18  Cognitive consequences of emotional arousal

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Does the cheerful person really view the world through rose-colored glasses? Does the depressed person act and think in ways that sustain his misery? Does the pessimist describe as "half empty" the same beer bottle that the optimist calls "half full"? These familiar emotional stereotypes crystallize several important assumptions, specifically, that our perceptions, thoughts, and actions are strongly biased by our emotional feelings.

We have been interested in experimentally testing these assumptions and have thus examined how emotional mood states might influence such cognitive processes as learning, memory, perception, and judgments. The following discussion of our research in this area is divided into four sections. First, we describe our general procedure of using hypnosis to induce and sustain emotional states in experimental subjects. We then summarize our experiments according to four major results: (1) mood selectively biases the recall of affectively toned material; (2) mood enhances the learning of mood-congruent material; (3) the intensity of a mood affects learning differently, depending on the particular mood and the type of materials used; and (4) emotional states can bias many cognitive processes, such as interpretations, fantasies, projections, free associations, personal forecasts, and social judgments.

The second section marshals arguments against a "compliance with demand" explanation of the obtained findings. The third section then explains the results in terms of a semantic network theory of affect. This theory conceptualizes memory for an event in terms of an associative network of descriptive propositions and concepts. As central units in a network, emotions are proposed that have strong associative linkages to other aspects of the network — for example, to autonomic response patterns, expressive behaviors, beliefs, events, and themes. These associative connections are used to explain how activation of a mood influences cognitive processes in multiple ways.

The final section addresses some problems with the network model and offers speculations about how the theory might be extended to deal with various affect-related phenomena. Among the topics addressed are the interaction of...

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cognition, behavior, and emotion; the development of affective structures; and the use of control processes to regulate emotional responses.

Empirical investigations

The general procedure

The experiments were conducted by the authors and a few colleagues over a five-year period. The general procedure shared by most of the experiments involved recruiting highly hypnotizable subjects, defined by their high scores (top 15% of population) on the Stanford Hypnotic Susceptibility Scale, Form C (Weitzenhoffer & Hilgard, 1962) or the Harvard Group Scale of Hypnotic Susceptibility, Form A (Shor & Orne, 1962). Approximately 60% to 70% of the subjects were Stanford undergraduate students; the rest were mental-health professionals who had attended hypnosis workshops given by the first author. Most subjects were run in groups of 1 to 4.

To experimentally induce the desired mood state, subjects were first hypnotized via a 10-15 minute general eye-closure induction (Weitzenhoffer & Hilgard, 1962). They were then asked to begin to develop a specific mood (e.g., happiness or sadness) by remembering and reviving a personal experience in which that mood was prominent. Thus, a subject who was asked to feel happy would often recall an enjoyable vacation or an exuberant success; subjects who were requested to feel sad would remember funerals or crushing disappointments. When, as instructed, a subject signaled that an emotional incident had been accessed and replayed in imagination – usually within a minute or two – instructions were given to forget about the specific content of the revivified memory and instead simply concentrate on intensifying the accessed emotional state. These instructions were repeated for about 5 minutes until subjects were totally immersed in the suggested mood. They were told to maintain the mood until the experimenter asked them to do otherwise and then given further instructions regarding the specific tasks of the experiment. (Amnesia suggestions for the mood induction were usually also given to decrease possible compliance effects.) Following the experimental tasks, the experimenter would rehypnotize subjects, shift them back to a neutral mood, remove all other suggestions (e.g., posthypnotic cues), and then reorient them to their waking states. Subjects would then be thoroughly questioned and debriefed, usually paid or given credit for their participation, and then dismissed after ascertaining that they were suffering no ill effects from the mood induction.

The issue of demand compliance will be addressed later; here, however, preliminary comments about the use of hypnosis are in order. The sensational folklore and myths surrounding hypnosis have led many lay people to overestimate its value, with the result that skeptical academicians have reacted by rejecting its authenticity outright. We would emphasize that the scientific validity of hypnosis has been established by many reputable investigators (e.g., Hilgard, 1965; Hull, 1933; Orne, 1959). We have used it as a methodological tool because we have found it to be a highly reliable and effective way to experimentally induce and maintain mood states. The hypnotic alteration of physiological states is well documented (e.g., Crasilneck & Hall, 1959; Gottlieb, Gieser, & Gottschalk, 1967; Sarbin, 1956), as is the hypnotic production of emotional states (Blum, 1967; Damasc, Shor, & Orne, 1963; Gidrov-Frank & Bull, 1950; Hepp & Brady, 1967; Zimbardo, Maslach, & Marshall, 1972). These findings are consistent with our general understanding of hypnosis as a naturalistic state in which the suggested development of relaxation enables complete absorption in suggested images to the extent that actual physiological changes may result (cf. Hilgard, 1965; Zimbardo et al., 1972). We therefore expected that our highly hypnotizable subjects would easily develop the suggested moods, and their success was confirmed by experimenter observations, subject reports, mood checklists, and experimental results.

The remainder of this section describes how the induced moods were used to test four general hypotheses: the state-dependent recall hypothesis, which postulates that superior memory occurs when the recall "state" (e.g., mood) matches the learning state; the mood-congruity hypothesis, which states that material agreeing in emotional tone with the subject's mood is learned best; the mood-intensity hypothesis, which predicts that learning is positively correlated with the intensity of a mood; and the thought-congruity hypothesis, which states generally that subjects' thoughts – free associations, fantasies, interpretations, and judgments – will be thematically congruent with their mood state.

State-dependent recall

General theories of memory proposed by Anderson and Bower (1973) and Tulving and Thomson (1973) share the premise that memory retrieval is positively correlated with the overlap of cues available during retrieval and those present at the time of learning: in other words, the more "learning context" cues present at recall, the better the memory. Because the "learning context" includes many variables – other items on a list, testing room, the subject's posture, his mood – there have been many tests relevant to this claim. In an early study by Abernathy (1940), for example, students taking a final exam in a room different from the regular classroom remembered less and performed worse than students tested in the regular room. More recently, Godden and Baddeley (1975) had deep-sea divers learn word lists while either on a boat or 20 feet underwater. When later tested in either the same or the different environment, subjects recalling in the same environment remembered significantly more words. Similarly, Smith, Glenberg, and Bjork (1978) had subjects learn a word list one day in one environment (a windowless, clean room with
The page contains text discussing the finding that mood is a differential and opposite mood, and that mood sets in the recall of the mood that is the opposite of the mood in which the memory was formed. It also mentions the importance of emotional recall and the influence of mood on memory retrieval. The text includes a reference to a graph showing the relationship between mood and recall, and ends with a question about the relationship between mood and retrieval. The text is fragmented and does not form a coherent paragraph.
and recall moods matched, recall averaged 85%; when moods were different but not opposite, 70% of the words on a list were remembered; but with opposite moods, recall averaged only 54%.

These generalization scores, predicted by Plutchik’s theory, could also be interpreted in terms of the differential emotions theory of Izard (1972). That theory would claim that the nominal “emotional states” in this experiment are patterns or mixtures of elements from several primary emotions, for example, that sad situations may also evoke some elements of anger and/or fear. This theory would further claim that the coefficients of overlap in emotional elements among our experimental conditions follow the gradients predicted by Plutchik’s model. These claims could be tested simply by asking subjects to fill out Izard’s (1972) Differential Emotions Scale while in our four different emotional states and then checking for the overlap coefficients in the patterns of emotions checked off.

