Introduction

Much of cognitive psychology is still influenced to some extent by the computer analogy or metaphor, although much less so than used to be the case. For example, this can be seen in the emphasis on information-processing models. One of the limitations of this approach is that it does not lend itself readily to an examination of the relationship between cognition and emotion (especially the effects of emotion on cognition). The reason is that it is difficult to think of computers as having emotional states.

Most cognitive psychologists ignore the issue of the effects of emotion on cognition by trying to ensure that all their participants are in a relatively neutral emotional state. However, there has been a rapid increase in the number of cognitive psychologists carrying out research in the area of cognition and emotion. Some of that research (e.g., the role of emotional states in eyewitness testimony; flashbulb memories; autobiographical memory) is discussed in Chapter 8.

The most common approach adopted by cognitive psychologists wishing to study the effects of emotion on cognition has involved manipulating participants’ emotional states in a systematic way. In contrast, some researchers (e.g., Lazarus, 1991; Smith & Lazarus, 1993) have studied the effects of cognition on emotion. As there are almost constant interactions between cognition and emotion in everyday life, any attempt to provide an adequate theory of cognition that ignores emotion is likely to prove inadequate.

Before proceeding, it is worth considering some definitions. The term “affect” is very broad, and has been used to cover a wide variety of experiences such as emotions, moods, and preferences. In contrast, the term “emotion” tends to be used to refer to fairly brief but intense experiences, although it is also used in a broader sense. Finally, “mood” or “state” are terms describing low-intensity but more prolonged experiences.

Cognitive Determinants of Emotion

What factors determine our emotional experience? There is reasonable agreement concerning the relevant factors, but much controversy about the relative importance of these factors. According to Parkinson (e.g., 1994), emotional experience depends on four separate factors:
(1) **Appraisal of some external stimulus or situation.** This is generally accepted as the most important factor, and was the one emphasised by Lazarus (e.g., 1991).

(2) **Reactions of the body (e.g., arousal).** According to the James–Lange theory, our emotional experience depends on our perception of our own bodily symptoms. As James (1890, p. 451) argued, “If we fancy some strong emotion, and then try to abstract from our consciousness of it all the feelings of its bodily symptoms, we find we have nothing left behind.” The finding that patients with spinal cord injuries (who have little or no direct experience of their bodily symptoms) have no reported reduction in emotional experience (e.g., Cobos, Sanchez, Perez, & Vila, 2004) is inconsistent with this theoretical position.

(3) **Facial expression.** The importance of this factor was shown in a study by Strack, Martin, and Stepper (1988). Participants were more amused by cartoons when adopting a facial expression close to a smile than when producing an expression resembling a frown.

(4) **Action tendencies.** For example, preparing to advance in a threatening way is associated with anger, whereas preparing to retreat is associated with fear (Frijda, Kuipers, & ter Schure, 1989).

It is very important to bear in mind that these four factors are not independent of each other (see Figure 18.1). More specifically, cognitive appraisal of the situation affects bodily reactions, facial expression, and action tendencies, as well as having a direct effect on emotional experience. These considerations inspired the bold notion that cognitive factors (especially appraisals) are always of fundamental importance in determining emotional experience. This was precisely what was argued by Lazarus (1982, 1991) in his appraisal theory, which led to the development of several other appraisal theories (see Barrett, in press, for a review). The essence of this theoretical approach is as follows: “Whether emotion is generated in response to perceived, remembered, or imagined events, and by automatic or controlled processing, appraisal theories claim that *appraisals start the emotion process, initiating the physiological, expressive, behavioural and other changes that comprise the resultant emotional state*” (Roseman & Smith, 2001, p. 7).

### Appraisal theory

The original version of appraisal theory was put forward by Lazarus (1982). According to this theory, cognitive appraisal can be subdivided into three more specific forms of appraisal:

- **Primary appraisal:** an environmental situation is regarded as being positive, stressful, or irrelevant to well-being.
- **Secondary appraisal:** account is taken of the resources that the individual has available to cope with the situation.

![FIGURE 18.1](https://example.com/figure18.1.png)

Re-appraisal: the stimulus situation and the coping strategies are monitored, with the primary and secondary appraisals being modified if necessary.

