to 7 (extremely familiar) on a rating sheet, to ensure that participants attended to the word. Next, and for five minutes, subjects were given a filler task (subjects wrote the name of Spanish cities)
After the filler task, participants were asked to complete 56 word fragments.
The variable of interest was the proportion of fragments correctly completed. The priming score was obtained by subtracting the proportion of studied word fragments correctly completed from the proportion of non studied word fragments correctly completed.

For the word production from semantic categories test, 40 exemplars extracted from 40 category names of the past research. The 40 exemplars selected in the experiment (“expected exemplars”) had a low probability of generation (mean of 0.17). They were between the 14 and 17 frequency rank position in the norms.

In the first phase of the word production test, subjects were required to perform a rating task similar to the one used for word fragment completion. Participants were shown 28 category exemplars (study list) and asked to rate how familiar or unfamiliar they were.

After a filler task (for five minutes), participants were asked to give as many exemplars as possible from 40 category names presented one at a time for 12 s each. Twenty-eight of the category names were represented by an exemplar in the study list (“old” category), and the other 12 were completely new in the experiment (“new” category). Subjects were simply instructed to write as many exemplars as possible from each category. No explicit reference was made to the rated list.

The variable of interest was the proportion of “expected exemplars” from each category. The priming score was obtained by subtracting the proportion of expected exemplars produced from old category names from the proportion of expected exemplars produced from new category names.

Results of the experiment showed that for word fragment completion test priming obtained by schizophrenic
patients and priming obtained by normal subjects was statistically identical. But on word production from

semantic categories test
priming obtained in patients with schizophrenia was significantly lower than the priming obtained in normal
subjects.

Overall, both groups showed implicit memory, although there is a dissociation effect between the tests. There
were no priming differences between groups on the word fragment completion test, but there were significant
differences on the word production from semantic categories test. In other words, no differences were found
when the investigators used perceptually driven implicit memory test while marked differences were found
when they used conceptually driven implicit memory tests.

Word fragment completion is a data-driven task in which the fragments evoke the perceptual identification
record of the target. In this test, the stimulus presented during the study phase is shown on the test in a
perceptually related form, although partially. The letters in the fragment, drawn randomly from the word, are
poor cues for locating words in the lexicon. On the other hand, word production from semantic categories is a
conceptually-driven task in which the provided information in the test phase is semantically related to the
studied information, and requires a response based on stimulus meaning. Therefore, dissociable effects of these
tests were found and suggested differential effect of perceptually driven and conceptually driven tests on
memory.

Mulligan and Peterson (2008) examined the role of attention in the implicit memory tasks. In their research
they used category verification task which is conceptually driven test and the other test which they used was
lexical decision task which is perceptually driven test. Prior research on implicit memory appeared to support 3
generalizations: Conceptual tests are affected by divided attention, perceptual tasks are affected by certain divided attention manipulations, and all types of priming are affected by selective attention. These generalizations are challenged in experiments
using the implicit tests of category verification and lexical decision. First, both tasks were unaffected by divided-attention tasks known to impact other priming tasks. Second, both tasks were unaffected by a manipulation of selective attention in which colored words were either named or their colors identified. Thus, category verification, unlike other conceptual tasks, appears unaffected by divided attention, and some selective-attention tasks, and lexical decision, unlike other perceptual tasks, appears unaffected by a difficult divided-attention task and some selective-attention tasks. Finally, both tasks were affected by a selective-attention task in which attention was manipulated across objects, indicating some susceptibility to selective attention. The results contradicted an analysis on the basis of the conceptual perceptual distinction and other more specific hypotheses but were consistent with the distinction between production and identification priming.

Mulligan and Dew (2009) investigated generation effect and perceptual implicit memory. The generation manipulation has been critical in delineating differences between implicit and explicit memory. In contrast to past research, the present experiments indicated that generating from a rhyme cue produced as much perceptual priming as does reading. This was demonstrated for 3 visual priming tasks: perceptual identification, word-fragment completion and word-stem completion. This result occurred regardless of the mode of study response (written or spoken) or whether the generation condition was compared with reading words in or out of context. Rhyme generation did not produce priming on the letter height task, implying that the effect was not mediated by covert visualization. Nor was the effect due to the mere presence of the rhyme cue. Semantic generation (from definitions) produced a different pattern, exhibiting a reverse generation effect on word fragment completion and
word stem completion but full priming on perceptual identification. The present results were not
consistent with accounts based on the standard transfer-appropriate processing view, covert visualization, explicit contamination, or conceptual contributions to nominally perceptual tasks.

One recent study was conducted by, and Smilek (2010). They conducted their study on long term conceptual implicit memory. Demonstrations of long-term implicit memory are numerous, but to date they have been reported in what might be thought of as perceptually driven tasks. In the present experiment, a low-frequency state name was presented verbally to participants within the context of a memory-course lecture, and the influence of that experience was measured indirectly 4 to 8 weeks later using a state-name-generation task. Participants were significantly more likely to generate the critical state name when it had been presented in an earlier lecture than when it had not been presented in an earlier lecture, a novel demonstration of long-term, conceptually driven priming after a single stimulus exposure.

