

## Affect and cognition

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This paper reviews my research on emotional influences on memory and judgement. First, it is found that when people are feeling happy, sad, or angry, they selectively attend to and learn more about stimulus material that is congruent with their feeling. Beyond selective attention, it is hypothesized that this congruity effect on learning arises because congruent material causes a more intense emotional reaction, and, within limits, people better remember events that are associated with more intense reactions. Second, it is found that emotion serves as a selective retrieval cue for material stored in memory in association with that emotion. People remember material best when they can reinstate the emotion they felt when it was learnt. Third, owing to this selective retrieval, emotion influences diverse cognitions and judgements: people's fantasies, their impressions of others or themselves, their forecasts of the future, their predictions about their competencies, and so on.

### INTRODUCTION

I shall discuss my research into how people's emotions influence their memory, perception, judgement and thinking.

I shall organize these findings into three broad areas. The first group of findings is that people's emotions influence what memory records they can retrieve from their memory store. People can best retrieve events originally learnt in a particular emotional state or mood by somehow reinstating or returning to that same mood. We call this mood state-dependent retrieval and we have several demonstrations of it.

Second, we find that people learn more about material that agrees with their emotional state. Thus stimuli that support or justify a person's feelings seem thereby to become more salient, to arouse more interest, cause deeper or more elaborate processing, and so it is learnt better. I shall then examine evidence for the hypothesis that the mood-congruity effect arises from stimulus-locked fluctuations in the felt intensity of the person's mood.

Third, we find strong emotional influences upon thinking and judgements. People's social perceptions as well as their imaginative fantasies are subjective; they are easily influenced by their mood of the moment. These influences occur whenever people evaluate their friends, themselves, their life situation, and their future.

### MOOD INDUCTION METHOD

Because our experiments examine the influence of emotional moods, I should first explain which emotions we study and how they are created. The emotions usually studied are simply happiness and unhappiness or mild sadness, approximately what people feel from watching a funny comedy or a sad film. A number of university students have served as paid volunteers and they consent to feel the emotional moods we suggest for our experiments. As a tool, we

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often use hypnosis. We hypnotize our volunteers, then ask them to get themselves into a happy mood or a sad mood by remembering some happy or sad experience from their lives. They are to go through that memory in their imagination, to relive the emotion they felt at the time, and then hold on to that emotion while they carry out some experimental task. The emotional feelings created in this manner are quite real although mild, rather what any of us can do by vividly reviewing a happy success experience or unhappy failure experience. In some experiments we do not use hypnosis, but rather simply ask the subject to remember happy or sad scenes from his life, thereby stimulating himself to become happy or sad. That method works almost as well as hypnotic suggestions. At the end of the experiment, we remove our emotional suggestions, returning the volunteers to a state of pleasant relaxation. The procedures seem quite harmless and our subjects willingly volunteer for more experiments. So that is the way we create happy or sad moods in our subjects.

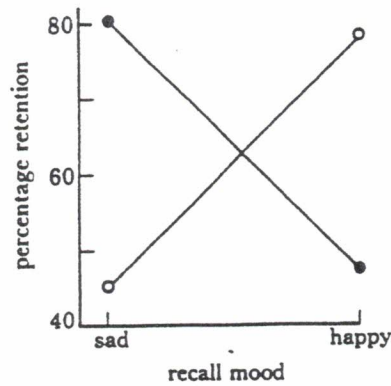


FIGURE 1. Percentage retention scores vary according to the match between learning mood and recall mood. The sloping lines refer to subjects who learnt the two lists in different moods: ○, happy; ●, sad. (From Bower (1981); reprinted with permission.)

#### MOOD STATE-DEPENDENT RETRIEVAL

Let us now examine some experiments we do. First, I shall discuss how retrieval of memories is affected by the subject's emotional state at the moment. Here our research has uncovered a kind of state-dependent memory created by different emotional states. The idea is that the memories that a person stores when he is in one emotional state are most retrievable later if he can re-enter that same emotional state, but his retrieval will be much worse if he tries to recall while in a different emotional state from original learning. It is as though a specific emotional state is like a specific room in a library into which the subject places memory records, and he can most easily retrieve those records by returning to that same room or emotional state.

We have several experiments showing this emotion state-dependent memory. In the first, we had people learn to recall two lists of 16 words, one list learnt while they were happy, a second list while they were sad. Later they were placed in a happy mood or a sad mood and asked to recall both lists of words. The percentages of words retained are shown in figure 1. People who were tested while sad recalled more of the list they had learnt while sad, whereas people who were tested while happy recalled more of the list they had learnt while happy. Relative to control subjects who learnt and recalled both lists in a single mood, subjects who learnt the lists in different moods showed interference when recalling a list while in a



mismatching mood, and facilitation when recalling it in a matching mood. The results can be explained by assuming that a subject's mood becomes associated with the learning items, that these associations facilitate recall when the test mood matches the mood under which the items were learnt but they interfere with recall by calling forth competing associates when the test and input moods mismatch.