The descriptions of these forms of appraisal seem to imply that they involve deliberate conscious processing. However, that is not necessarily the case. For example, Lazarus (1991, p. 169) referred to “two kinds of appraisal processes—one that operates automatically without awareness or volitional control, and another that is conscious, deliberate, and volitional”.

There have been two major developments in appraisal theory since the theoretical formulation of Lazarus (1982). First, it is increasingly claimed that each distinct emotion is elicited by a specific and distinctive pattern of appraisal. For example, Smith and Lazarus (1993) argued that there are six appraisal components, two involving primary appraisal and four involving secondary appraisal:

- **Primary**: motivational relevance (related to personal commitments?).
- **Primary**: motivational congruence (consistent with the individual’s goals?).
- **Secondary**: accountability (who deserves the credit or blame?).
- **Secondary**: problem-focused coping potential (can the situation be resolved?).
- **Secondary**: emotion-focused coping potential (can the situation be handled psychologically?).
- **Secondary**: future expectancy (how likely is it that the situation will change?).

According to Smith and Lazarus (1993), different emotional states can be distinguished on the basis of which appraisal components are involved and how they are involved. For example, anger, guilt, anxiety, and sadness all possess the primary appraisal components of motivational relevance and motivational incongruence (these emotions only occur when goals are blocked). However, they differ in terms of secondary appraisal components. Guilt involves self-accountability, anxiety involves low or uncertain emotion-focused coping potential, and sadness involves low future expectancy for change.

Second, most early appraisal theories (including that of Smith & Lazarus, 1993) focused on the structure of appraisal rather than the processes involved. In other words, they emphasised the contents of any given appraisal but largely ignored the underlying mechanisms involved in producing appraisals. This issue has been addressed in several recent theories (see Barrett, in press). Of particular importance is the theoretical approach of Smith and Kirby (2001). According to their theory, various appraisal processes occur in parallel. There are three basic mechanisms (see Figure 18.2). First, there is associative processing, which involves priming and activation of memories. This form of processing occurs rapidly and automatically, and lacks flexibility. Second, there is reasoning. This process involves deliberate thinking, and is slower and more flexible than associative processing. Third, there are appraisal detectors that continuously monitor appraisal information coming from the associative and reasoning processes. The emotional state an individual experiences at any given moment is determined by the total information registered by the appraisal detectors.

**Evidence**

There are numerous studies showing that emotional experience is influenced by cognitive appraisal. For example, consider an early experiment reported by Speisman, Lazarus, Mordkoff, and Davison (1964). Participants saw various anxiety-evoking films. One film showed a Stone Age ritual in which adolescent boys had their penises deeply cut, and another film showed various workshop accidents. The most horrific of these accidents involved a board caught in a circular saw that rammed with tremendous force through the mid-section of a worker, who died writhing on the floor.

In the study by Speisman et al. (1964), cognitive appraisal was manipulated by varying the accompanying soundtrack. For example, denial was produced by indicating that the incision film did not show a painful operation, or that those involved in the workshop film were actors. Intellectualisation was produced in the incision film by considering matters from the perspective of
an anthropologist viewing strange native customs. It was produced in the workshop film by telling the viewer to consider the situation in an objective way. Various psychophysiological measures of arousal or stress (e.g., heart rate; galvanic skin response) were taken continuously during the viewing of each film.

Denial and intellectualisation both produced substantial reductions in stress as indexed by the psychophysiological measures compared to a control condition in which there was no soundtrack. Thus, manipulating an individual’s cognitive appraisal can have a significant impact on physiological stress reactions.

As discussed earlier, Smith and Lazarus (1993) argued that which emotion is experienced by an individual in a given situation depends on the specific appraisal components activated by the situation. They presented scenarios to their participants and instructed them to identify with the central character. In one scenario, the central character had performed poorly in an important course and he appraised the situation. Other-accountability was produced by having him put the blame on the unhelpful teaching assistants. Self-accountability was produced by having him argue that he made a lot of mistakes (e.g., doing work at the last minute). Low emotion-focused coping potential was produced by having him think that there was a great danger he would finish with a poor academic record. Low future expectancy was produced by having him think it was impossible to succeed with his chosen academic path.