These findings lead us to conclude that the perceptually driven and conceptually driven tests of memory have differential effect on implicit and explicit memory and these two types of tests are processed by different mechanisms. Therefore, perceptually driven and conceptually driven tests are one important variable which highlight the dissociation between implicit and explicit forms of memory.

SECTION V
MOOD CONGRUENT MEMORY AND COGNITIVE RIGIDITY-FLEXIBILITY
As stated earlier that section fifth, of this chapter reviews those relevant studies which highlight the implication of cognitive rigidity-flexibility in mood-congruent memory.
Cognitively rigid people may tend to ruminate when feeling sad because they have difficulty in generating alternative ways of coping. Cognitive rigidity may also increase rumination because it makes it difficult for people to switch their attention away from themselves and their problems to pleasant, distracting topics or activities. Rumination involves behaviors and thoughts that passively focus one’s depressive symptoms and on the implications of these symptoms, which leads to maintain their depression. Rumination disrupts qualities of cognition, such as problem solving and cognitive flexibility.

Here we will review studies related directly or indirectly to mood congruent memory in the context of cognitive rigidity and flexibility-

Davis and Nolen-Hoeksema (2000) investigated whether a ruminative coping style would be related to a cognitive style marked by perseveration and inflexibility (rigidity). They examined the performance of ruminators and nonruminators on the Wisconsin Card Sorting Test (WCST), a measure of cognitive flexibility, and tasks measuring related cognitive processes. Ruminators committed significantly more perseverative errors and failed to maintain set significantly more often than nonruminators on the WCST. On an advanced section of the WCST designed for this study, male ruminators exhibited significantly greater inflexibility than male nonruminators. These effects could not be attributed to differences in general intelligence or the presence of depressed mood. Results suggest that rumination may be characterized by, and perhaps prolonged by, an inflexible (rigid) cognitive style.

Nolen-Hoeksema (2000), conducted his study on the role of rumination in depressive disorders and mixed
anxiety/depressive symptoms. Investigator showed that rumination also predicted depressive disorders, including new onsets of depressive episodes. Rumination predicted chronicity of depressive disorders before accounting
for the effects of baseline depressive symptoms but not after accounting for the effects of baseline depressive symptoms. Rumination also predicted anxiety symptoms and may be particularly characteristic of people with mixed anxiety and depressive symptoms.

Joormann and Seimer (2004), recent studies have suggested that mood-incongruency effects are due to mood-regulatory processes, in which people retrieve positive memories to repair negative moods. In Study 1, the authors investigated whether dysphoria influences the accessibility of autobiographical memories following a positive or a negative mood induction combined with subsequent rumination or distraction. The results showed a mood-repair effect for nondysphoric but not for dysphoric participants following rumination. In Study 2, participants were asked to either distract themselves or to recall positive autobiographical memories after a negative mood induction. Whereas nondysphoric participants’ mood improved under both conditions, dysphoric participants’ mood improved only after distraction. These results suggest that dysphoria is associated with a reduced ability to use mood-incongruent recall to repair sad moods.

Whitmer and Banich (2007), the goal of their study was to determine whether perseverative/rigid tendencies are associated with an inability to switch attention away from old to new information or with an inability to effectively inhibit the processing of previously relevant information. They used a task-switching paradigm that can distinguish between these two processes. Two experiments showed that depressive rumination is associated with a deficit in inhibiting prior mental sets. The second experiment also demonstrated that, in contrast to depressive rumination, angry and intellectual rumination are associated with difficulties in switching to a new
task set, but not with inhibition of a prior task set. Their study suggests that different forms of
rumination are associated with different cognitive mechanisms and that both deficits may contribute to the perseverance or rigidity that is associated with ruminative tendencies.

Nolen-Hoeksema, Wisco and Lyubomirsky (2008) review the aspects of the response styles theory that have been well-supported, including evidence that rumination exacerbates depression, enhances negative thinking, impairs problem solving, interferes with instrumental behavior, and erodes social support. Next, they address contradictory and new findings. Specifically, rumination appears to more consistently predict the onset of depression rather than the duration, but rumination interacts with negative cognitive styles to predict the duration of depressive symptoms. Contrary to original predictions, the use of positive distractions has not consistently been correlated with lower levels of depressive symptoms in correlational studies, although dozens of experimental studies show positive distractions relieve depressed mood. Further, evidence now suggests that rumination is associated with psychopathologies in addition to depression; including anxiety, binge eating, binge drinking, and self-harm. They discuss the relationships between rumination and worry and between rumination and other coping or emotion-regulation strategies. Finally, they highlight recent research on the distinction between rumination and more adaptive forms of self-reflection, on basic cognitive deficits or biases in rumination on its neural and genetic correlates, and on possible interventions to combat rumination.