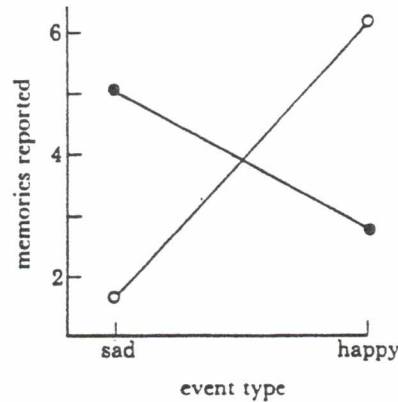


FIGURE 2. Number of happy and sad memories of recent events reported by happy (○) and sad (●) subjects. (Based on Snyder & White (1982); adapted with permission.)

This mood dependence in free recall has been replicated several times in our laboratory. For example, people who are happy recall many more happy than sad events from their childhood or from their recent life as recorded in their personal diaries; on the other hand, people who are sad recall relatively more sad than happy events from their lives. One does not need to use hypnosis to demonstrate this selective retrieval. A recent experiment by Snyder & White (1982) induced happiness and sadness through autosuggestion without hypnosis; the subjects were then asked to report personal events of the past week. Other judges rated the reported events as happy, sad or neutral, with the results as shown in figure 2. This again shows state-dependent memory: happy people retrieved relatively more happy memories, and sad people sad memories. This is state-dependent retrieval because we assume that people felt appropriately happy or sad at the time these happy or sad events occurred originally. Thus when the subject is later made sad, for example, that mood will better retrieve earlier events stored at the time he was sad.

The explanation for selective recall of real-life events is the same as the explanation given earlier for selective recall in our word-list experiment. In another place (Bower 1981) I have provided an associative network theory that explains this mood state-dependent retrieval. It is based on the idea that for our purposes an emotion can be represented as unit in the memory system, which is characterized by its connection to facial expressions, to behavioural scripts, to autonomic arousal patterns, and to ideas and memories that have occurred in association with that emotion. When this emotion is aroused later, activation will spread out along its connections, thus priming and bringing into readiness these associated ideas and memories. Thus when the person is happy and is asked to recall some event from his childhood, his set of happy childhood memories will be receiving more total activation than will alternatives; these most-activated memories will therefore become conscious and available for recall.

recalled  $1\frac{1}{3}$  times as many sad incidents as happy ones. This is not a state-dependent effect, because these subjects were in a neutral mood during recall.

These experiments show that people learn more about material that agrees with their emotional state. Why is this? As I noted before, one reason is that when given a choice, people prefer to attend to material that agrees with their mood; thus they ordinarily spend more time reading and thinking about such material. However, that cannot be the complete explanation, because in other experiments when we have equalized exposure times, we found that people still remember more mood-congruent material. So what else might be going on?

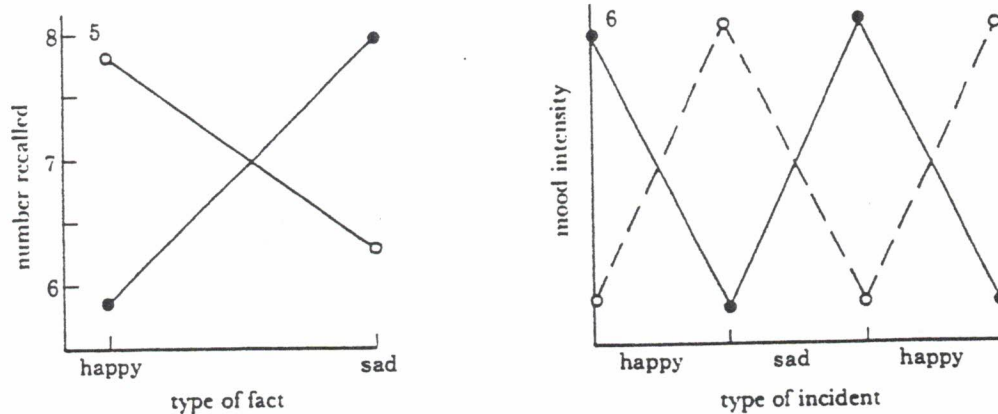


FIGURE 5. Number of happy v. sad story incidents recalled by readers who were happy (○) or sad (●). (From Bower (1981); reprinted with permission.)

FIGURE 6. Hypothesized fluctuations in intensity of a happy person's mood (broken line) or a sad person's mood (solid line) as they read a story containing first a happy incident, then a sad incident, then another happy one. Congruous events heighten mood intensity, whereas incongruous events cause it to wane. (From Bower (1981); reprinted with permission.)

I believe that the mood-congruity effect arises from multiple sources and have investigated several hypotheses regarding its cause. The hypothesis I shall discuss proposes that mood-congruent material is remembered better because it is accompanied by a more intense emotional reaction. That is, when a person attends to material that is congruent with his emotional state, we assume that this intensifies or heightens his emotional feelings; however, when he attends to material that is incongruent with his current emotional state, that causes a reduction in the intensity of his felt emotion. The hypothesized changes in intensity are depicted in figure 6.

This shows the changes in intensity of the felt emotion as a happy subject and a sad subject read a happy episode in a story, then a sad episode, then another happy one. Thus, for example, a happy subject will become more euphoric as he reads about a happy romance, whereas he will become less happy as he reads about a funeral; and conversely for a sad subject. If we assume that people are more likely to remember events that are associated with more intense emotional reactions, then this fluctuation in mood intensity would explain why people remember better material that is congruent with their current mood state.