Smith and Lazarus (1993) found that the appraisal manipulations generally had the predicted effects on the emotional states reported by participants. For example, anger was more common when there was other-accountability rather than self-accountability. Guilt was more common when there was self-accountability rather than other-accountability. In spite of the apparently positive nature of these findings, Parkinson (2001) argued that they were relatively unimpressive. He pointed out that under 30% of the variance...
in emotion ratings was accounted for by the appraisal manipulations. In other words, most of the differences in emotional states across situations could not be explained directly by the appraisal manipulations.

Bennett, Lowe, and Honey (2003) suggested that more impressive findings might be obtained if real-life emotional events were studied rather than the hypothetical scenarios used by Smith and Lazarus (1993). Bennett et al. asked participants to think of the most stressful event they had experienced over the previous 4 weeks. The emotional states experienced by the participants were predicted reasonably well by the cognitive appraisals they had used. However, the relationship between appraisals and emotional experience was no stronger in this study than in the one by Smith and Lazarus (1993).

The relationship between cognitive appraisals and specific emotional experience may sometimes be weak because any given emotion can be produced by various combinations of appraisals. This possibility was explored by Kuppens, van Mechelen, Smits, and de Boeck (2003). They studied four appraisals (goal obstacle; other-accountability; unfairness; control) relevant to the experience of anger. Participants described recently experienced unpleasant situations in which one of the four appraisals was present or absent. What Kuppens et al., p. 266, found was that the determinants of anger are relatively flexible and changeable: “None of the selected components [of appraisal] can be considered as a truly singly necessary or sufficient condition for anger.” Thus, for example, we can feel angry without the appraisal of unfairness or the presence of a goal obstacle.

According to Smith and Kirby (2001), appraisal can involve very rapid associative processes occurring below the level of conscious awareness. There is much evidence to support this viewpoint (discussed in the next section). For example, Chartrand, van Baaren, and Bargh (2006) confirmed that automatic appraisal processes can influence emotional state. Positive (e.g., music; friends), negative (e.g., war; cancer), or neutral (e.g., building; plant) words were presented repeatedly but so briefly they could not be identified at the conscious level. Participants receiving the negative words reported a more negative mood state than those receiving the positive words.

**Evaluation**

There is a consensus that appraisal processes are of fundamental importance in influencing emotional experience. Such processes not only determine whether or not we experience emotion, but also strongly influence the precise emotion experienced. Smith and Kirby (2001), with their distinction between associative processes and reasoning, have clarified the processes involved in appraisal, which were left rather vague in previous versions of appraisal theory. Various criticisms can be made of the appraisal approach to emotion. First, the assumption that appraisal always plays a crucial role in determining emotional experience is probably too strong. In fact, it is likely that appraisal is sometimes a consequence of emotional responding rather than a cause. For example, there is much evidence that depression can be caused by neurotransmitter abnormalities and can be alleviated by the use of anti-depressant drugs (see Eysenck, 2004). Second, the rapid and automatic associative processes involved in appraisal are difficult to study in detail, and there has been relatively little progress in understanding them. Third, it is assumed that appraisal causes emotional experience, but appraisal and emotional experience often seem to blur into each other. As Parkinson (2001, p. 181) pointed out, “It seems likely that a willingness to endorse items describing one’s helplessness and feelings of loss [appraisal] implies a tendency to agree that one is also sad and sorrowful [emotional experience].” Fourth, “Appraisal theory has taken the paradigm [model] of emotional experience as an individual passive subject confronting a survival-threatening stimulus” (Parkinson & Manstead, 1992, p. 146). Thus, appraisal theory de-emphasises the social context in which most emotion is experienced. Fifth, appraisal theories focus on “a relatively limited number of emotions, leaving large gaps in our understanding of the full spectrum of emotional phenomena in need of explanation” (Barrett, in press).
MULTI-LEVEL THEORIES

As we have seen throughout the book, the cognitive system is complex and multi-faceted. For example, Baddeley’s working memory model now consists of four different components (see Chapter 6). Accordingly, it is probable that several different cognitive processes underlie emotional experience. For example, as discussed above, Smith and Kirby (2001) argued that emotional experience is influenced by associative processes and by reasoning.

