

## CHAPTER 4

# Mood and Memory

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### ABSTRACT

This chapter examines the role of moods in selective memory. Reviewed are **repression**, mood selectivity, mood state dependent retrieval, and reduced capacity due to depression. Briefly discussed are demand characteristics, interpretation of and inconsistencies in experimental findings and asymmetrical effects of moods on memory.

### MOOD AND MEMORY

Why do we remember some of our experiences but forget others? Psychologists have long been intrigued by the possibility that moods like depression, elation, and anxiety influence memory. Historically much of the **research on the role of moods in memory** has focused on the Freudian notion of **ssion** which claims that memories of experiences associated with anxiety are inhibited from **entering** conscious awareness. More recently, experimental psychologists have borrowed concepts from modern cognitive psychology in order to uncover the mechanisms by which **moods** influence what we store and retrieve from our memories.

I will begin this chapter with a brief review of some of the research on repression, then move to a review of the more recent work influenced by the modern cognitive perspective on memory and finally conclude with a discussion of some of the attendant problems associated with mood and memory research.

### REPRESSION

Repression is a theoretical defence mechanism whereby memories of disturbing events are stored in the unconscious and unintentionally inhibited from entering consciousness. The memories are not lost,

however. If the negative affect associated with the event can somehow be removed then the memory may be allowed to return to **awareness** (Freud, 1915- [1957]). Usually the disturbing quality of an experience thought to give rise to repression is ego-threatening **anxiety**—for example, the kind of anxiety associated with social or sexual **embarrassment**.

A variety of experiments have **attempted** to establish the psychological validity of repression (for an extensive review, see Holmes, 1974). One line of research is typified by Zeller (1950). He required subjects first to learn a list of nonsense words to criterion. Immediately afterwards, the subjects were given a psychomotor task; however, the experiment was rigged so that some of the subjects **experienced** repeated failure on the task while the rest experienced **success**. The **idea** was that the embarrassment **over** failure on the psychomotor task would induce **anxiety** which would generalize to the experience of learning the nonsense **ables**. Subjects were then required to recall the nonsense **syllables**—as predicted by the repression hypothesis, the anxiety-induced subjects recalled less than the neutral control subjects. Later, the anxiety-induced subjects were allowed to experience success on the psychomotor **task**—they were now able to recall as many nonsense syllables as the neutral control group. Apparently the anxiety had been lifted so that memories of the nonsense syllables which had been repressed could now enter consciousness.

A number of other experiments have replicated Zeller's basic set of findings (e.g. Merrill, 1954; **Flavell**, 1955; Penn, 1964). Unfortunately, explanations other than repression can account for the results of these sorts of experiments. D'Zurilla (1965) and Holmes (1974), among others, have argued that anxiety associated with a memory creates competing thoughts **whenever** a portion **of** that memory is accessed. These thoughts then interfere with the cognitive activity required to accomplish recall of more of the details of the experience.

Consistent with the **interference** hypothesis, D'Zurilla (1965) found from extensive interviews that the anxiety-induced subjects in his experiment thought a lot more about the experiment than did the neutral controls; possibly the anxiety-induced subjects were concerned about the embarrassment they endured. Yet repression would predict that anxiety-induced subjects ought to think less about the experiment than the control subjects.

More direct evidence for the interference hypothesis is provided by Holmes (1972) who required subjects to learn **sts** of words; for one group the words were associated with ego-threatening personality feedback, for a second group the words were **associated** with ego-enhancing personality feedback, while for a third group the words were associated with neutral feedback. Consistent with the interference hypothesis, both the ego-enhanced and ego-threatened subjects recalled fewer words than

did the control **subjects**—presumably thoughts about either positive or negative feedback interfered with the memory **processes required** to recall the word list. When subjects were told of the **deception**, both the ego-enhanced and the ego-threatened group's recall then improved to the level of the neutral group's recall. Note that the repression hypothesis cannot explain why the response pattern of **ego-threatened** subjects would be the same as ego-enhanced subjects (see Holmes, 1974, for a more complete discussion of the interference hypothesis).

Not all research on repression can be explained away by interference, however. Blum and Barbour (1979), for example, report a series of experiments in which subjects were required to solve anagrams for a fixed set of words. In the course of the experiment subjects were asked to associate some of the words with Blacky pictures (Blum, 1950) which are pictures of a young dog engaged in **various** activities. Some of the associations between the word and the picture connoted pleasure while other associations connoted anxiety. For example, anxiety connotations might be induced by asking subjects mentally to associate the word 'lick' to a picture of Blacky licking himself (herself) by imagining that Blacky is licking his (her) sexual organ and so feels afraid that his (her) parents might disapprove of masturbation. Pleasure **associations** might be induced by asking subjects instead to imagine that Blacky is licking a spot where a flea was. Each **subject** learned both the **anxiety** and pleasure associations, **tho**ot to the same words.