We have several sources of evidence for this mood intensity hypothesis. A first is that our subjects spontaneously report the mood-congruent waxing and waning of their felt emotion according to the material they are reading at the moment. Thus happy people report coming down from their euphoria as they read about a misfortune or funeral; and conversely for sad



## MOOD-SELECTIVE LEARNING

Having<sup>2</sup> discussed state-dependent retrieval, I shall now move on to my second topic, namely selective learning caused by emotional states. The basic hypothesis is that people in a given mood will learn more about material that agrees with their mood; it is as though they attend to things that will justify or maintain their mood. We have studied this mood selectivity in several ways. In one unpublished experiment, done by my student Colleen Kelley, happy or

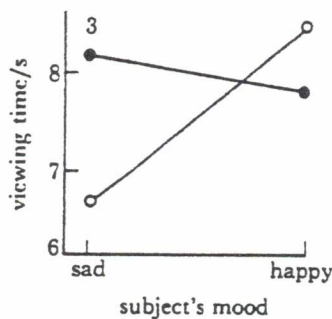


FIGURE 3. Average time that happy or sad subjects spent viewing pictures depicting happy (○) or sad (●) scenes. (Data from Kelley (unpublished); reprinted with permission.)

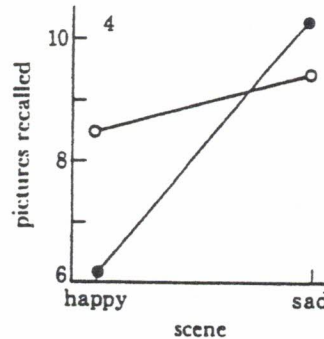


FIGURE 4. Average number of happy and sad scenes recalled by subjects who studied the pictures when they were happy (○) or sad (●). (Data from Kelley (unpublished), with permission.)

sad subjects were asked to examine at their own pace a set of pictures containing some happy and some sad scenes. Typical happy scenes were of people laughing, playing or celebrating victories; sad scenes were typically of failures, rejections, funerals and the aftermath of disasters. Without informing the subjects, we recorded how much time they spent looking at the different types of picture. We obtained the results shown in figure 3. Here we found that if the viewers were happy they spent more time looking at the happy scenes than at the sad ones; if the viewers were sad they spent more time looking at the sad scenes. Often people were unaware they were doing this. So this is selective exposure to materials that agree with the mood of the viewer.

This difference in exposure time caused a difference in memory for the two types of pictures. When these subjects were asked to free-recall the gist of the pictured scenes, Kelley obtained the results shown in figure 4. Happy subjects remembered more happy pictures, whereas the sad subjects remembered more sad pictures. Thus the selective exposure to mood-congruent material gave rise to selective learning of it.

As a second illustration of mood selectivity, this time with printed textual material. S. Gilligan and I (see Bower *et al.* 1981) had subjects read some simulated psychiatric interviews, in which a patient talked about his childhood to his psychiatrist. The patient in the narrative briefly described a series of unrelated happy incidents and sad incidents from his life. The subjects who were reading the narrative were made to feel happy or sad while they were reading it. Later, they recalled this narrative with the results as shown in figure 5.

Here we find that people learnt more about incidents that agreed with their mood. Happy readers recalled about  $1\frac{1}{4}$  times as many happy incidents as sad ones, whereas sad readers

people. These emotional reactions are 'socially appropriate' to events; indeed, in everyday life we would consider it strange or indicative of deviance if a person reacted inappropriately to sad or happy stories.

A second bit of evidence is that material that evokes strong emotional reactions is more likely to be recalled. The basic effect here was shown in another experiment by Colleen Kelley. She presented subjects with brief phrases such as 'lost child' or 'happy days', or 'bad bets'; they

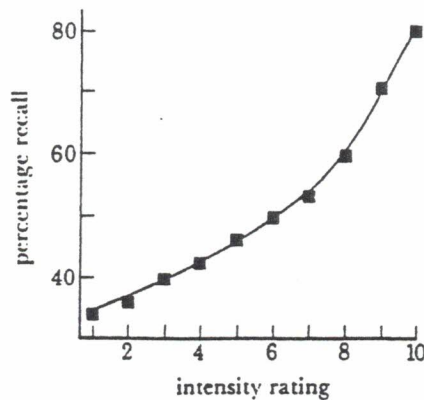


FIGURE 7. Probability of later recall of a memory-prompting phrase related to the emotional intensity of the memory prompted with the phrase. The curve has been smoothed with moving averages of three points. (Data from Kelley (unpublished); reprinted with permission.)

TABLE 1. SEQUENCE OF EVENTS IN GILLIGAN'S (1982) EXPERIMENT

*First session:* train subjects to access on one low (1, 2) medium (4-6), or high (8-10) intensities of an emotion. Different groups for sad, happy or angry.

*Second session:* hypnotize.  
 access mood (happy, sad or angry)  
 intensity level A: imagine self in 12 episodes  
 (4 happy, 4 sad and 4 angry)  
 shift to intensity level B: imagine 12 new episodes  
 shift to intensity level C: imagine 12 new episodes  
 shift to neutral mood  
 remove from trance  
 interpolated task for 5 min  
 free recall gist of episodes (neutral mood)

were instructed to use these phrases to retrieve a specific memory from their life, and then to rate the current intensity of feeling they had about that event. After going through a series of 78 such prompting phrases, the subjects received a surprise memory test, being asked to recall all of the prompting phrases that had been given to them. The results are shown in figure 7, which shows how the intensity rating given to an experience at the time the prompting stimulus occurs correlates with its later recall. As a phrase prompts a more emotional memory, the subject becomes increasingly likely to remember that phrase on the later recall test. This therefore provided an assessment of the relation between the emotional intensity of an experience and its later recall.