The complexity of the cognitive system is one important reason why theorists are increasingly putting forward multi-level theories to identify the key cognitive processes underlying emotion. Another reason is that such theories seem to be needed to account for the emotional conflicts most of us experience from time to time. For example, individuals with spider phobia become very frightened when they see a spider even though they “know” that most spiders are harmless. The easiest way of explaining such emotional conflicts is to assume that one cognitive process produces fear in response to the sight of a spider, whereas a second cognitive process provides conflicting knowledge that it is probably harmless.

There are many multi-level theories (see reviews by Robinson, 1998, and Teasdale, 1999), and these theories differ in important ways. However, there is fairly general agreement that one way (but not the only one) in which emotional reactions can be triggered is by preattentive or automatic processes. We start by considering some of the evidence on this issue before discussing two multi-level theories.

Automatic or preattentive processes

In the previous section, we discussed findings by Chartrand et al. (2006) suggesting that processes below the level of conscious awareness can produce emotional reactions. Some of the most convincing evidence that emotional responses can be activated automatically was reported by Öhman and Soares (1994). They presented snake- and spider-phobic participants with pictures of snakes, spiders, flowers, and mushrooms. These pictures were presented very rapidly so that they could not be identified. In spite of this, the spider-phobic participants reacted emotionally to the spider pictures, as did the snake-phobic participants to the snake pictures. More specifically, there were greater physiological responses (in the form of skin conductance responses) to the phobia-relevant pictures. In addition, the participants experienced more arousal and felt more negative when exposed to those pictures than to the other ones.

A related phenomenon is worth mentioning at this point. There have been numerous studies in which stimuli (e.g., pictures; Chinese ideographs) were presented very briefly below the level of conscious awareness. Even though these stimuli could not subsequently be recognised, participants were still more likely to choose previously presented stimuli than comparable new ones when asked to select the ones they preferred. Thus, there was a positive affective reaction to the previously presented stimuli (as assessed by their preference judgements) in spite of the fact that these stimuli had not been perceived consciously. This phenomenon is known as the mere exposure effect (see Bornstein, 1989, for a review).

Monahan, Murphy, and Zajonc (2000) pointed out that most studies of the mere exposure effect have focused only on positive affective reactions to the specific stimuli previously presented below the level of conscious awareness. They wondered whether the positive affect produced by repeated exposure to stimuli might generalise to novel stimuli. Monahan et al. explored this issue as follows. Participants were initially presented with 25 different polygons or Chinese ideographs once each (single exposure) or with five polygons or ideographs presented five times each (repeated exposure). Each stimulus was presented for only 5 ms and was followed by a mask so that it could not be identified consciously. After that, all participants rated their liking for various stimuli. Some of these stimuli had been presented previously, some were novel but from the same category (i.e., polygons or ideographs), and some were novel and from the other category. What was found was that all three types of stimulus
were liked significantly better by participants who had initially been presented with repeated exposures of stimuli they could not consciously perceive (see Figure 18.3).

What do these findings mean? First, preattentive or automatic processing based on repeated exposures to the same stimuli can produce positive affect. Second, the positive affect thus created can influence the emotional reactions to a surprisingly wide range of novel stimuli.

**LeDoux: Fear**

LeDoux (1992, 1996) has focused mainly on fear in his research. He has emphasised the role of the amygdala, which he regards as the brain’s “emotional computer” for working out the emotional significance of stimuli. According to LeDoux, sensory information about emotional stimuli is relayed from the thalamus simultaneously to the amygdala and to the cortex. Of key relevance here, LeDoux (1992, 1996) argues that there are two different emotion circuits in fear:

2. A fast-acting thalamus–amygdala circuit based on simple stimulus features (e.g., intensity); this circuit bypasses the cortex.

Why do we have two emotion circuits? The thalamus–amygdala circuit allows us to respond rapidly in threatening situations, and thus can be valuable in ensuring our survival. In contrast, the cortical circuit produces a detailed evaluation of the emotional significance of the situation. As such, it allows us to respond to situations in the most appropriate way.

The findings of Öhman and Soares (1994; discussed previously) are consistent with the notion that there is a fast-acting system for threat detection that involves only minimal cortical processing. Additional support was reported by Morris, DeGelder, Weiskrantz, and Dolan (2001). They studied a patient who had no conscious visual perception of stimuli presented to damaged areas...
of his primary visual cortex. In spite of this, he had significant activation of the amygdala to fearful faces presented to the damaged area. The overall pattern of brain activation indicated that the fast-acting system was involved and that there was little or no cortical processing. Other studies consistent with LeDoux’s theoretical approach are discussed in a review by Öhman (2005).