The main finding of their experiment was that if a word was associated with anxiety, response times to solve an anagram of that word were slowed down relative to anagrams of neutral words. Response times to anagrams of words associated with pleasure, on the other hand, were generally faster than to anagrams of neutral words. It is difficult to see how interference **could** account for these **results**. Presumably interference would generalize to all the words, yet an **inhibiting** effect was observed only for the anagrams of anxiety-laden words. Furthermore, the interference hypothesis would predict that positive emotional associations ought to distract from **anagram** problem-solving, yet anagrams for pleasure-laden words were solved more quickly than neutral anagrams. The repression hypothesis, on the other hand, predicts inhibition only for anagrams of words associated with ego-threatening anxiety, as was found. Unfortunately, Blum and Barbour (1979) report that many subjects did not show any inhibition on anxiety-laden **words**—the effect was **absent** in 10 out of 25 subjects in one of their experiments.

Another kind of paradigm frequently employed to investigate repression requires subjects to learn and later recall material with either emotionally positive, negative, or neutral connotations to see if subjects recall less of the negative material. Unlike the studies discussed earlier, the research

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inhibiting - ... inhibition - ...

investigating the recall of positive and negative information does not attempt to induce anxiety into one group of subjects or in some sessions of the experiment.

One example of this sort of research is provided by Wilkinson and Cargill (1955) who asked subjects to read and later recall a story which either contained **ego-threatening** material (a boy dreams he slept with his mother and then climbs to a temple surrounded by foliage) or contained only neutral material (the boy dreams he **slept with** his brother and then walked towards a lake). Presumably the **Oedipal complex** implied in the ego-threatening story was threatening only to males. Consistent with the repression **hypothesis**, male but not female subjects recalled less of the ego-threatening story. Unfortunately, a problem with this experiment and others like it (e.g. Sharp, 1938; Jacobs, 1955; Smock, 1957) is that the anxiety-laden and neutral material may differ on dimensions other than emotional ones. Perhaps the difficulty in recalling the negative material stems from these other **differences—forexample**, negative words or imagery which connote psychosexual themes may be less frequently encountered **abstract** or suggestive of fewer associations than **neutral** or positive material. Any one of these differences, independent of anxiety, could account for the poorer recall of the negative material.

Similar research requires subjects to recall personal experiences which are then classified as positive, negative, or neutral. An example is provided by Meltzer (1931) who asked subjects to write down and evaluate their experiences during a Christmas vacation. Six weeks later the subjects attempted to recall those **experiences—a** greater percentage of the negative experiences were forgotten than of the positive experiences (for an early review of other such experiments, see Gilbert, 1938).

Not all experiments, however, have found that positive material is remembered better than negative material (e.g. Menzies, 1936; Sears, 1944; Thompson, 1985); furthermore, even in the cases where such a trend is observed, we cannot be sure that repression is the explanation. Perhaps people talk more about their positive experiences or connect these experiences more with other events in their lives than they do with negative experiences. Such activities would make the positive event more **memorable**. It is not even clear that all negative experiences induce ego-threatening **anxiety—the** death of a loved one, for example, may be laden with negative emotion but not induce a threat to one's personality.

In summary, then, a lot (though not all) of the research employing anxiety induction or comparing positive and negative materials demonstrates that negative or anxiety-laden material is not remembered as well as emotionally neutral or positive material. As discussed above, there are probably a variety of reasons for this **tendency—the initial** recall of negative feelings may interfere with the processing required

to recall in more detail or negative material may be less memorable for reasons unrelated to the material's emotional content. And finally, humans may employ defense mechanisms which operate to repress some ego-threatening experiences thereby making them difficult to remember. The importance of repression in everyday memory, **however**, remains uncertain.

An implicit assumption made by the repression hypothesis is that the cognitive processes underlying memory for stimuli associated with anxiety are different from the cognitive process underlying memory for other stimuli. It is as if the mechanism of repression remains **dormant** until a person tries to remember an **anxiety-laden** event, at which time the mechanism springs into action to inhibit the memory. In contrast to the repression hypothesis, the assumption of much of the current work on mood and memory is that the same cognitive processes which account for remembering and forgetting in other contexts also account for remembering and forgetting in various mood states (Bower, 1981). No special cognitive mechanism is needed to explain the effects of moods on the storage and retrieval of information. Much of the rest of this chapter will develop this theme.

## MOOD, MEMORY, AND INFORMATION PROCESSING

Most current models of memory adopt an information processing perspective which suggests that memory includes a storage phase during which information is connected to representations of **information residing** in memory and a retrieval phase during which information in the current physical, emotional, and cognitive environment accesses representations of stored information (see Klatzky, 1980; **Anderson**, 1985). Memory failure may be due to either storage or retrieval operations. For example, information in the environment may be ignored, or the information may be processed but not well integrated into **previously** existing representations, or the retrieval environment may not provide the cues needed to access the target memory. Most theories of human memory assume that the cognitive system is limited by how much information can be stored or retrieved at any one time (e.g. Kahneman, 1973); if the amount of information or the task requirements **overburden** the cognitive system, then information will also be lost.

The information processing perspective provides a convenient framework for organizing and understanding much of the current research on the role of moods in selective memory. In this section I will first consider how moods affect the storage of information, then discuss how moods affect retrieval operations, and finally consider how moods might affect

the limited **capacity of the cognitive** system for storing and retrieving information.