Unfortunately, that result has several interpretations, because the material that causes an



intense emotional reaction differs in many ways from material that causes only a mild reaction, and perhaps something about the material or the event being remembered was causing the differences in recall. The results would be easier to interpret if we could keep the material or event constant and simply vary the person's emotional reaction to it by some means such as hypnotic suggestion.

That is the experiment done next by my student, S. Gilligan (1982). Because the experiment was somewhat complex, the sequence of procedures is spelt out in table 1. First, Gilligan trained three groups of 10 hypnotic subjects to feel a given emotion at three distinct intensity levels: low, defined as 1 or 2 on a 10-point scale of intensity, medium (4-6) or high (8-10). Initially, subjects accessed those intensity levels through use of different event memories, but with training they became able to access the mood intensities directly upon a verbal signal without resorting to the different memories to recruit their moods. One group of ten subjects learnt to produce different intensities of happiness, another group learnt with sadness, and the third group learnt with anger. In the second session, the hypnotized subject accessed his trained mood of anger, happiness or sadness at some instructed intensity level (low, medium or high for one third of the subjects) and felt this intensity of emotion while he imagined himself involved in 12 consecutive brief episodes described orally by the experimenter. These comprised 4 each of happy, sad, and angry episodes. A happy episode might be finding money on the pavement while walking, whereas an angry episode might be the provocation of having someone cut in front of you at a bus queue, causing you to miss your bus. After imagining himself in these 12 episodes, the subject was then shifted to a second intensity level and presented with another 12 episodes; then he was shifted to his third intensity and read a final set of 12 episodes. He was then shifted to a neutral mood, removed from trance, given arithmetic problems for 5 minutes, then finally, when in a neutral mood, was asked to recall all the 36 episodes he had experienced. The order of receiving the three intensities was counterbalanced across subjects in a given condition.

The first result of interest appears in figure 8. This shows the familiar mood-congruity effect for each group: happy subjects recalled more happy episodes, sad subjects recalled more sad episodes, and angry subjects recalled more angry episodes. These results replicate and extend our earlier findings.

The more interesting results appear in figure 9, which shows how recall varies with the intensity of the mood during learning. For happy and angry subjects, the more intense their emotion, the better they learn episodes experienced at that time. But the picture is reversed for the sad subjects: for them, the sadder they become, the poorer is their learning. We have thus encountered a complication in testing the mood-intensity hypothesis by this manipulation. Specifically, sadness seems to activate old habits that interfere with learning; very sad people feel unmotivated, tired, defeated, and just want to withdraw and be left alone. These attitudes and behaviours are harmful to learning.

Let us retrace our reasoning in the light of these new findings: first, we find that people remember mood-congruent materials even when those are studied for the same duration as incongruent materials. Next, we guessed that people may learn mood-congruent materials better partly because these produce a more intense emotional reaction. Third, we noted that subjects report just such fluctuations in their mood intensity according to the type of material. Fourth, we find that phases that prompt more intense memories are better recalled, in apparent support of the intensity hypothesis. Finally, manipulation of the subject's mood intensity by

hypnotic suggestion has mixed effects on learning: positive for happiness and anger, but negative for sadness or depression. Perhaps we can lessen the impact of the sadness data on the intensity hypothesis by noting the peculiarity of this hypnotic manipulation of mood intensity. During the learning trial, subjects were first asked to place themselves into a specific intensity level of mood and to maintain this as a background feeling as they imagined themselves

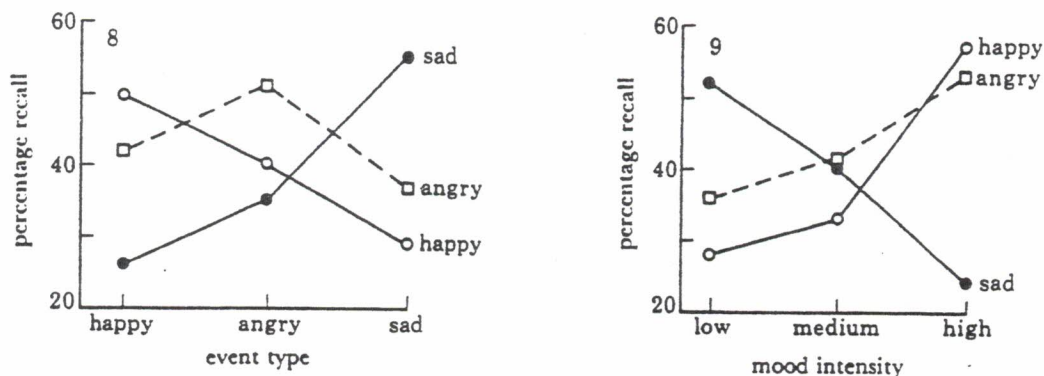


FIGURE 8. Average free-recall percentages of happy, angry and sad episodes by subjects who studied them while they were happy (○), angry (□) or sad (●). (Data from Gilligan (1982); reprinted with permission.)