State-dependent recall of autobiographical events. To determine whether these results would obtain for more naturalistic situations involving the retrieval of autobiographical memories, we modified a methodology developed by Holmes (1979). Diaries were given to 26 highly hypnotizable subjects (Bower & Gilligan, 1980), in which they were to record the time, place, and gist of each emotionally laden event, along with a rating of its intensity on a 10-point scale, for a week. Thus, entries might read: “Monday 7:30 p.m.: just got angry at my mother on the phone; a –8 rating” or “Wednesday noon...got word that my vacation request has been granted...+6.”

A week later, most subjects returned at their scheduled times. Not surprisingly, a number of them had been remiss in maintaining accurate diary recordings. Using the criterion of 15 or more adequately recorded incidents, only 14 of the 26 diaries were judged usable. The 14 subjects were asked to return a week later for some hypnotic experiments, ostensibly unrelated to the diaries. Upon their return they were hypnotized (in groups of 1–4), induced into a pleasant or unpleasant state (7 subjects in each condition), and then asked to recall as many incidents recorded in the diary as they could. Subjects later rated each recalled incident according to its present intensity value.

The major results, in terms of the average number of pleasant and unpleasant incidents as recorded in the diary and the corresponding numbers recalled (Table 18.1), indicate that more pleasant than unpleasant experiences were recorded by subjects, replicating a finding by Holmes (1970) and Matlin and Stang (1979). This may be due to a variety of factors, including a reporting bias, a greater frequency of happy events, or different forgetting rates for happy and sad events. Accordingly, more pleasant experiences were recalled by most subjects. The major data of interest, however, are the relative percentages of pleasant and unpleasant incidents recalled by subjects in the different moods. As indicated in the right column, the expected interaction occurred between mood state and type of incident recalled: subjects in a pleasant mood recalled more pleasant than unpleasant experiences (31% vs. 23%), whereas subjects in an unpleasant mood showed the reverse pattern (33% vs. 38%).

Another finding was that the original intensity ratings given to incidents were somewhat predictive of recall. Dividing each subject’s ratings at the median, the more intense experiences were later recalled better than the less intense ones (37% vs. 25%). The second round of ratings, made at the time of recall, were largely influenced by the experimentally induced mood: happy subjects tended to rate happy incidents as more pleasant and unhappy events as less unpleasant than before, whereas sad subjects showed the opposite tendency. Thus, the current mood seemed to shift the evaluation scale for memories.

To ensure that the selective recall effect was not a design artifact, Monteiro and Bower (see Bower & Gilligan, 1980) ran a similar experiment in which hypnotized subjects made happy or sad were asked to recall for 10 minutes a succession of unrelated childhood incidents. They were also instructed to write down the gist, time, and place of each remembered event (e.g., “my party in fifth grade; we went to the fun house”). When subjects returned the next day for a different experiment, they rated (while in a neutral mood) each recalled event as either pleasant, unpleasant, or neutral. The ratings indicated that 92% of the memories recalled by “happy” subjects were happy, whereas only 45% retrieved by “sad” subjects were happy and slightly more than 50% were sad. Thus, the overall bias toward recalling happy memories was again found, as was the more important effect of mood/state-dependent recall.

Supporting evidence. These experiments show that mood can bias recall, a finding consistent with those reported by others. For example, Isen and her associates (1978) found that positive moods induced by winning a game enhanced recall of positively toned experimental materials. Bartlett and Santrock (1979) used a design similar to the two-list state-dependency experiment described
Explaining mood-state-dependent recall

Finding that certain stimuli (such as emotional words) elicit more specific processing leads to the question: How do we account for the effect of mood state on memory performance? One perspective involves the idea that mood state influences the encoding of emotional information, leading to better recall of emotional words. However, this explanation does not fully account for the observed effects. Other factors may also play a role, such as the individual's current emotional state or the context in which the words were encoded.

Summary

To examine the effects of mood state on memory performance, several hypotheses have been proposed. One hypothesis is that mood state influences the encoding of emotional information, leading to better recall of emotional words. However, this explanation does not fully account for the observed effects. Other factors may also play a role, such as the individual's current emotional state or the context in which the words were encoded.

Reconstruction memory influenced by mood

The influence of mood state on memory performance suggests that emotional words may be encoded and retrieved differently depending on the individual's current emotional state. This has implications for understanding the role of emotion in memory and for the development of interventions aimed at improving memory performance.
a story, autobiographical experiences, and so on. The propositions constitute the basic units of thought, and the activation of them or their related concepts is the basic process of thought. Activation can occur directly or indirectly. Direct activation occurs by presentation of a corresponding stimulus pattern: for example, stimulation of an emotion would activate the corresponding emotion node; presentation of a word on a recognition test would access its network representation. Indirect activation occurs when “energy” spreads from associated nodes that are activated, for example, the mood could be “turned on” via activation spreading to its from associated concepts or propositions.

The state-dependent results can be explained straightforwardly by this model. Figure 18.3 illustrates in a highly simplified fashion how two-word phrases like “happy days” or “dying dog” learned under different moods in one of our multiple-list experiments would be represented in a memory network. Each memory is represented as a subject-predicate (S-P) proposition, which was experienced and learned while (note the name on the association) the subject was in Mood 1 and List Context 1. At recall, reinstating the learning mood for, say, List 1 would reactivate that mood unit (Emotion 1) and spread activation down its associative links, thereby priming List 1 words. At the same time, asking the subject to recall the first list would activate the List 1 node, which would also spread activation. Thus, the target items (i.e., the List 1 words) would receive the summation of activation emanating from the two activated sources, thereby making them more highly accessible than alternative contents. Intersection of activation from the List 1 node helps to discriminate the target items from the many other associations to Emotion 1; it also provides the additional energy needed to push activation of target items over threshold, thereby bringing them into consciousness. Conversely, mismatching learning and recall moods would depress accessibility, because the recall mood not only would fail to activate the target items but would also

The mood-congruity effect

The character identification experiment. In addition to the question of how mood biases memory, we have also been interested in whether mood might cause selective learning of affective material (see Bower, Gilligan, & Monteiro, 1981). Our first experiment in this area developed from an earlier interest in the role of character identification in the reading and recall of narratives (Bower, 1978). The basic question was whether a subject made happy or sad would identify more with, and thus learn and recall more about, a story character expressing the same mood. To test this idea, we composed a short third-person narrative about two students playing tennis on a Saturday afternoon. One character, André, is very happy—he sings, jokes, enjoys the sunshine, wins the game, and so on. The other character, Jack, is just the opposite—he is morose, worries about exams, feels scorched by the sun, loses the game, and so on. The number of (mostly happy) statements about André equaled the number of (mostly sad) statements about Jack.