### Mood effects during storage

A variety of mood and memory research has made the general point that people will store more information consistent than inconsistent with their **mood—an** effect sometimes **called** mood selectivity or **mood congruency**. For example, a person who feels elated is more likely to notice and later remember positive information (like being praised for doing good work) than negative **information** (like forgetting a person's name). Similarly, a depressed person is more likely to notice and later remember negative than positive information.

Often this research uses the strategy of mood induction. Subjects are induced to feel a certain mood through techniques like hypnosis, manipulated success or failure in games-playing, or the Velten (1968) mood-induction procedure in which subjects read lists of either positive statements (e.g. **'I feel so good I almost feel like laughing'**), negative statements (e.g. **'Looking back on** my life, I wonder if I have ever accomplished anything worthwhile') or neutral statements (e.g. **'Utah is the beehive state'**). The idea behind mood induction is to provide the experimenter with control over what mood a subject experiences so that any differences in memory may be attributed to mood and not to any extraneous variables.

A well known mood-induction experiment demonstrating mood selectivity is that of Bower, Gilligan and Monteiro (1981). In one of their experiments subjects were **hypotized** to feel either sad or happy and then required to read a story about two fictional characters, Jack and Andre. Jack is an unhappy character who has a series of rather depressing experiences such as losing his girlfriend while Andre is a happy character who has positive experiences such as **winning** at tennis. Twenty-four hours later the subjects recalled in a neutral mood as much of the story as they could remember. Subjects who had been induced to feel sad recalled more about sad Jack than happy Andre while elated subjects recalled more about Andre than Jack. Induced mood did not affect how many facts the subjects were able to remember: the elated and depressed subjects recalled overall about the same number of facts. Bower *et al.*'s (1981) research has been replicated (e.g. Gilligan, 1982, in Bower, 1983) although a failure to replicate has also been reported (e.g. Mecklenbrauker and Hager, 1984).

Mood selectivity has also been found in paradigms in which subjects are asked to read a list of positive and negative adjectives while in an induced mood and later remember the adjectives. Again, the usual finding is that induced elation **biases** the subjects to recall (or recognize) the positive

adjectives while induced depression biases subjects to recall the negative adjectives (Nasby and Yando, 1982; Natale and Hantas, 1982; Bower and Mayer, 1985; Alexander and Guenther, 1986; Brown and Taylor, 1986; for a failure to find this **result**, see Clark, Teasdale, **Broadbent** and Martin, 1983).

An example of this paradigm is provided by Nasby and Yando (1982) who induced happy and sad moods in fifth-grade children using **guided** fantasy. The children then read a list of positive (e.g. **'funny'**) and negative (e.g. **'mean'**) adjectives and later tried to recall them. While there was a general tendency for the children to recall more positive than negative **traits** the depressed children recalled fewer positive adjectives than did **children** for whom no mood was induced (neutral controls) while the elated children recalled more positive adjectives than did the neutral controls.

Another line of research compares naturally depressed individuals (who are often hospitalized for depression) to non-depressed controls. These investigations cannot, of course, control for other possible **differences** between depressed and non-depressed people besides current mood. However, if a person's mood does bias them to store mood-congruent information, then the effect should be observed in naturally occurring moods. In fact, a variety of investigations comparing clinically depressed to non-depressed have found evidence for mood selectivity (Nelson and Craighead, 1977; Davis, 1979; Breslow, Kocsis, and Belkin, 1981; Deny and Kuiper, 1981; Finkel, Glass, and Merluzzi, 1982; **Slife**, Miura, Thompson, Shapiro, and Gallagher, 1984). For example, Deny and Kuiper (1981) required clinically depressed and non-depressed controls to read a **list** of adjectives and say whether or not the adjectives described themselves. The clinically depressed but not the controls recalled more negative adjectives. As another example, Breslow *et al.* (1981) compared hospitalized depressed patients to non-depressed controls for their recall of a story containing positive, negative, and neutral elements. The depressed patients recalled fewer of the positive elements than did the controls. **In** general, then, the **research** on naturally occurring depression is consistent with the mood-induction **research—both** sorts of research find evidence for mood selectivity.

Other research on depression has **suggested** that depressed people do not **necessarily** remember more negative **information** in general; rather, they seem to be biased to remember only negative information that is in some sense related to themselves. Bradley and Mathews (1983), for example, asked clinically depressed psychiatric patients and control subjects to study lists of negative and positive adjectives and then to judge, on some **trials**, if the adjectives applied to themselves, or to judge, on other trials, if the adjectives applied to another person. The depressed patients remembered more negative than positive adjectives, but only for the adjectives applied to themselves.

For adjectives applied to **others**, the depressed patients recalled more of the positive than negative adjectives. The control subjects, on the other hand, recalled more of the **positive** than negative adjectives for adjectives applied to themselves or applied to another person. As another example, Brown and Taylor (1986) found that subjects induced to feel depressed recalled more negative traits than did subjects induced to feel elated, but only for traits that subjects agreed described themselves. For traits that subjects judged did not describe themselves, there was no effect for induced mood. Similarly interpreted results are reported by Deny and Kuiper (1981), Kuiper and **Derry** (1982), Kuiper and McDonald (1983), Ingram, Smith, and Brehm (1983), and Pietromonaco and Marcus (1985).