Wisco and Nolen-Hoeksema (2009) conducted their study on the interaction of mood and rumination in depression, effects on mood maintenance and mood-congruent autobiographical memory. The purpose of their study was to evaluate the effects of pre-rumination mood on post-rumination mood and subsequent memory.
Participants scoring high or low in depressive symptoms were assigned to either a positive or
negative emotion induction prior to ruminating and completing an autobiographical memory task. Analysis of self-reported mood indicates that both emotion inductions were effective. Surprisingly, all participants returned to baseline mood levels following the rumination induction, and emotion induction had no effect on the negativity of the memories recalled. Dysphorics recalled significantly more negative memories than nondysphorics, regardless of whether positive, neutral, or negative memories were specifically prompted. Results indicated that the prolonged experience of dysphoria may have greater effects on post-rumination mood and memory than the transitory experience of sadness.

Goetter, Forman, Herbert, Alloy and DeMatteo (2010) conducted their work on depressive rumination, implications for cognitive flexibility, problem solving and depression. These investigators state that depressive rumination, or thinking about the causes and implications of one’s depression, is a maladaptive form of repetitive thinking, rumination exacerbates depression because it increases the accessibility of negative schemas, disrupts the individual’s social support networks, and inhibits instrumental skills behaviors and qualities of cognition, such as problem-solving and cognitive flexibility, respectively. Although research has supported a relationship between rumination and problem solving, rumination and cognitive flexibility, and cognitive flexibility and problem solving, no study has examined all three in the context of a single analysis. Their study sought (1) to examine if cognitive inflexibility mediates the relationship between rumination and poor problem solving, and (2) to determine if mindfulness (i.e., present moment awareness and nonjudgmental acceptance) and psychological distancing (i.e., defusion or decentering) might buffer ruminators’ tendencies toward
cognitive inflexibility (operationalized as performance on the Wisconsin Card Sorting Test). Participants were

97 undergraduate students from
a large, metropolitan university. Results suggest that rumination exerts a negative impact on problem solving for individuals with average to low levels of depression, but that rumination may have a beneficial impact on task performance for individuals with higher levels of depression. Consistent with the analytical rumination hypothesis, focusing on one’s depressive symptoms, in a structured clinical context (and preventing degradation into pathological, repetitive though), may encourage problem-focused coping for those with moderate depression. Post hoc analyses suggest that psychological distancing strategies attenuate the relationship between rumination and depression. Their findings suggest that psychological distancing strategies may be beneficial for ruminators because of their protective role in decreasing depressive symptoms.

Meiran, Diamond, Toder and Nemets (2010) conducted their research on cognitive rigidity in unipolar depression and obsessive compulsive disorder. They examined the performance of 17 patients (9 suffering from unipolar depression without obsessive compulsive disorder, and 8 suffering from obsessive compulsive disorder without unipolar depression), and 17 control participants matched on age, gender, language and education, on a battery covering the four main executive functions. Results indicated that, across both disorders, patients required more trials to adjust to single-task conditions after experiencing task switching, reflecting slow disengagement from switching mode, and showed abnormal post-conflict adaptation of processing mode following high conflict Stroop trials in comparison to controls. Rumination, which was elevated in unipolar depression and not in obsessive compulsive disorder, was associated with poor working memory updating and less task preparation. The results show that obsessive compulsive disorder and unipolar depression are
associated
with similar cognitive rigidity in the presently tested paradigms. Their study clearly highlights the role of rigidity in rumination and depression.

Joormann, et. al. (2011) conducted their study on deficits in cognitive control correlate with depression and rumination. Author states that Cognitive rigidity may play an important role in rumination, a risk factor for the onset and maintenance of depressive episodes. They assessed participants’ ability to either reverse or maintain in working memory the order of three emotional (positive or negative) or three neutral words. Differences (or sorting costs) between response latencies in backward trials, on which participants were asked to reverse the order of the words, and forward trials, on which participants were asked to remember the words in the order in which they were presented, were calculated. A recognition probe was used to index sorting costs (i.e., differences between response latencies on the forward and the backward trials. The probe word consisting of one of the three words was presented until the subject responded. Participants were instructed to press a key (“1,” “2,” or “3”) to indicate as quickly and as accurately as possible whether the probe was the first, second, or third word (counting forward or backward, as appropriate) in the set they had been instructed to remember. Compared with control participants, depressed participants had higher sorting costs, particularly when presented with negative words. It is important to note that rumination predicted sorting costs for negative words but not for positive or neutral words in the depressed group. Their findings indicate that depression and rumination are associated with deficits in cognitive control.

Koval, Kupppens, Allen, and Sheeber (2012) conducted their research entitled ‘Getting stuck in depression, the
roles of rumination and emotional inertia’. According to them depression is characterized by psychological
inflexibility such as rumination and emotional inertia. In two studies they tested predictions that a) rumination
and
emotional inertia are related and 2) both independently contribute to depressive symptoms. They examined
emotional inertia of subjective affective experiences in daily life among a sample of non-clinical undergraduates
(study1) and affective behavior during a family interaction task in a sample of clinically depressed and non-
depressed (study 2) and related it to self-reported rumination and depression severity. In both studies, rumination
and emotional inertia particularly in depression were positively associated, and both independently predicted
depression severity. These findings demonstrate the importance of studying both cognitive and affective
inflexibility in depression.