FIGURE 9. Average free-recall percentages for all episodes experienced under low, medium or high intensities for happy (○), angry (□) or sad (●) moods. (Data from Gilligan (1982); reprinted with permission.)

engaged in the 12 episodes described by the experimenter. Note that the episodes were not to be interpreted as causing or giving rise to this intensity of emotion; rather the episodes just happened to be experienced, almost accidentally, while the subject's mood was at the instructed intensity. Perhaps emotional intensity has its positive effect on memory for an event primarily when subjects attribute causal power to the event, when they believe that it was the event itself that caused their momentary change in emotional intensity. It would certainly be an evolutionary advantage for a brain to learn about causally related events rather than any random coincidences.

This causal attribution argument suggests that the hypnotic manipulation of felt intensity of a 'background' mood is not an appropriate test of the intensity hypothesis. Rather, a better test would have the neutral mood subjects shift to a specified intensity level of their emotion as a direct result of experiencing a single episode; then their mood would be returned to the neutral point before the next episode was presented. Unfortunately, there are many procedural complications that preclude that experiment: mood shifts require several minutes to complete, and it is infeasible to ask subjects to causally ascribe their mood elevation to an affectively incongruous event (e.g. to feel euphoric over a child's grief). A proper experiment is yet to be done. In the meantime, we may content ourselves with the conclusion that emotional intensity is still a possible explanation for the mood-congruity effect provided that the subject believes that the event to be remembered caused the emotional reaction.



## MOOD INFLUENCES ON COGNITION

Let us return now to our main topics. Having discussed mood state-dependent retrieval, and selective learning of mood-congruous material, I shall move on now to discuss several other influences that emotions have on cognitive processes.

When emotions are strongly aroused, concepts, words, themes and rules of inference that are associated with that emotion will become primed and highly available for use by the emotional subject. We can thus expect the emotional person to use top-down or expectation-driven processing of his social environment. That is, his emotional state will bring into readiness certain perceptual categories, certain themes, certain ways of interpreting the world that are congruent with his emotional state; these mental sets then act as interpretive filters of reality and as biases in his judgement. I shall now briefly illustrate some of these effects, which are listed in table 2.

TABLE 2 LISTING OF SOME COGNITIVE PROCESSES INFLUENCED BY EMOTION

1. free associations
2. themes of fantasies (T.A.T. stories)
3. snap judgements of people
4. judgements of event likelihood
5. inter-personal judgements
6. self-perception
7. self-confidence

*Free associations*

First, emotion affects free associations. In one experiment, subjects were feeling happy, sad, or angry as they free-associated to neutral words. Their free associates often revealed this mood. For instance, a subject who was happy was given the stimulus word 'life' and gave as chained free associates the words 'love, freedom, fun, open and joy'. Another subject who was angry responded to 'life' with the associates 'struggle, toil, fight and competition'. Many of the associations were just this obvious. The associative network theory implies this bias because it supposes that the prevailing mood acts as a constant source of activation, so that the most activated word-associates lie at intersection points in the associative network between the mood and the stimulus words. Thus the associates typically satisfy joint constraints suggested by the mood and the stimulus word.

*Fantasies*

Second, we find that emotion influences the kind of fantasies and daydreams that people have. As a demonstration, in one experiment, we asked happy or angry subjects to make up stories about what was going on in several pictures from the Thematic Apperception Test (T.A.T.). We found that in general, the content of the stories was strongly affected by the person's mood. Happy people told happy stories about success or romance, whereas angry subjects told aggressive stories about conflict and turmoil. This is understandable if we suppose that emotions such as anger or happiness suggest a theme such as conflict or romance, around which a story is then elaborated in imagination.

positive events or blessings, and reduced their estimates of future negative events or disasters. On the other hand, depressed subjects did just the reverse: they increased their probability estimates of disasters, and lowered their estimates of the likelihood of blessings. These differences were quite striking and quite consistent across subjects and items. The effects are just as large for international events as for personal events directly affecting the subject. Here, then, is the optimism of the happy person and the pessimism of the depressed person.

To explain this result, I might note that people use a strategy of estimating the probability of an event according to how quickly they can retrieve supporting evidence for it from memory. Thus in estimating the likelihood of being injured in a car accident, a person might try to remember relevant episodes involving himself or his friends in car accidents or newspaper stories about such accidents. He then adjusts his probability estimates according to how easily examples are retrieved from memory. Because of mood-dependency in retrieval, memories of mood-congruent episodes appear to be more available; hence probability estimates become dramatically biased in the mood-congruent direction. Thus happy subjects will think that happy events are very likely to occur, whereas depressed subjects will think that disasters are very likely to occur.