Subjects were induced into a happy or a sad mood via a posthypnotic cue (see Bower et al., 1981) and then asked to read the narrative. Afterward, they filled out questionnaires regarding which character they identified with and attended to more. A written free-recall test of the story was given the next day while subjects were in a neutral mood. Of the facts recalled by “happy” readers, 55% were about Happy André, whereas of the propositions recalled by “sad” readers, 80% were about Sad Jack. In addition, all subjects reported identifying more with the character whose mood matched theirs at the time of reading. This is not a state-dependent effect, as a neutral mood prevailed at the time of recall; rather, the results suggest selective learning.

The single character experiment. The hypothesis attributing the recall differences to “character identification” was not uniquely tested in the André-Jack experiment because that story confounded the type of fact with the character. That is, all happy facts involved Happy André and all sad facts pertained to Sad Jack. Thus, the observed effect may have reflected selective learning of mood-congruent materials, mediated by character identification. To test this possibility, we constructed a short narrative about a single character, a psychiatric patient, recounting a mixture of happy and sad memories recovered during hypnotic age regressions. As before, subjects read the story while in hypnotically induced happy or sad moods. This time, though, they were also in an induced mood while recalling the story some 20 minutes later. By independently manipulating learning and recall moods, we could isolate possible
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Effects of the counter-experiment:

When mood during recall of a single list had little or no selective influence where mood during recall of several lists had strong selective influence. The counter-experiment was run on four factors: (1) the mood of the counter-experiment; (2) the mood during recall of several lists; (3) the mood during recall of several lists; and (4) the mood during recall of several lists.

The second counter-experiment was run on the same factors: (1) the mood of the counter-experiment; (2) the mood during recall of several lists; (3) the mood during recall of several lists; and (4) the mood during recall of several lists.

The third counter-experiment was run on the same factors: (1) the mood of the counter-experiment; (2) the mood during recall of several lists; (3) the mood during recall of several lists; and (4) the mood during recall of several lists.

The fourth counter-experiment was run on the same factors: (1) the mood of the counter-experiment; (2) the mood during recall of several lists; (3) the mood during recall of several lists; and (4) the mood during recall of several lists.
reminding, strongly suggested by subject reports and by other experiments (e.g., Lloyd & Lishman, 1975; Teasdale & Fogarty, 1979), would result in more elaboration on mood-congruent material. And as Bower and Gilligan (1979) have found in other work, memory is enhanced substantially by associating personal memories to the to-be-learned material. Thus selective reminding as a plausible explanation of the mood-congruity effect merits further investigation.

A third hypothesis is selective attention to mood-congruent material. A good case for this can be made via attribution theory. Specifically, our subjects were typically given amnesia for the mood suggestions and thus may have wondered why they were feeling so intensely happy or sad while reading the story. If so, they could have attributed their feelings to the story material; then, to justify their attribution, they might have spent more time attending to mood-congruent items.

However, this attribution hypothesis was not supported by further experiments, which showed that the mood-congruity effect obtained even when no amnesia was given for subjects’ moods, so that subjects knew that their mood stemmed from the suggestion. Of course, a case could be made for selective attention independent of attribution processes; for example, more time might be spent on mood-congruent items because of ease of elaboration or selective reminding processes. This could be tested by controlling reading times for congruent versus incongruent items and checking whether the mood-congruity effect still obtained. Another possibility would be to let the mood-induced subjects pace their reading of the stories line by line, with reading time recorded for each line. Subjects should spend more time on the mood-congruent statements.

A fourth explanation of mood-congruent learning involves mood intensity. This explanation assumes that (1) the intensity of subjects’ mood states increases while reading mood-congruent episodes but decreases while reading mood-incongruent episodes and (2) an episode’s memorability increases with the intensity of the subject’s emotional reaction to it at the time of learning. The first assumption was suggested by subjects’ frequent postexperimental mentioning of mood fluctuations in response to happy or sad episodes in the story they were reading. Specifically, “sad” subjects often reported that their sadness intensified when reading sad events but lessened when reading about happy events; similarly, “happy” subjects noted that their emotional intensity was augmented by happy events but dampened by sad ones. That this intensity difference could have produced the mood-congruity effect is suggested by a number of sources, including (1) our finding in the “mood diary” experiment (described earlier) that emotional intensity ratings of events correlated with their recall, and (2) Kanungo and Dutta’s (1966; Dutta & Kanungo, 1975) findings that emotionally provocative material was remembered better than neutral material.

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Mood intensity and learning

The experiments just cited, showing results supportive of the mood-intensity hypothesis, systematically confound the nature of the material with the normal emotional reaction to it. Theoretical inferences would be simpler if we could disentangle the influence of emotional intensity per se from the stimulus materials. To rectify this, we conducted experiments in which mood intensity was manipulated hypnotically, with the materials presented at each intensity level randomized for each subject. We used a procedure adapted from Blum (1967) in which highly hypnotizable subjects were first trained to experience various intensity levels of a mood and then given various learning tasks at each intensity level.

 Experiment 1. In the first experiment, subjects were trained to experience three intensity levels of happiness: low (calm and content), medium (joy), and high (ecstatic bliss). Once subjects could reliably shift (on cue from the hypnotist-experimenter) among the three intensity levels, they received an experimental learning task in which both mood-relevant and mood-irrelevant episodes were presented at the different intensity levels. Specifically, subjects were hypnotized, shifted to a randomly determined mood-intensity level, and asked to imagine themselves personally involved in twelve short episodes (vignettes) that were read to them. They were also asked after each reading to rate on a scale of 1 to 7 how imaginatively absorbed or involved they had become in that vignette. Following this, subjects were shifted to a different intensity level and asked to repeat the procedure with twelve additional vignettes. They were then shifted to the third intensity level and presented with more vignettes.

Half the vignettes presented at each intensity level were affectively neutral (e.g., “reading a newspaper and passing the time while doing your laundry”); the other half described happy incidents (“walking along the street and finding a five-dollar bill”). Aside from this constraint, presentation of the materials was randomized across subjects. Recall occurred in a neutral state following a 20-minute retention interval.

Both mood-congruent and mood-irrelevant vignettes were included because an earlier pilot study had shown that, contrary to the simple intensity hypothesis, increasing the intensity of a happy mood significantly decreased learning rates for neutral words (e.g., names of American cities, kitchen utensils). Extensive subject interviews suggested that the ease of relating the learning material to the mood might be critical in determining how intensity level influenced learning. Subjects commonly reported being unwilling or unable to attend to “kitchen utensils” and the like while feeling intense euphoria. The present experiment was designed in part to test this possible interaction between materials and intensity level.
Experiment 2. The procedural experiment used only happy moods, and thus
participated in conclusions about learning and emotional intensity in general.

Summary and General Explanations. The results of these several experiments

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overall emotional responses are somewhat predictable of recallability.
vignettes; intensifying a sad mood hampered the learning of even mood-relevant vignettes. Thus, both the mood and the relatedness of the learning materials are important variables in determining the effect of mood intensity on learning. Further experiments are currently under way to determine if these results can be replicated and generalized.

A preliminary explanation of the findings can be offered here in terms of the network theory of affect. As noted earlier (Figure 18.1), this theory assumes that emotions can be represented by central units in an associative network encoding memories, with each emotion node bearing associative connections to specific autonomic patterns, beliefs, events, response patterns, and interpretation schemata. The development of a mood state activates the corresponding emotion unit in the network; by virtue of spreading activation, its surrounding nodes (e.g., the specific autonomic patterns, event instances) are also brought into play. Roughly speaking, the activated components of the network become the "contents of consciousness."