Not all research comparing naturally depressed to non-depressed controls has found evidence for mood selectivity. One well known failure is that of Hasher, Rose, Zacks, Sanft, and Doren (1985) who required subjects to read and later recall stories which contained both **positive** and negative events. In three different experiments the recall of subjects who rated themselves depressed did not differ from the recall of non-depressed subjects. There may be several reasons for their failure to obtain mood selectivity, however. For example, the naturally occurring mood variations experienced by otherwise rather normal individuals (the subjects were college students) may not have been strong enough to produce mood selectivity, the paper and pencil tests used to assess temporary mood states may have instead measured enduring personality traits, or the positive and negative elements of the stories may have been too interconnected (Mayer and Bower, 1985).

What might explain mood selectivity? One explanation is based on schema theory, a popular concept in modern cognitive psychology (Minsky, 1975; Schank and Abelson, 1977). Generally, a schema is like an outline of a commonly occurring event or a prototype of a concept. Examples of schema include the knowledge of the events that occur when eating at a fancy restaurant or the typical features of a college student. When a schema is activated in the course of information processing, attention is directed towards information **relevant** to the schema, ambiguous data are interpreted according to the biases induced by the schema, and information consistent with the schema is more readily elaborated upon and so better connected to other facts in memory.

A nice demonstration of how schemas affect memory is provided by Pichert and Anderson (1977) who asked subjects to read a story about a house from the perspective of either a home buyer or a burglar. Subjects who took the home buyer perspective later recalled

more facts relevant to home buying (e.g. the house needed painting) while subjects who took the burglar perspective recalled more facts relevant to burglarizing (e.g. the stereo was in the living room). The suggestion made by a number of theorists (e.g. Beck, 1967; Bower *et al.*, 1981; Johnson and Magaro, 1987) is that moods also function as schemas for selecting, organizing, and elaborating upon information. To put it in another way, a mood is like any other perspective a person might take; information consistent with the mood is more likely to be noticed, is likely to be connected to other facts about that mood, and is likely to promote elaborations which embellish its meaning. Later on, any cue to remember the information will result in more mood-congruent information coming to mind (see Roth and **Rehm**, 1980 or Davis and **Unruh**, 1981 for additional evidence for the schema hypothesis).

Another explanation for mood selectivity proposes that events associated with more intense moods (either good or bad) become more memorable presumably because such events are distinctive or inspire semantic elaboration (Bower *et al.*, 1981). Therefore, any time a **person** processes a story or list whose emotional tone is inconsistent with their prevailing mood, the intensity of their mood will diminish and that material will then become less memorable. A variety of experiments have found that experiences rated as intensely emotional, regardless of the type of emotion, are better recalled (**Menzies**, 1936; Waters and Leeper, 1936; Holmes, 1970; Dutta and **Kanungo**, 1975). Gilligan (1982; in Bower, 1983), in a mood-induction experiment, used hypnosis to vary the intensity of elation, anger, and depression and then required subjects to read (while mood-induced) and later recall (in a neutral mood) a list of descriptions of events such as finding money or missing a bus. Besides replicating the mood selectivity effect, he found that the more intense the induced mood, the more likely the associated event was later recalled. But for depression, the effect was just the **opposite—events** associated with severe depression were poorly recalled. Subjects induced to feel severely depressed acted tired and **less—behaviors** which undermined their learning. It is not clear, then, if the intensity hypothesis can explain mood selectivity for people feeling severely depressed.

In summary, research using mood induction or comparing clinically depressed to non-depressed people suggests that people are likely to store information consistent with their mood. One possible explanation suggests that moods function like any other cognitive schema in the manner in which information is assimilated. Another explanation is based on the idea that mood-consistent information helps subjects maintain a more intense mood and so inspires more rehearsal or semantic elaboration of

that **information**. Severe **depression**, however, may disrupt the storage of new information.

### Mood effects during retrieval

The research in the previous section focused on the effects of moods during the storage phase of memory. Now the focus moves to the effects of mood states on the **retrieval** of previously learned material.

Some mood-induction research has investigated whether mood induced at the time of recall selectivity influences what is remembered from previously learned material. The results of these studies have been inconsistent. Some experiments investigating mood induced only at recall have found no mood selectivity effect (Bower *et al.*, 1981) while others have found mood selectivity effects (Laird, Wagener, **Halal**, and Szegda, 1982; Teasdale and Russell, 1983; Forgas, Bower, and Krantz, 1984; Fiedler and Stroehm, 1986). **Isen**, **Shalker**, Clark, and **Karp** (1978) induced positive and negative mood by manipulating whether subjects won or lost while playing a video game. Subjects who won (and presumably felt happy) recalled more positive traits from a list of traits presented previously, but subjects who lost (and presumably felt sad) were no more likely to recall negative than positive words. Similar results were reported by Nasby and Yando (1982). Finally, Clark and Teasdale (1985) found mood selectivity for mood induced at recall, but only for their female subjects.