#### *Social impressions*

Moving to my next point, we also find that a subject's mood strongly affects his judgements about other people's behaviour towards him. Social perceptions of what someone is doing, of what is happening around us, are heavily tinged with subjectivism and evaluation. The meaning of people's actions is not given to us objectively, but rather is projected onto those actions according to our evaluations. We have to read the intentions hidden behind people's words and actions. In that reading, the emotional premise from which we begin strongly influences how we interpret behaviour. Thus we have to decide whether a student who argues with us in class is being forthright or is being hostile, whether he is showing admirable persistence or pigheadedness. We have to decide whether a policeman's actions towards criminals illustrate daring courage or utter recklessness. Clearly, the judgements we make depend on how the actions impact on us and how we feel about the actor. We find that happy people tend to be charitable, loving, positive in their interpretation of others. Depressed people are quick to notice any signs of loss of friendship, they exaggerate the slightest criticism, and they overinterpret remarks as personal and critical of themselves. Angry people have a 'chip on their shoulder', tend to be uncharitable, ready to find fault, to take offence. They may take out their anger on innocent bystanders who had nothing to do with arousing their anger; this is the basis of scapegoating.

#### *Self observations*

These emotional influences on personal judgements apply just as well when people are judging themselves and their own behaviour. For instance, psychiatrically depressed patients are notorious for criticizing themselves for what they perceive as their incompetent, reprehensible actions. In an experiment with J. Forgas & Susan Krantz (unpublished) I investigated whether someone's emotional state would influence their moment-by-moment perception of their own behaviour. Specifically, we asked whether college students would naturally see themselves as incompetent and socially unskilled if they looked at themselves while feeling socially rejected. Conversely, we wanted to see whether they would see themselves as behaving with positive, socially skilled actions if they looked at themselves while feeling happy. This required a two-day



*Snap judgements*

Third, our theory implies that mood will influence people's snap judgements about familiar people or topics about which they have stored heterogeneous impressions. In one of our experiments, we had our subjects give brief personality sketches of familiar people in their lives, such as a teacher, a relative or a friend. They described some characters while they were happy, and others while they were angry. We found that these snap judgements were strongly influenced by the subject's passing mood. Happy subjects tended to give very charitable, friendly descriptions of their acquaintances; angry subjects tended to be uncharitable, and overcritical in describing their friends.

If people have stored a variety of impressions about familiar persons, we may suppose that the subject's current mood causes retrieval of primarily positive or primarily negative memories of that person. In this manner, the summary evaluation of that person can be biased by the availability of the positive as opposed to negative opinions that come to mind. This bias in evaluation is therefore just a disguised form of affect state-dependent memory.

*Event likelihoods*

We have also investigated how happy or depressed moods influence people's judgements about the subjective probabilities of future events. After inducing a happy or depressed mood in our subjects, we had them estimate the likelihood of each of a number of possible future events. Half the future events were positive events or blessings, half were negative events or disasters; within each set, half were personal events, and half were national or world events. For example,

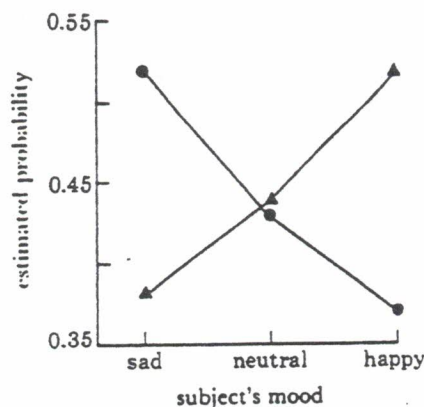


FIGURE 10. The average probability estimates of positive events ('blessings') (▲) and of negative events ('disasters') (●) for subjects in a happy, neutral or sad mood. (Data from W. F. Wright & G. H. Bower (unpublished), with permission.)

we asked the subjects to estimate the probability that within the next 3 years they would take a vacation to Europe; or that in the next 5 years they would be involved in a serious car accident; or that within the next 10 years there would be a major disaster at a nuclear power plant in California. Subjects were asked to be as objective as possible in their estimates, and all sincerely believed that they were not influenced by their moods.

None the less, people's mood dramatically influenced their subjective probability estimates compared with estimates given by control subjects who were in a neutral mood. The results are shown in figure 10. When happy, subjects elevated their probability estimates of future

experiment. On the first day, subjects were interviewed for about 20 min about personal topics, and this was videotaped with their knowledge and consent. The next day they returned and learnt how to score videotaped interviews for pro-social (positive) or anti-social (negative) conversational behaviours. Examples of positive behaviours were smiling, leaning forward, and contributing friendly remarks; negative behaviours were frowning, looking away, grimacing, and so on. Subjects learnt to score such behaviours every 5 s while watching a person in a videotape. After this, subjects were hypnotized. Half of them were asked to remember and replay

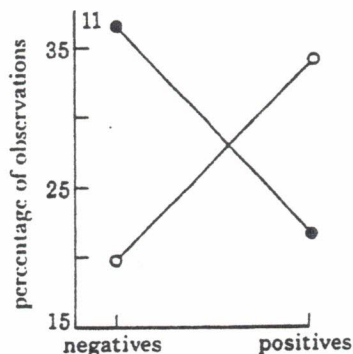


FIGURE 11. Self-observation of positive and negative behaviours with subjects feeling good (○) or bad (●) about themselves. (From J. P. Forgas, G. H. Bower & S. E. Krantz (unpublished), with permission.)

in imagination a moment of social success when they had performed spectacularly well and felt good about themselves. The remaining subjects were asked to recall and replay a moment of social failure, when they had felt embarrassed and socially rejected because of something awkward or shameful they had done. Subjects were then asked to maintain this mood while they looked at the 20 min videotape of themselves being interviewed the day before. Every 5 s they were to mark at least one positive, negative or neutral behaviour they observed in themselves.