Emotional intensity can be represented as the degree to which an emotion unit has been activated. Low-intensity emotion results in only minor spreading activation to nearby associative nodes; high-intensity emotion causes a large amount of activation to spread along many associated links as well as to distant parts of the network. The amount of emotional activation affects the contents of consciousness because the theory supposes that only those ideas that receive activation above their threshold will become conscious. Thus a stronger emotion will cause more ideas linked to that emotion to "flood into" short-term memory. This is true for both irrelevant, preexperimental associations and the associations specifically trained in the experiment.

This differential flooding of short-term memory by emotion-related material has several implications. First, the impact of the mood on processes of perceptual interpretation, learning, and memory will generally increase insofar as newly arriving stimuli are interpreted according to currently active categories in short-term memory. Second, the filling of consciousness by emotionally related ideas results in the phenomenon described as the "narrowing of attention" to mood-related material (Easterbrook, 1959). In certain cases, if the internally generated scenario is sufficiently compelling, the emotional flooding of short-term memory can lead to "lack of attention" to external stimuli. This may have happened with our high-sad subjects in the last experiment. In addition, the content of the mood-related ideas and their helpfulness for learning may differ for happy versus extremely sad moods. Thus, the very sad mood may evoke a preexperimental depressional syndrome of withdrawal, ruminating over failure, crying, predicting failures, feeling fatigued, and helplessness. In extreme form, these negative factors could lead to poor learning and poor performance by our very sad subjects. This implication agrees with the claims of differential-emotions theory, as well as the clinical observations of depressed people.
Mood effects on other cognitive processes

Associations, interpretations, and depictions. The multiple effects of mood on learning and memory processes led us and our colleagues to investigate whether other cognitive processes would be similarly affected. In one study, hypnotized subjects were induced into happy, angry, or sad moods and then given a series of tasks, including (1) generating chains of free associations to abstract affectively neutral words like life, mind, and future; (2) composing stories in response to pictures of the Thematic Apperception Test (TAT); and (3) giving "thumbnail personality sketches" of people familiar in their lives (e.g., first-grade teacher, uncle, best friend). Independent judges then blindly rated subjects' productions in terms of their mood content. The results showed that mood dramatically biased thought productions: Judges could reliably determine the mood of the subjects during the task. All subjects gave free associations, composed TAT stories, and retrieved selective sketches of their acquaintances in a manner congruent with their mood at the moment. Such results are consistent with the network theory. For example, in the TAT study, the theory implies that the person's emotional state will evoke a theme congruent with that of the story (e.g., anger will evoke themes of conflict or war).

Predicting the future. In another experiment, Wright and Bower (1981) investigated the influence of moods on probability estimates of future events. Two lists were constructed, each specifying 12 possible future events. One list referred to personal events, the other to national or global incidents; half the items on each list were happy, half were depressing and catastrophic. Thus, the 24 items were of four different types: Happy Personal Events (e.g., "You will take a European vacation in the next three years"), Happy National or Global Events (e.g., "There will be a cure for most cancers discovered within ten years"), Catastrophic Personal Events (e.g., "You will be involved in a serious auto accident within the next five years"), and Catastrophic National or Global Events (e.g., "World war will occur within the next ten years"). Subjects were made happy or depressed by hypnosis and asked to use a 1–100 scale to estimate the probability of half the events, then shifted into the opposite mood and requested to estimate the probabilities of the other events. Special emphasis was placed on providing "objective" estimates, and subjects later stated that they felt their estimates were not influenced by their moods.

However, a mood bias was in fact revealed by the estimates (Table 18.2). The happy mood boosted estimates for blessed events and lowered them for tragic events, and the sad mood had the opposite effect. The influences are nearly symmetrical around the neutral-mood estimates.

That a transient mood could exert such a powerful effect was somewhat surprising but is nevertheless quite consistent with Tversky and Kahneman's (1973) heuristic principles of availability and representativeness. Three types of strategies might have been used by our subjects in judging the likelihood of an event: (1) recalling related autobiographical episodes involving one's self or friends and using a representativeness judgment of the available sample to estimate the likelihood of a similar event in the future; (2) retrieving memories of news reports and using them in a similar way; and (3) constructing a "causal scenario" leading to the event and generating an estimate based on the ease with which such a scenario could be formed. Mood would have biased the first two strategies via state-dependent retrieval processes, that is, the availability of relevant episodes would be either lowered (for mood-incongruent material) or raised (for mood-congruent material) by the estimator's emotional state. Similarly, the third strategy could have been influenced by the mood-mediated "ease of elaboration," as discussed earlier. Further investigations of these possibilities are warranted. For now, we merely note that we have produced in the laboratory the fabled optimism of the happy person and pessimism of the depressed person.

Mood and social judgments

The network theory suggests than an emotional state may influence the interpretation of ambiguous stimuli because the emotion primes into readiness congruent concepts and categories. An especially interesting class of ambiguous stimuli are social behaviors of others directed toward us. Judgments of social actions are heavily tinged with subjectivism, because we must rely upon inferences about the actor's intention; and those inferences may differ, depending on the "emotional premise" from which the perceiver begins. Is someone who continues to disagree with you being admirably persistent or unreasonably stubborn and pigheaded? Is a student who disagrees with a professor's work assignment being assertive or lazy or aggressive? The interpretation will vary with how the perceiver feels in general, and how he feels about the actor in particular. Thus, happy people tend to be friendly, charitable, and merciful in their judgments of others; angry people tend to be the opposite.
The complying with demand explanation

The US government would be struggling beyond reason to explain why
wood-pulp exports would be entitled to protection under the general
provisions of the US trade agreements. The claims of US industry
would not be adequately supported by evidence, but it is not
likely that the US government would be inclined to change its
tactics. The major issue is that the US government's policy is
based on its belief that the American economy is
healthy and that US industry can compete successfully with
foreign competitors.
these prescient subjects did not show mood-dependency in memory tests involving recognition. Nor does the hypothesis explain why manipulations of mood only at recall (following neutral input of mixed items) caused no selective recall. The network theory explains both these anomalies, so it is the more parsimonious as well as the more fruitful theory.

In contrast to the memory studies, our results showing the influence of emotion on free associations, fantasies, social judgments, and probability estimates are more vulnerable to the charge of demand compliance. Ruling out the demand hypothesis has proven more challenging for such cases. Nonetheless, we believe several arguments can be marshaled against the demand-compliance hypothesis as a consistent explanation of the results, and we will review four such arguments here.

First, the emotions induced seem real and have little of the phenomenal character of a faked pretense. For example, measures of autonomic arousal such as changes in GSR and heart rate reveal changes during the suggested emotion similar to those during the actual emotional experience (e.g., Gidro-Frank & Bull, 1950; Zimbardo et al., 1972). Furthermore, our subjects looked, sounded, and acted as though they were really in the throes of their emotions: sad subjects appeared morose, sometimes tearful, and happy subjects beamed, laughed, and exuded a sense of well-being. The authenticity of these moods was confirmed by subjects during postexperimental interviews that urged honest reporting.