Several explanations for these inconsistencies are possible. The affective associations to material may sometimes be lost by the time subjects attempt to recall or the material may not inspire much of an emotional reaction if learned or experienced in a neutral mood. In general, it is probably true that the selective effects of a schema are greater when the schema is evoked during learning than when it is evoked only during recall (see, for example, **Bransford** and Johnson, 1972; Mayer, 1975). So it is not surprising that mood selectivity effects for mood induced at the time are not always observed.

Other research has examined what effect the similarity between the mood experienced during storage and the mood experienced during retrieval has on recall. Some anecdotal evidence suggests that people will remember better if they are in the same mood when they recall an experience as they were in when they originally had the experience, a phenomenon called mood state dependent retrieval. For example, **Diamond** (1969) reports that Sirhan Sirhan, the man who assassinated Robert Kennedy in 1968, initially claimed he could not remember committing the murder which he in fact committed while in a greatly agitated state. Under hypnosis to help him remember, Sirhan became greatly aroused and was only then able to recall the assassination. Bower (1981) has suggested that

Sirhan's case illustrates the general phenomenon of mood state dependent retrieval. Sirhan could only recall the event when he was placed in the same greatly agitated and angry mood as he was in when he originally carried out the assassination.

A variety of mood-induction experiments have looked for mood state dependent retrieval. For example, Bower, Monteiro, and **Gilligan** (1978) induced moods using hypnosis and required **subjects** to learn two lists of random (and emotionally neutral) words, one while experiencing elation and the other while experiencing depression. Later, subjects were put into one mood or the other and asked to recall both lists. Depressed subjects recalled more items from the list learned while depressed while elated subjects recalled more items from the list learned while elated. Compared to subjects who had learned both lists and recalled in the same mood, subjects who learned lists in different moods showed interference when recalling the list which mismatched their mood but facilitation when recalling the list which matched their mood. Important to the demonstration was that the cues to induce mood were different at recall than at **storage—otherwise** the results could be attributed to the similarity of the cues rather than the similarity of mood states.

Bower *et al.* (1978) found no mood **state** dependent retrieval effect when subjects were required to learn only one list (in one mood) and recall in either the same or different mood. In the one list paradigm subjects recalled as many words when their moods matched as when they mismatched. Other failures to find a mood state dependent effect in the one list paradigm include Nasby and Yando (1982) and Duncan, Todd, and Perlmutter (1985). The memory trace for a single list is probably so distinctive that it is easy for subjects to recall the list even when in an altered mood (Bower, 1981). Generally no mood state dependent retrieval effect is found when it is easy for subjects to remember the **material—as**, for example, when the experiment tests memory using recognition rather than recall (Bower, 1983; see also Eich, 1980, for similar results in **which** states are induced with drugs).

Mood state dependent retrieval using the list learning paradigm has been replicated by Schare, Lisman, and Spear (1984) who used the Velten (1968) technique to induce mood, by Bartlett and Santrock (1982) who found the effect in young children, and by Gage and Safer (1985) who found the effect in a recognition test of previously presented photographs but only for photographs first presented to the right cerebral hemisphere. Surprisingly, Bower and Mayer (1985) report a failure to replicate the mood state dependent effects (as does **Wetzler**, 1985). Probably mood state dependent retrieval in list learning experiments is a rather weak effect, especially since the to-be-learned material has little if any connection to the induced mood.

Another paradigm which provides more consistent evidence for mood state dependent retrieval requires subjects to feel happy or sad and to recall real life experiences. Such subjects typically **recall** more positive events when elated and more negative events when depressed. I regard this as a state dependency effect since the recalled events were likely experienced in the same mood as induced during retrieval (Blaney, 1986, **however**, regards these results as examples of mood selectivity).

This paradigm is typified by the research of Teasdale and his associates (Teasdale and **Fogarty**, 1979; Teasdale, Taylor, and Fogarty, 1980; Teasdale and Taylor, 1981). In their research, moods were induced by the Velten (1968) mood-induction procedure. Subjects were then given stimulus words (such as '**money**') and asked to retrieve a real life experience brought to mind by the stimulus word. In general, happy memories were more likely to be retrieved when subjects were induced to be in an elated mood while unhappy memories were more likely to be retrieved when subjects were induced to be in a depressed mood. In addition, the time it took subjects to retrieve a memory was longer if their induced mood and the affective connotations of the experience mismatched than if the mood and affective connotations of the experience matched. Similar results have been reported by Bower (1981), Natale and Hantas (1982), Snyder and White (1982), and Alexander and **Guenther** (1986).

Mood state dependent retrieval is also observed in severely depressed people who typically report a high frequency of unpleasant memories (Beck, 1967; Beck, Rush, Shaw, and Emery, 1979). Research which compares clinically depressed to non-depressed controls has generally revealed that non-depressed controls more quickly and readily retrieve positive than negative experiences while clinically depressed patients tend to take longer or are less likely to retrieve positive experiences (Lloyd and Lishman, 1975; Weingartner, Miller, and Murphy, 1977; Clark and Teasdale, 1982; Fogarty and Hemsley, 1983). Other research has shown that people who come to an experiment in a cheerful mood are more likely to recall positive experiences than people who are depressed (see **Bousfield**, 1950 for a review of some of this **work** which was done as early as 1917).