The primary results are shown in figure 11, which shows the percentages of all judgements that fall into the pro-social and anti-social categories. The graph shows that people who felt socially rejected and in a bad mood perceived themselves in the videotaped interview as exhibiting many more negative, socially inept acts than positively skilled acts. In contrast, subjects who were in a good mood perceived more positive, pro-social actions than negative actions in themselves. These differences are 'all in the eye of the beholder', because neutral judges rated the two groups of subjects as exhibiting roughly equal proportions of positive and negative behaviours. The results illustrate just how ambiguous 'body language' is, because these are moment-by-moment perceptual judgements, not retrospective evaluations. It thus appears that social behaviour is somewhat a blank canvas onto which perceivers project a picture according to their moods. They can even project a picture onto themselves, one that varies according to their current mood.

Such emotional influences on social judgements can be explained by the associative network theory. The perceiver's mood activates and primes into readiness certain mood-congruent concepts, hypotheses and inference rules. These are then used in expectation-driven or top-down processing to classify the ambiguous gestures, phrases and expressions a person gives during a conversation.



*Self-efficacy judgements*

In a final line of research, we are discovering that a person's emotional feelings have a large impact upon his self-confidence and his self-esteem. In particular, a person's emotional state influences his beliefs about his efficacy, skill and mastery in the performance of his social, intellectual and physical activities. Professor Albert Bandura of Stanford University has hypothesized (Bandura 1977) that a person's performance of some action will be strongly

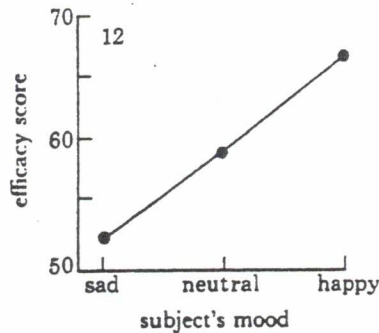


FIGURE 12. Average self-efficacy score, or prediction of performance skill across diverse activities, for subjects who were feeling sad, neutral or happy about themselves. (Data from D. Kavanagh & G. H. Bower (unpublished), with permission.)

influenced by his feelings of efficacy or mastery of that activity. Thus a man who is socially anxious and very shy with women will predict that he will be inept and incompetent in dealing romantically with them. These failure predictions often become self-fulfilling prophecies, because actions carried out without confidence or conviction are often of poor quality and make a poor impression on others. Part of the goal of psychotherapy with such a person would be to improve his sense of mastery of efficacy regarding those behaviours that cause him problems.

Earlier we saw how happiness and depression influence a person's predictions about impersonal events in the future. We asked in our next experiment whether such emotions would also affect a person's predictions about his own performance in a variety of activities. In this next experiment, done with my student, D. Kavanagh (unpublished), we had some subjects put themselves into a happy mood by remembering a success experience, while other subjects put themselves into a sad mood by remembering a failure experience. Then, after we had deceived them regarding the purpose of the experiment, we asked them to predict the likelihood that in their typical life-situation they would be able to succeed at a variety of activities. The activities we asked about involved skills in attracting someone of the opposite sex, competence in initiating and maintaining romantic relationships, skill in dealing effectively with all sorts of people, and skill in a variety of athletic and intellectual activities. For each activity, the subject estimated the likelihood that in his normal life he could successfully perform that activity at a specified level of competence. The results are shown in figure 12. This shows that, with respect to control subjects who were in a neutral mood, people who were happy had an elevated sense of self-efficacy, whereas depressed people had a much reduced sense of efficacy. Happy people predict that they will succeed at all sorts of tasks; depressed people predict they will fail. This is important because we know from Bandura's work that these feelings of self-confidence and self-efficacy determine which activities a person will attempt and how long he will persist

with an unrewarded activity. These are important aspects of performance, for instance, for neurotic patients who are frightened, shy, or are just learning new social skills that formerly they lacked. The importance of this result is that a person's self-efficacy and hence his actual performance in tasks requiring courage and persistence will vary enormously depending upon his temporary emotional state. Psychotherapists should be able to translate this result into practice with patients who are preparing to carry out threatening behaviours that formerly they were afraid to perform.

#### *Habitual optimism—pessimism*

The experiments I have been reviewing illustrate that what people see and how they interpret a situation varies with how they're feeling. Of course, people can also acquire a certain style of interpreting the world, whether through jaundiced or rose-coloured glasses. We all know people who habitually see the bad side of things, who can find some clouds to worry about in every silver lining. Some of these people have been trained to worry in distinctive ways. Indeed, some professions train their members to adopt a characteristically optimistic (e.g. stockbrokers) or pessimistic (e.g. police) perspective on the world and human nature. For example, my lawyer and my insurance salesman have been trained to imagine hundreds of things that I should worry about and should insure myself against. These habitual styles of viewing the world can be explained by the person's training history and his or her selective exposure to certain aspects of reality (e.g. police in urban ghettos see mainly the seamier sides of human behaviour). There need be no postulation of a continuous 'mood' (e.g. of hatred or grouchiness) to explain that character's style.