Second, similar results have been obtained when the mood manipulation was not hypnotic in nature. We replicated the free-association and TAT results using disguised “mood music” (see Bower, 1981). Laird and his associates (1982) observed a mood-congruity effect in learning in a study where mood was induced by having subjects pose their face into unwitting frowning, smiling, or sorrowful expressions. Isen and her colleagues (1978) have obtained similar results when moods were induced in unobtrusive ways, including having subjects win or lose a card game, find a dime in a phone booth, or receive a small gift (e.g., nail clippers, cookies). Bartlett and his associates (in press) induced moods in their kindergarten subjects by simply having them revisit and describe an emotional memory. Teasdale and Fogarty (1979) used the Velten procedure, in which subjects read a series of self-referent mood statements to access a particular mood. Thus, our results agree with those obtained when moods were induced by diverse means.

Third, the mood effects on performance often appear as predicted despite running counter to the experimenter’s demand. A good example is the experiment by Teasdale and Fogarty (1979) in which happy or sad subjects were instructed to retrieve as fast as possible a stipulated pleasant or unpleasant incident from memory in response to neutral cue words. They found that happy subjects retrieved pleasant memories faster and sad subjects retrieved unpleasant memories faster, despite the experimenter’s demand for fast retrieval in all cases.

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Fourth, in some studies we have misled subjects about the experimenter’s “demand.” In one study, subjects wrote free-associations and TAT stories after being told that the experimenter’s interest was in whether hypnosis would affect physical properties of handwriting. Whereas post-experimental interviews indicated that subjects believed the handwriting deception, the results showed that mood nonetheless biased the emotional content of subjects’ associations and stories. Thus, systematically misleading subjects did not alter the general results.

We will tentatively conclude, therefore, that the mood effects we have observed are “automatic” and not the result of the subjects’ compliance with a demanded role. Thus we believe that our use of hypnosis should be recognized as a minor and incidental aspect of our research. Of central importance is that mood can influence cognition in diverse ways. We will now consider an explanatory theory for these findings.

The network theory of affect

Basic assumptions

The results obtained in the preceding experiments can be accounted for by a network theory of affect, which represents memory as a rich associative network of concepts, schemata, and events. We will begin by stating some basic assumptions of the theory. First, emotions will be treated as central units in this network, with multiple associations to related schemata, concepts, and events. These connections might include autonomic arousal patterns, action patterns, attitudes, beliefs, facial expressions, and interpretative schemata was illustrated in Figure 18.2. The contents of these general aspects of experience may be different for each mood.

To comment briefly on the “emotion node” hypothesis, a node in memory is defined primarily in terms of the other elements to which it is connected. An emotion node like “anger” differs from a concept node in only a few respects. First, at least some emotion nodes are liable to be inborn, with some innate connections to the facial musculature and autonomic nervous system. Second, once activated, emotion nodes receive reverberatory feedback from the autonomic response pattern they initiate, and this feedback cycle causes the activated emotion unit to persist for some time after its arousal. The activation eventually dies out (after removal from the evocative situation) by a natural dampening process. Such persistence of activation is unusual for a simple concept or idea, which typically disappears from working memory as soon as, say, the topic of conversation is changed. Third, the emotion nodes may be distinguished by the absolute amount of excitation that they transmit into the associative network once they pass threshold and are turned on. One might think of nodes in the network as small voltage sources (or signal boosters),
The network that represents emotional arousal.

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Note: emotional words in the text correspond to the network's nodes in the network. For example, the node for the emotion of happiness is represented by the node labeled "HAPPY."}

[Diagram of the network showing emotional arousal nodes and their connections]

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spreading activation from the excited emotion node, biases recall toward mood-congruent incidents.

This general explanation can be extended to the state-dependent recall study involving word lists. Figure 18.3 depicted the basic explanation of why mood provided a discriminating cue that enhanced or inhibited memory, depending on whether a list’s learning and recall moods matched or mismatched. When lists are learned in opposite moods, each list would become associated to a different emotion node. At the time of recall, a mood would activate the corresponding emotion node and spread activation to its associates. Reinstating a target list’s learning mood would result in superior recall because of the enhanced accessibility of only that list, as the other list would have been associated to a different emotion node. However, recalling while in a different mood – for example, trying to remember List 1 while in Mood 2 – would result in poor memory because the activated emotion node would (1) provide no retrieval paths to the target list and (2) make the alternate list more accessible (and thus augment its interference effect). As noted earlier, this explanation of state-dependent recall in terms of retrieval paths is consistent with the finding that the effect did not obtain when recognition tests were used, as the direct access to target items provided by recognition tests minimizes the need for retrieval cues.

Explaining the mood-intensity results. The network theory of affect explains the “mood-intensity” findings in terms of varying activation levels of an emotion concept. Specifically, intensifying a mood results in increased activation of its corresponding unit in the network and its associates. This causes consciousness to be flooded with mood-congruent associates, which narrows the subject’s attention to mood-congruent cues (Easterbrook, 1959). This makes it difficult for the subject to respond to mood-irrelevant tasks or stimuli. The increased activation of a mood also amplifies the influence on behavior of an emotion’s associated ideas and roles. As was illustrated in Figure 18.2, the nature of these concepts differs for each basic emotion. For example, “happiness” may be associated with high expectations of successful performances, optimism, confidence, and self-esteem; conversely, “sadness” probably calls forth expectations of failures, exhaustion, and inwardly directed rumination, resulting in poor motivation for active performances. Each set of associates would have a different impact on a learning task. This may explain why the learning of mood-relevant items increased when a happy mood was intensified but decreased when a sad mood was intensified. Other theories such as Izard’s (1972) differential-emotions theory do not derive such implications from first principles but rather simply assume that different emotions differ in their motivational properties.

Explaining the thought and judgment results. The network theory can also be applied to the research showing mood effects on other cognitive processes.

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The mood biases in free associations follow by supposing that a person in a specific mood (say, sadness) will associate to a neutral word like life those words in the associative hierarchy to life that also receive activation from the mood. Thus, sad associations to life, such as death and suffering, will be chosen over more pleasant associations.

The mood bias in TAT stories is explained by supposing that the subject’s mood activates and makes available certain themes such as success and romance (for happiness), or conflict and war (for anger), or failure and loss (for sadness). These themes are then elaborated using the characters shown in the TAT pictures.

The mood bias in personality sketches of acquaintances is viewed as a form of state-dependent memory. People probably have a heterogeneous collection of positive and negative opinions, facts, observations, and episodes about anyone they know well. When placed in, say, an angry mood and asked about an acquaintance, the person’s memory selectively retrieves the negative (or unflattering) facts and opinions. Since these negative facts are highly available, the subject gives his “snap judgment” of the acquaintance based on them (see Tversky & Kahneman, 1973).

The mood bias in probability estimates of future events is explained as a form of state-dependent retrieval of past relevant events or opinions. For any given future event, whether a blessing or catastrophe, any well-educated person can usually think up some facts (or opinions) that argue for or against the likelihood of that event. The theory supposes that ideas that support positive (“happy”) events and discourage negative events will be more available to the happy person, whereas the reverse will be true for the sad person. Introspections of happy and sad subjects during the event-estimation task provided some anecdotal support for this availability hypothesis.