What might explain mood state dependent retrieval? Many theories of memory propose that information is stored in memory in a network of connections between concepts (e.g. Collins and **Loftus**, 1975; Anderson, 1985). In fact, a schema is one kind of network. When a concept is activated either by presentation of its corresponding stimulus or by a prior **thought**, then activation temporarily spreads to other related concepts. If a collection of concepts receives enough activation, then that collection enters consciousness and is experienced as memory for a fact, an image or an event.

An important implication of this sort of network model of retrieval is that memory for an event or fact depends on the similarity between

the environmental and cognitive elements that make up the event or fact and the environmental and cognitive elements present during retrieval. When those elements overlap, memory for the event or fact becomes more probable. The idea that such overlap is essential for successful retrieval is central to several theories of memory (e.g. **Guthrie**, 1959; Tulving and Thomson, 1973).

Network activation provides then an explanation for mood state dependent retrieval (**Bower**, 1981; Johnson and Magaro, 1987). A mood can be thought of as a collection of concepts that includes degree of arousal, expressive behaviors, beliefs, and so on. When an event is experienced under a given mood, the elements of that mood will become connected to the elements of the event. If a person later tries to recall the event in the same mood, then the same mood elements will be activated and spread excitation to the elements of the event. That activation may combine with activation from other retrieval cues to raise the total activation of the elements of the target event above the threshold necessary for recall. If a person is in a different mood during retrieval than when the event **was** experienced, the activation prompted by that mood will spread **excitation** to the wrong part of the memory **network—and** so will not combine with activation prompted by the other retrieval cues. Consequently memory should be better when the moods during storage and during retrieval match rather than mismatch.

In summary, research consistently demonstrates mood state dependent retrieval when subjects are asked to recall past experiences while in a particular mood. List learning demonstrations of mood-dependent learning are not as consistently obtained, although that may be because the information in the list is unrelated to the prevailing mood. Network activation models used to explain retrieval in other contexts would also seem to account for the mood state dependency effect.

### Depression and limited capacity

Most current models of human memory emphasize that information processing is limited by how much information can be processed at the same time. The usual interpretation is that the cognitive system has limited resources (Kahneman, 1973; **Anderson**, 1985). The sense in which human cognition is limited, though, remains a matter of debate (e.g. Neisser, 1976). Whatever the basis of our cognitive limits, many researchers have suggested that **moods—in particular depression—can** affect the capacity of the cognitive system (Hasher and Zacks, 1979; Weingartner, Cohen, Murphy, **Martello**, and Gerdt, 1981).

Certainly, a common observation made of the very depressed is that their level of cognitive functioning seems reduced. For example, many

depressed people frequently complain of memory failures and often find it difficult to learn new information (Beck, 1967; Sternberg and Jarvik, 1976; see Johnson and Magaro, 1987 for a review). However, not all of the research on depression finds that depression reduces memory (e.g. Davis and Unruh, 1980). Indeed many of the experiments on mood selectivity and mood state dependent retrieval show that overall recall levels or recall latencies are about the same under depression as under elation (for example, Bower *et al.*, 1981; Teasdale and Russell, 1983; Alexander and Guenther, 1986). So there is no consistently observed effect of depression on overall level of recall.

Ellis, Thomas, and Rodriguez (1984) have tried to resolve this inconsistency by arguing that depression may inhibit only the cognitive processes which are effortful—especially the kind of processing required to encode material in a way that makes that material more memorable. Generally, information that is difficult to recall (isolated words or sentences) may be made more memorable if a person embellishes or elaborates upon the information (see Stein and Bransford, 1979). Presumably such elaboration creates more connections between the information and other concepts already stored in memory.

A variety of evidence support Ellis *et al.*'s (1984) claim. For example, Ellis *et al.* (1984) presented subjects with lists of sentences like 'The old man bought the paint' and sentences like 'the old man bought the paint to color his cane'. Some subjects were induced (through the Velten mood-induction procedure) to feel depressed. Later, subjects were given a cued recall test (e.g. Who bought the paint?). For the shorter sentences it is harder to recall the subject (e.g. 'old man') because there is no inherent connection between the subject and predicate (Stein and Bransford, 1979). But for the longer sentences, the additional phrase suggests a meaningful connection between the subject and predicate (e.g. the fact that the old man is coloring his cane with paint clarifies the idea that the man is old). But subjects must be willing or able to extract and process that additional information in order to make the sentence more memorable. Ellis *et al.* (1984) found that for the short sentences there was very little difference in recall between depressed and non-depressed subjects. However, the non-depressed subjects recalled many more of the longer sentences than did the depressed subjects. Apparently the depression-induced subjects were unwilling or unable to engage in the effortful processing required to take advantage of the additional phase.

Research comparing clinically depressed to non-depressed controls also supports the notion that depression interferes mainly with the effortful cognitive processing (Weingartner *et al.*, 1981; Silberman, Weingartner, Laraia, Byrnes, and Post, 1983; Jackson and Smith, 1984). For example, Weingartner *et al.* (1981) found that depressed people failed to use

processing which might have enabled them to organize input. In their experiment, clinically depressed and normal subjects were allowed to study a list of words taken from several categories like flowers or animals. For some lists the words were blocked by category (all the words from the same category were presented together) while for other lists the words were randomly ordered. The depressed and control subjects recalled about an equal number of words from the blocked lists, but the depressed recalled fewer words from the random lists. Presumably, successful recall of the random lists requires engaging in rather effortful reorganizing processes; the depressed subjects were less willing or able to do so.