#### FINAL COMMENTS

Our research efforts are still in early stages, but we are already overthrowing some age-old myths. One strongly held myth is that people are rational creatures, that they are well-functioning information-storage devices who can set aside their passions, look at the facts objectively, and can arrive at their evaluations and decisions rationally and without bias. All of our subjects believed this myth; they believed that they were being totally objective, that their emotions were not influencing their judgements and perceptions of themselves and their world. I was not prepared for the dramatic impact that these emotions have had upon our subjects' behaviour. We find that people simply cannot override their emotions: their emotions appear to leak out in nearly everything they do. Moreover, this occurs despite their attempts to do otherwise. Cognition is suffused with emotion.

I think that by appreciating these scientific facts about how our emotions dramatically colour our memory and our judgement, we should be able to gain a better understanding and tolerance for differences in each other's judgements and perspectives.

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### Discussion

A. SAHGAL (*M.R.C. Neuroendocrinology Unit, Newcastle upon Tyne, U.K.*). In his paper, Professor Bower mentioned only free-recall procedures. What happens when forced-choice techniques are used, or recognition memory is assessed?

G. H. BOWER. It is a curious fact that state-dependent effects on memory are largest with unaided free recall (where external cues are minimal) and smallest or even non-existent with recognition-memory tests where supportive retrieval cues are maximal. Intuitively, the more that the memory test requires the subject to generate internally his own retrieval cues, the greater is the retention decrement caused by a change in internal context such as mood. In our experiments with words or one with photographs of faces, we have found no difference in recognition memory depending on whether the mood during recognition-memory testing agreed or disagreed with the mood during learning. This difference in state-dependency outcomes between free recall and recognition measures of memory seems quite general. In a literature review, Eich (1980) found that in studies with a variety of centrally active drugs like alcohol and amphetamine, state-dependent results were typically found with free recall (or minimally cued recall) but rarely with recognition memory.

One can try to explain this difference in outcome in several ways. One is to note that recognition memory requires the subject to start at the item node in memory and retrieve the single association from it to the list-tag that informs him that this item occurred in the list. This item-to-list link is relatively free from interference, and so an additional search cue (such as one's current mood) may not be needed to retrieve the list-tag. This interference-free situation contrasts with the free-recall situation in which the list name is given as a cue (i.e. 'Recall all items on list B'); that list-cue is heavily overloaded with associations to many items, so that retrieval of any specific list-to-item association can be substantially aided by reinstatement of a second context cue (like mood), which is also associated with the target items.

An important distinction in methods has typically been glossed over in these recognition-memory studies, however. The usual question on a recognition test has been 'Was this item presented somewhere during the learning session?' Perhaps an effect of mood context would be obtained if the memory test were more explicitly one requiring a *discrimination* of context. Thus the more relevant question to the subject might be 'Was this item presented in list A or in list B?', where these lists were learnt in different mood states. That would make the subjects' task more similar to that of the subjects in our two-list experiment who were required to 'Recall only items from list A.' That list-discrimination experiment, comparing matching with mismatching moods, would be worth doing.

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D. A. ROUTH (*Department of Psychology, University of Bristol, U.K.*). If one considers people possessed by differing moods, I wonder what sort of changes Professor Bower envisages to be taking place in the networks and in their utilization? Do people just move to a different part of semantic memory, so that some things become inaccessible, when they undergo a change of mood? Or do the psychological distances between nodes change in some sense?

G. H. BOWER. The theory that I proposed (Bower 1981) assumes that the structure of the semantic network stays fixed over brief time-spans as moods change; rather, the mood causes an increase in the level of activation of those parts (nodes) of the network connected to that mood. These conceptual nodes that receive greater activation under a given mood thus have a greater weight in determining summary judgements such as the 'similarity of meaning' of two concepts.

I do not conceive of the effects of mood as causing either a change in 'distance between nodes in the network' nor as causing the search mechanism to 'move to a different area of semantic space' (to use Dr Routh's metaphors). Rather, my metaphor is that moods influence which ideas are activated and available in consciousness, thus to influence free associations and summary judgements like 'similarity of meaning' of two concepts. As an example, people's free associations to a word like *life* will be positive (e.g. they say things like *free, wonderful*) or negative (e.g. *death, misery*) according to whether their mood is positive or negative. Such results do not require that we change the structural network around *life* depending on the subject's mood. Rather, they can be explained by assuming that of all the pre-existing associations one has to *life*, those linked to a positive (or negative) emotion node will receive greater total activation, and thus be given as a 'free associate', when the person is feeling in a positive or negative mood during the free association test. Thus, *death* satisfies the joint constraint of being one (of many) associates to *life* and being linked to a sad mood.

This answer is not to deny that people can acquire different sets of memories (and hence lexical associations) as a result of a prolonged history of, say, depression in their life. Thus, compared with the norm, depressed and anxious psychiatric patients may well have acquired a different set of associations and 'subjective meanings' for many words. If we were to construct either a tree or a multidimensional semantic space (Cunningham 1978) from similarity judgements of such concepts as *self, job, spouse, boss* and *future*, these ideas would cluster in different ways for different patients, partly reflecting their history of anxious or dysphoric life-styles and interactions. These would be reflected in learnt structural differences in the networks of such individuals. The concern of my theory, however, is to explain the different outputs that we obtain from the same person as we alter his moods; for that purpose the 'amount of activation' theory seems to give a plausible explanation.

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