Finally, the mood bias of social perception of others or of oneself is predicted by the network theory, since social judgments are so heavily determined by the trait categories and schemata used by the observer. If the observer is happy, he tends to look for evidence of “positive” social behaviors in his target; if he is angry, he is biased to look for “negative” antisocial behaviors. Social behavior is sufficiently ambiguous and unconstrained that the perceiver will usually be able to find evidence for whatever trait category or schema he wishes to impose on the behaving target. This top-down determination of social impressions works just as strongly when people judge their own behavior as when they judge that of others.

Summary. The network theory of affect proposes that emotion plays a central role in a unified representation of mind. Basic emotions are viewed as innate elements or units that through experience become connected with various event memories, actions, roles, interpretation schemata, and themes. Activation of a mood is postulated to automatically activate varying numbers of these associates, depending on the intensity of the mood. This basic model provides
an account of how mood affects cognitive processes of memory, learning, free association, interpretation, judgment, and prediction. It also explains how the influence of intensifying a mood can vary depending on the specific mood. The remaining section addresses some of the important questions that have not been discussed.

General comments

The network theory of affect suffices to explain reasonably well our experimental results. However, the theory has several flaws. In this final section we will identify some problems with the theory, and then discuss some issues central to theories of emotion. Because of space limitations, our discussion will be selective; the reader may consult Bower and Cohen (1982) for a fuller discussion of some of these ideas.

Retrieval cue overload. One of our major arguments has been that mood-congruent memories are recalled best because they are associated to the emotion node and are thus primed via spreading activation from that node. In other words, every event in a person’s life involving, say, happiness is alleged to become linked to the “happy” emotion node in the network. An obvious problem with this assumption is that, without some means for separating different contexts, an astronomical number of experiences would become linked to each basic emotion node. With this many links, the small amount of activation spreading from that node distributed among its millions of outgoing branches would become extremely dissipated, to the extent that any specific targeted mood-related memory would receive insufficient activation to make its retrieval easier.

We must admit that this objection poses problems for our theory. Briefly stated, our best response is to assert that any retrieval within the network involves searches emanating from at least two cues, with the target items found at intersections of the retrieval paths. Thus the memory search process emanates not just from the happiness node but also from a node corresponding to other stimulus cues (e.g., “my friend” or “List 1” or “third grade”). By restricting the search domain in this manner, the “dissipation of activation” problem is a bit more manageable.

Representation of emotional intensity. Another potential problem is that our network model represents a basic emotion as a single unit that is qualitatively the same across different situations and different intensity levels. We noted earlier that intensity shifts, for example, could be conceived as involving quantitative (and not qualitative) changes in the activation of an emotion, perhaps indexed by autonomic arousal. However, certain problems are encountered in an associative network when different emotional intensities are to be represented by the degree of activation of the same node.

An immediate problem is that people (and animals) can learn to make different responses to low versus high intensities of an emotion or drive. For example, we learn to label our mild angers as annoyances, moderate angers as anger, and extreme angers as rages. But to represent this in an associative network requires either special connections or something like an analog-to-digital converter that monitors the activation level of the node. The “special connections” are easily designed in networks using inhibitory links and different threshold elements. Figure 18.8 illustrates a simple network that will activate different nodes (annoyance or rage), depending on the activation level of the basic emotion node (of anger). The lower-intensity node requires a lower threshold for its activation, and the higher-intensity node must have inhibitory connections to all lower-intensity nodes, so that when the high-intensity node fires it shuts off the firing of any lower-intensity nodes connected to that basic emotion node. Whenever the annoyance or rage node fires, it sends activation to whatever actions and memories have been associated with the firing of that node (such as the label of annoyance or rage).

A similar complication caused by the assumption of a single unit for primitive emotions is that the theory should differentiate among subtle shadings of a given emotion, depending on its context of arousal and its object. Thus, the feeling of tender love will probably differ greatly between, say, a woman’s tender love for her infant, husband, father, kitten, and old flame. Anger at one’s failings probably differs from anger at an aggressive stranger or at a governmental policy. The theory handles all such cases by supposing that the anger (or love) node activated is the same in all cases; but that the context or
object of the emotion are two other cognitive elements that, by intersection searches in conjunction with the basic emotion, cause different scripts, roles, and action patterns to be activated and retrieved into short-term memory. The subjective feeling reported is a mixture of the basic emotion together with the script appropriate to the target and the social situation.

**Interaction of emotion, cognition, and behavior.** Our research focused mainly on how emotional states influence cognitions. However, reciprocal interactions are to be expected; our cognitions obviously affect our emotions in many ways. Indeed, standard techniques for manipulating moods experimentally require the subject to dwell on certain thoughts or memories. Our hypnotic procedure is clearly of this kind. Another mood-induction method is that devised by Velten (1968), which suggests elation or depression in subjects by having them read a series of self-referential mood statements (e.g., “Things are going badly for me today”) and imagine that these describe their feelings. Another procedure, used by Thompson, Cowan, and Rosenhan (1980), induces sadness by having subjects listen to a tape asking them to project themselves into a story about a close friend dying of cancer.

Almost all emotion theorists accord a central role to cognitions in emotional responses. Many theorists relate emotions to cognitive appraisals of actual, imagined, or anticipated transactions in terms of their meaning to the person’s goals, self-image, beliefs, and well-being. The well-known “two-factor” theory of Schachter (1964; Schachter & Singer, 1962) suggested that emotion developed from a cognitive interpretation of physiological arousal; Mandler (1975) and Lazarus, Kanner, and Folkman (1980) present similar views about the complex interaction between autonomic arousal, cognitive interpretations, and actions.

The network theory is one representation of these interactions, as the theory conceives of the emotion node as being connected to patterns of autonomic arousal and to expressive behaviors (Figure 18.2). Importantly, these connections are reciprocal and two-way, that is, general autonomic arousal intensifies (amplifies) the activation of whatever emotional unit has already been selected by the cognitive system. This leads to the expectation that a background of excitement from irrelevant stimulation (such as physical exercise or a roller-coaster ride) will intensify any emotion (like anger or romantic love) elicited by a coincident provocation. Zillmann (1978) reviews much positive evidence for this “excitation transfer” hypothesis.

Another reciprocal influence on emotions comes from the face and bodily expressions. Cross-cultural research has shown that each of a limited set of basic emotions is associated with a characteristic facial expression (Ekman, Friesen, & Ellsworth, 1972). Facial expressions similar to those of real emotion occur even when the person simply produces imagery of a certain affective quality (e.g., Schwartz, Brown, & Ahern, 1980; Siroti & Schwartz, 1982). Evidence also suggests that the setting of the facial musculature and bodily postures will feed back activation to specific emotional units commonly associated with these poses. Laird and his colleagues (1982) found that subjects who configured their facial muscles unwittingly into a specific pose produced some of the corresponding emotional state. One could also expect competition among cognitive and facial determinants of emotion; thus, the time to retrieve and image clearly an anger scene should be slowed by having the subject’s face posed in a smile; conversely, the image latency for a happy scene should be slowed by an angry facial pose. Such reciprocal influences are consistent with the network model, which posits two-way linkages.