For what reason might depression interfere with the elaborative processing required to store information effectively in memory? One possibility is that the low arousal associated with depression reduces the overall cognitive capacity for information processing. If a task requires only a little effort, depression may not interfere since enough capacity is retained in spite of the depression. But if a task requires a lot of capacity, then depression may inhibit memory performance. There is reason, though, to doubt the idea that information processing limitations are due to the quantity of cognitive resources (Neisser, 1976).

Another explanation for the inhibitive effects of depression may be that depressed people simply lack the incentive to work hard in memory experiments (but have plenty of incentive to work hard at other tasks such as reflecting on past mistakes) or may be so preoccupied with themselves and their predicament that they become easily distracted and so are ineffective at processing information unrelated to their predicament. If so, depression will only interfere with effortful tasks which are unrelated to their depression (recall the experiments which show that the depressed readily remember negative information about themselves). Depression may not be so much a state of reduced cognitive capacity as it is a state in which cognitive effort is inner directed or directed towards environmental events that bear directly on the depression.

Finally, there is evidence that clinically depressed people may be as likely to retrieve an item from memory but are less likely to report the item than non-depressed controls (Miller and Lewis, 1977). Perhaps the confusion and sense of failure that typically accompanies depression undermines the confidence depressed people have in their memory (Johnson and Magaro, 1987).

#### ATTENDANT PROBLEMS WITH MOOD AND MEMORY RESEARCH

In this section I will briefly review four kinds of attendant problems with research on mood and memory; these include: inconsistencies in the research findings, demand characteristic explanations of the results,



asymmetrical effects of **moods**, and the unresolved issue concerning the role cognitions play in emotions.

### Inconsistencies

One general problem plaguing mood and memory research is the inconsistencies in many of the findings; especially in the experiments in which mood is induced (see Blaney, 1986). As discussed earlier, some experiments have **failed** to find a mood selectivity effect for moods induced (or measured) at the time of storage (e.g. **Mecklenbrauker and Hager, 1984**; Hasher *et al.*, 1985), others have failed to find a mood selectivity effect for moods induced only at recall (e.g. Bower *et al.*, 1981), others have failed to find mood state dependent retrieval for list learning experiments (e.g. Wetzler, 1985), and finally others have failed to find an inhibitory effect for depression (e.g. Teasdale and Russell, 1983).

I have suggested in the previous sections some of the reasons for these inconsistencies. Mood selectivity at recall might depend on material in which positive and negative elements are not **intertwined**, mood-biasing effects in general may be stronger when the material can be meaningfully connected to the prevailing mood, and the inhibitory effects of depression may require material that is inherently difficult to remember unless a person is willing or able to engage in effortful processing. Collectively, though, these inconsistencies suggest that mood-biasing effects on memory depend to a considerable extent on the particulars of the experimental task. Human memory is influenced by a large number of variables (including the nature of the information, motivation to recall, processing strategies, mood, and so on). It may be difficult to predict, then, which of these variables will provide the dominant effect on memory performance in any given situation.

### Demand characteristics

Another concern in mood-induction research is with the possibility that subjects may be performing only to fulfil the expectations of the **experimenter**—that is, a subject's memory performance may not be due to the induced mood but due instead to the demand characteristics of the experiment. This issue is rather difficult to **formulate** clearly and may entail several issues such as: do mood-induction procedures induce real moods that are experienced as are naturally occurring moods? Is it meaningful to claim that a person can simulate a mood in all of its behavioral aspects but not really feel the mood? Can a person really feel an induced mood yet retain control over what they chose to remember **from** memory in a manner independent of that induced mood? For that matter, is it possible that even

people who experience natural moods nevertheless respond to demand characteristics when participating in a memory experiment? It may not be possible to answer to answer all of these questions. Many researchers, though, have played down the role of demand characteristics in mood and memory experiments.

Bower (1981) notes that moods induced under hypnosis or by the Velten mood-induction procedure do not appear to be **faked**—rather, subjects behave as if they really are in the induced mood. Bower notes, too, that in some experiments subjects who are told to respond as quickly as possible (creating a demand to recall everything quickly) still show mood state dependent effects on response latency (e.g. Teasdale and Fogarty, 1979). Furthermore, subjects do not always show a mood selectivity or state dependent effect even when the experimental demands imply the occurrence of the effect. For example, in some experiments subjects show no mood selectivity effect when mood is induced only at the time of recall (e.g. Bower *et al.*, 1981). Finally, many of the mood biasing effects like selectivity or state dependency observed in mood-induction experiments are also observed in studies which compare clinically depressed to **non**-depressed people.