**The development of affective structures**

Although the network model is a convenient summary of emotion-cognition interactions, it gives us no clue about how many emotions there are or how they are developed. We feel these issues are outside our area of research and expertise, but as a theory should address these issues, we will hazard a few comments.

An associative (or semantic) network is a kind of formal “language” in which to transcribe theoretical guesses about the internal representation of concepts and events. This is done at the functional level of those elements that are connected to other units. Every language needs a base set of primitive elements in its “vocabulary” to build up higher-level ideas of structures. Thus, semantic-memory theories (such as HAM of Anderson & Bower, 1973, or the conceptual-dependency theory of Schank, 1975) assume that each infant begins with a base set of neural elements that are genetically prespecified to become sensory elements, action elements, and perhaps conceptual elements under appropriate environmental stimulation. For example, given appropriate stimulation, certain neurons along the visual pathways and in the visual cortex would be prespecified to become sensitive, say, to red light. Thus, we would say that “red light” would be a primitive element in the base set of percepts of most infants.

Second, associative theories stipulate a set of relations (among elements) and rules for building up more complex descriptions of objects and events out of relations among primitive elements. For example, a visual square would be characterized by the visual cortex as an object formed by parallel vertical and horizontal lines connected at right angles. From the base set of elements and relations, the brain can then build up arbitrarily complex descriptions of physical or conceptual objects; and it is the internal representations of these structural descriptions that are stored in memory. There is nothing esoteric or mysterious about this: A familiar analogy is that natural languages like English build up an unlimited number of arbitrarily complex words from a vocabulary of 26 letters plus a space and the relation of “successor.”
From such logical necessities, the network theory of emotions is led to postulate a beginning set of basic emotions that are genetically presupposed for each human infant. We do not know how to decide how many primitive emotions an infant has or what they are, but other scientists such as Izard (1972; Izard & Buechler, 1980) have come to reasonable conjectures of six to nine primitive emotions. Typical basic emotions are interest-excitement, enjoyment-joy, surprise-startle, distress-anguish, anger-rage, disgust-revulsion, contempt-scorn, fear-terror, and shame-humiliation.

The existence of such innate emotions is suggested by several lines of evidence: (1) the sharing across species of common emotional responses such as distress, startle, interest, revulsion, and aggression (see Strongman, 1978, chap. 7); (2) the cross-cultural similarities of facial expressions in various motions (Izard, 1971; Ekman, Friesen, & Ellsworth, 1972); and (3) the emotional expressions of very young infants (e.g., Izard, 1971; Izard & Buechler, 1980).

The network theory would suppose that these primitive emotions exist as innate units in the network, each with innate connections to a cortical and autonomic arousal pattern and to its pattern of facial-bodily expression. Also a few innate "productions" (S-R connections) would be needed to recognize stimulus situations in which the indicated emotional unit should be fired. From these rudimentary beginnings, the infant enters into a lifetime of learning through acculturation. The associative network model is capable of representing most of this learning and differentiation.

This cultural learning is extensive and goes on at several different levels. One type of learning involves increasing "stimulus learning and differentiation," with the infant learning to recognize more and more subtle situations that call for a particular emotion. Included would be the infant's learning of specific emotional reactions to specific persons, events, and topics. A second type of learning involves increasing "response learning." Each culture teaches its members certain social "scripts" (see Abelson, 1981; Schank & Abelson, 1977) for conventional displays of specific emotions. These emotional scripts are lengthy action routines, which are modeled for the child repeatedly by his social community. Thus, he learns the accepted cultural scripts for showing romantic love, for grief, shame, loneliness, and so on. These scripts are elaborated around the core of innate behaviors associated with the emotion; thus, the shamed person may put on the same face across cultures, although what he does with his shame—retribution, public breast-beating, or quiet isolation—will vary across cultures. Of course, idiosyncratic variations on these emotional scripts are frequent.

A third form of learning involves increasing differentiations of the primitive emotions. This is accomplished by subcategorizing situations and appropriate behavioral scripts that formerly fell under a given primitive emotion. One subcategorization is according to the intensity of the appropriate emotional reaction. As mentioned earlier (in Figure 18.8), the network model can represent

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the experience of different intensities of an emotion by "turning on" different nodes in the network, and these will call forth different response repertoires. Another type of differentiation involves setting up a cognitive unit to represent subtle shadings in subjective feelings attendant upon arousal of different thoughts when a common core emotion is aroused. For example, the core emotion of interest will be differentiated and labeled intellectual curiosity in one evoking situation, romantic pursuit in another, and thrill-seeking in still another. Although arousal of the emotion of interest is common, these feelings are differentiated not only by their evoking situations and the scripts followed but also by the other emotions and thoughts aroused during prototypical occasions.

This differentiation process is both creative and unbounded, which explains why the English language has nearly 18,000 words referring roughly to shades of emotional feelings or character traits (reported in Allport & Odbert, 1936). Our emotion vocabulary is a motley collection of words that differ in describing the quality of a feeling, its cause, goal, intensity, and its duration; the vocabulary even includes enduring character traits. Such a vocabulary is neither well ordered, logically constructed, nor taught with any precision to language users. Consequently, psychologists cannot hope to discover much about the primitive emotions by factor analyses of adults' judgments about the similarities of emotion words, any more than we learned anything about the physiology of color vision by analyzing our color vocabulary. However, such analyses may tell us something about cultural commonalities in the teaching of emotional terms.

Automatic versus controlled processes in emotion

We have interpreted our results as indicative of automatic (or spontaneous) influences of emotion on cognition rather than as a result of conscious intention to play a role. We may follow Posner and Snyder (1975) in defining automatic processes as those that occur without awareness (attention), without intention, and without interfering with other mental processes. Posner and Snyder contrast automatic with controlled processes, which require awareness (attentional resources), intention, time and effort to implement, and interfere with other ongoing mental processes.

Following Clark and Isen (1982), we feel that this distinction is useful for emotions, too. Clearly, people have learned diverse methods for controlling their moods and emotional reactions—for prolonging or terminating a mood, for blunting or augmenting an emotional reaction, for even transforming the affective significance of emotional stimuli (e.g., the ecstasy of the religious martyr).

The control strategies for moods involve some purposive manipulation of either our physical state, our environment, or our thoughts, images, and memories. People learn to alter their physical state through the use of psychoactive
drugs, muscle relaxation (with or without biofeedback), deep-breathing exercises, and physical exercise. People try to control their mood by environmental alterations, as when they go to parties, amusement parks, vacation resorts, entertainments (dramas, plays, movies, music), or when they call a friend or engage in absorbing activities to distract themselves from dwelling on their mood.

People also control their emotions by their cognitions about the event in question, by the way they categorize the event initially, by the evaluation and significance they assign to it, and by the persistent rehearsal of self-talk associated with the event. Thus, if someone publicly says that your hairstyle looks silly, you are likely to interpret that as a belittling insult that arouses anger. If you recycle the insult in short-term memory and repeat self-sentences about the event and the target (“What right does he have to embarrass me?”), such repeated thoughts will sustain the anger. Conversely, the anger could be circumvented by interpreting the remark differently in the first place. For example, you might regard it as simple information, or as reflecting good intentions of the observer, or as involving an unimportant issue for you. Alternatively, you could stop the angry self-sentences by counting to ten or by filling consciousness with well-rehearsed distracting or anger-coping thoughts such as “Don’t lose your temper. Keep calm.” The learning of such emotional self-control procedures is of major concern in psychotherapy with neurotic patients, especially in cognitive behavior therapy (e.g., Meichenbaum, 1979). In such therapy, patients are taught cognitive strategies (“thinking habits”) for coping with emotional problems such as anxiety, stress, pain, anger provocations, and depression.

In the network theory, we would represent these cognitive coping responses as “implicit habits” that become associated with (and triggered by) the activation of the relevant emotion node. These coping responses are able to fill short-term memory with distracting or countervailing thoughts and thus prevent the emotional reaction from facilitating itself (via its activated thoughts). In the absence of self-facilitation, the emotion dies out within a few seconds. Thus, the functions of “counting to ten” when a person is provoked to anger are (1) to fill short-term memory with innocuous material, (2) to prevent thinking about angry ideas primed by the provocation, and (3) with the passage of time to allow the initial emotional arousal to dissipate to zero.

Interestingly, people also deliberately use emotional events as modulators of other behaviors they must perform. These sorts of strategies were noted by Lazarus and his colleagues (1980). Thus, to persist in a taxing goal-directed effort (e.g., writing a book), people may use sustainers, which rekindle the motivation for completing the task (e.g., imagining the rewards at the end); they may take breathers (a rest), which temporarily disengage them from the fatiguing or stressful task, allowing the stress system to recover; or they may use restorers (vacations), which allow recuperation from the long, exhausting tasks that overstrained them. These restorative measures are often useful in everyday stress management, and problems such as “job burnout” may result from their neglect.

Of course, emotional controls are not always socially appropriate or available. When they are not, psychological problems may result. For example, the person may overuse certain control strategies and thereby obstruct the natural “flow” of emotional experience. This is exemplified by the overly “inhibited” person who so rarely expresses his feelings that he loses the ability to feel much of anything. Furthermore, attempts at emotional control may backfire, as when a high-strung insomniac tries to command himself to relax and fall asleep and in this way exacerbates his tension. Strategies can also be socially inappropriate and dysfunctional, such as the drug addict who tries desperately to re-create a “high” through chemical means, or the person who habitually dulls the impact of negative emotions with tranquilizers. Finally, as noted earlier, many clinical problems arise from the absence of emotional controls: Examples include the depressive whose spiraling cycle of pessimistic cognitions and negative mood go unchecked; the premature ejaculator who cannot control the intensity of his sexual arousal; and the aggressive person who is easily provoked to outbursts.

In short, control processes can powerfully affect emotional experience. They may be overused, applied inappropriately, or not available. The vast number of them and their ability to enhance or limit the quality of one’s experience suggest that it would be useful to monitor a more thorough understanding of them. This knowledge could be used not only for furthering a theoretical understanding of emotion but also for therapeutic applications and perhaps the development of educational programs to enhance people’s abilities to use control processes beneficially.

Appraisals of emotional events

In this chapter we have examined the cognitive consequences of arousing an emotion, but we have not discussed how emotional reactions are triggered in the first place. Bower and Cohen’s (1982) work extends the network model to deal with the elicitation of emotional reactions. In principle, recognizing situations in which one should feel frightened, angry, or sad should not differ greatly from recognizing objects, scenes, and social situations that would be categorized in non-emotional terms. The same issues of stimulus-pattern recognition arise, and complex decision rules will be needed to characterize a person’s social discriminations for evoking different emotions.

Bower and Cohen suggested that the initiation of emotional reactions could be modeled in terms of generalized habits, which they called “emotional interpretation rules” or “productions.” A production is like an S-R habit designed to recognize a configuration or pattern of relevant variables (the S) that describe a situation; when its pattern is matched (recognized), the production
is fired, causing the appropriate emotional units (the R) to become activated and to thus enter consciousness. An example of such an emotional interpretation rule is: IF someone harms you and he could have prevented it, THEN feel anger at that person. The stimulus conditions for such productions are presumed to exist in an abstraction hierarchy, so that diverse events can come to be categorized, say, as “harmful to you.” Furthermore, a given situation or social remark might be recognized by several productions; for example, a sarcastic quip can be interpreted either as merely funny or as a personal attack. Which interpretation is selected depends on the current strength of the different productions. Bower and Cohen handled this issue by supposing that emotional interpretation rules are themselves connected to the emotions they turn on; thus, for example, when someone is feeling angry, productions that result in, or sustain, anger will be temporarily strengthened. Their greater strength implies that these rules will most likely be selected to control the interpretation of ambiguous situations. This means that people will interpret ambiguous emotional signals in a way congruent with their current emotion. These are exactly the sort of emotion-driven interpretive biases that one wants a theory to have.

Reappraisals of events from memory

Bower and Cohen also proposed that an episode causing an emotional reaction would be stored in memory as a triad: the description of the episode, the emotions it aroused, and the emotional interpretation rule by which that episode called forth those emotions. Bower and Cohen noted several reasons for storing the interpretative rule with the episode-emotion connection. One reason is that the rule enables the person later to explain why he had the emotional reaction that he did. A second important reason is that memory of the rule used in the original interpretation is often used in reinterpreting or changing one’s appraisal of an earlier event. By replaying the remembered experience and reappraising it according to an altered rule or in an altered context, a different emotional reaction may be assigned to the event.

Some reasons for altering an emotional appraisal can be cited briefly. First, the person may receive new information. For example, the anger associated to the event of a friend not showing up for a date might be replaced with guilt when you hear that the friend had been seriously injured in an auto accident on the way to the date. Second, a change in attitudes or values may occur between the event and its reappraisal. For example, a teenager’s contempt for his parents’ physical weakness may be replaced later by tolerance and compassion for the infirmities of the aged. Third, a reinterpretation might be prompted by a shift in evaluation mood. For instance, a husband who is exhausted and cranky may be very upset with his wife’s tardiness in preparing dinner; when feeling rested on the following day, he may reappraise that scene and now feel guilty about his insensitivity. Fourth, an event may change in im-

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portance because of consequent events. For example, the sadness associated with being rejected from one job would dissipate quickly if soon afterward an offer of a better job was received. Finally, there may be a change in goals or interests. Thus, the excitement once associated with a honeymoon experience may be replaced with anger and sadness following a bitter divorce.

To summarize, control processes are used in many ways to alter emotional responses to past, present, and future (anticipated) events. The obvious therapeutic value of such controls is reflected by the many psychotherapies that emphasize methods for altering or coping with emotional associations; for example, aversive conditioning (e.g., McGuire & Vallance, 1964; Thorpe et al., 1964), systematic desensitization (e.g., Wolpe, 1958), and hypnotherapy (e.g., Kroger & Fezler, 1976). Many forms of psychotherapy strive for periodic reappraisals of critical life events and memories of them. Such reappraisals often lie at the heart of insight and growth toward psychological maturity.

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