**Still**, these observations may not completely dispel the demand characteristic explanation for the results of mood-induction experiments. Several researchers have argued that the cognitive effects of the Velten mood-induction procedure are due mainly to its demand characteristics and not induced mood (Polivy and Doyle, 1980; **Buchwald**, Strack, and Coyne, 1981). Similar arguments have been made for hypnotically induced moods (e.g. Spanos, 1982). Subjects told to respond quickly in an experiment may nevertheless remain sensitive to the rather obvious demand characteristics implied in mood induction. That sometimes **subjects** do not show mood selectivity effects when mood is induced at recall may only mean that positive and negative information may be difficult to sort out after they begin to forget the material or that the **material is** not perceived as emotional if they originally learn it in a neutral mood. Finally, that depressed patients show mood biasing does not prove that experimental subjects are ignoring demand characteristics; rather, subjects induced to feel depressed may simply base their pattern of recall on their knowledge of how depressed people behave.

Recently, Alexander and Guenther (1986) explicitly varied the demand characteristics in one of their experiments and found that a suggestion made to subjects that people remember information inconsistent with their moods eliminated the mood selectivity effect (measured by the recall of traits presented while in an induced mood) usually observed in this sort of paradigm. Their finding suggests that demand characteristics may have a rather potent effect on recall in mood-induction experiments.

Presumably mood-biasing effects on memory observed in seriously depressed people are not due to demand characteristics. Indeed, depressed people often find it difficult to prevent the occurrence of depressing thoughts in spite of the very clear and strong demands of other people (including their therapist) to dwell on more positive thoughts. If demand does play an important role in mood-induction research then the mechanisms which account for mood-biasing effects in clinically depressed people and in experimental subjects undergoing mood induction may be different. Depressed **people** usually report that they cannot easily control their feelings and accompanying negative thoughts (Beck, 1967). Subjects in mood-induction experiments, on the other hand, are only playing the role of a depressed or elated **person—they** presumably remain in control of their feelings. Perhaps, too, they retain control over what they chose to store into or retrieve from memory. Hopefully, future research can help clarify how and under what circumstances demand characteristics influence behavior in mood and memory experiments.

### Asymmetry of mood effects

Much of the research investigating the effects of elation and depression on memory has implicitly assumed that these moods are symmetrical in their **effects—depressed** subjects store and retrieve negative information while elated subjects store and retrieve positive information. Isen (1985), however has challenged this assumption. She notes that in some experiments depressed subjects do not show as great a tendency to recall negative materials as do elated subjects to recall positive materials. That is, mood selectivity and state dependent retrieval effects may be less for depression than for elation (e.g. Isen *et al.*, 1978; Bartlett and Santrock, 1982; Nasby and Yando, 1982; Brown and Taylor, 1986; see Isen, 1985, or Blaney, 1986, for a review).

Isen (1985) has suggested several reasons for this asymmetry. One reason may be that mildly depressed individuals are motivated to try to repair their moods by deliberately thinking about or noticing positive events. Elated individuals, on the other hand, would be motivated to maintain their moods and so deliberately attend to positive events. Another basis for the asymmetry between depression and elation may be that the cognitive schema associated with depression may connect to fewer facts or events than schema associated with elation. Mild depression is usually about something like loss while elation may be associated with a wider range of situations. The mood state of elation, then, may activate more facts, images, and events stored in memory.

The reader should note, however, that a variety of studies have found symmetrical effect for mood selectivity and mood state dependent

retrieval (e.g. Bower *et al.*, 1981; Teasdale and Russell, 1983; Alexander and Guenther, 1986). Furthermore, processes like mood repair may not characterize the behavior of the clinically depressed. They may have depressive schemas that are quite general or they may be too overwhelmed by their depression to engage successfully in mood repair.

### The role of cognitions in mood

Up to this point, I have only considered how moods might affect what and how much people remember. I will conclude this chapter by considering how thoughts and memories might affect moods. Some researchers have suggested that the thoughts and memories that accompany moods also help to maintain or change them. So, for example, depression may trigger negative thoughts and memories which in turn cause a deepening of the depression (Teasdale and Russell, 1983). However, as Blaney (1986) has pointed out, such an interpretation predicts that people will invariably drift toward an extreme and permanent emotional state. Yet people are generally in a neutral mood despite having positive and negative thoughts. Even the seriously depressed usually recover.

A possibility is that memories and thoughts which accompany moods do not actually cause the **mood—rather**, such cognitions are only by-products of moods elicited by other variables. This possibility is, of course, related to the longstanding debate on whether cognition precedes emotion or emotion precedes cognition (Plutchik, 1985). Another possibility is that thoughts do influence moods but that people deliberately engage in cognitive activities that help **then** escape from negative mood states like depression. Isen's mood repair is an example of such an activity.

A third possibility is that cognitions influence moods, but the cognitions that do so are not memories of pleasant experiences and the like but rather are the schemas by which experiences are interpreted and problems are solved. That is, semantic rather than episodic memory may play the more important role in affecting moods (see Tulving, 1972, for a discussion of the difference between semantic and episodic memory). Certainly merely thinking of pleasant thoughts is not likely to reduce depression (Teasdale, 1978) but changing the schema by which one understands oneself and one's relationship to events may help (Beck, 1967). People recover from severe depression because they change the way they interpret events and because they find new ways to obtain gratification. Such changes probably depend more on having positive experiences than on directing thoughts towards pleasant memories. Perhaps future research on mood and memory can help better clarify the role cognitions have in controlling mood states.

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