**Interacting Cognitive Subsystems framework**

Teasdale and Barnard (1993) developed one of the most influential multi-level theoretical approaches, the Interacting Cognitive Subsystems framework. In essence, it is assumed that there are several kinds of information codes (see Figure 18.4):

1. Sensory codes for basic features of visual, acoustic, and proprioceptive [concerned with one’s own body state] sensory input.
2. Intermediate codes for speech-level and object information.
4. Implicational codes representing a more general level of implicit, non-verbal meaning based on schemas and expressing feelings with implicit content.

Three points need to be emphasized about the Interactive Cognitive Subsystems approach. First, what Teasdale and Barnard (1993) proposed is a framework rather than a fully developed theory. As a consequence, it does not directly generate testable predictions. Second, it is assumed that the various subsystems interact strongly with each other. Third, it is assumed that emotional experience depends much more on implicational meanings than propositional ones. In the words of Barnard and Teasdale (1991, p. 24), the essence of the distinction is between “knowing with the head (propositional) and knowing with the heart (implicational).”

Walz and Rapee (2003) carried out a study to test the notion that there are separate propositional and implicational levels of meaning. They argued that the content of spoken words determines their

![FIGURE 18.4](image-url)
propositional meaning, whereas the way they are expressed (e.g., tone; volume) determines their implicational meaning. The two forms of meaning can be distinguished by saying emotional words in a neutral tone (e.g., “fury” said neutrally) or by saying neutral words with an emotional expression (e.g., “jury” said with anger). They had two further conditions in which emotional words were said with an emotional expression (e.g., “fury” said with anger) and neutral words were said unemotionally (e.g., “jury” said neutrally). There were two tasks. The content task required participants to decide as rapidly as possible whether the word meaning was emotional or neutral while ignoring the expression. The expression task involved deciding whether the expression was emotional or neutral while ignoring the word content.

What did Walz and Rapee (2003) find? Of crucial importance, implicational meaning in the form of expression played a key role in both tasks. Unsurprisingly, performance speed on the expression task was determined almost exclusively by whether the expression of the stimulus word was angry or neutral. In addition, however, word expression influenced performance speed on the content task (see Figure 18.5). Word content was important on the content task but had a relatively modest impact on the expression task.

The above findings provide general support for the Interacting Cognitive Subsystems framework. First, they suggest that implicational and propositional meaning can have separate influences on performance of emotion-based tasks. Second, it is assumed within the framework that implicational meaning is of central importance in emotion, and that form of meaning influenced performance more across the two tasks than did propositional meaning. Third, the finding that angrily expressed anger words produced the fastest decisions on the content task (see Figure 18.5) is consistent with the framework on the basis that information from the implicational and propositional subsystems was congruent and mutually supportive.

Overall evaluation

Multi-level theories have much to recommend them. They are typically more consistent than previous theories with the accumulating evidence concerning the nature of the cognitive system. In addition, there is convincing evidence that emotional experience can be triggered by preattentive or automatic processes as well as by more conscious, deliberate processes. Such evidence is relevant to the common experience of being frightened of some object or situation in spite of “knowing” that it is actually harmless.

There are various limitations with multi-level theories. First, they differ significantly from each other (see Robinson, 1998), but the evidence does not...
not clearly indicate the superiority of one multi-level theory over the others. Second, some theoretical approaches (e.g., the Interacting Cognitive Subsystems approach) lack sufficient detail to permit direct testing of their assumptions. Third, more generally, “If we can ‘explain’ all aspects of cognition–emotion relations simply by an unconstrained re-description of those relations in the language of a complex framework which does not yield verifiable predictions, then we may have really explained very little” (Teasdale, 1999, p. 677). In spite of such pessimism, however, it is highly probable that future theories will be multi-level rather than single-level.

MOOD AND COGNITION

Suppose you are in a depressed mood. What are the likely effects of your mood on your cognitive processes? Most people find that unhappy memories spring to mind when they are depressed. They also tend to think more negatively about themselves and the world around them. More generally, any given mood state (negative or positive) seems to influence cognitive processing so that what we think and remember matches (or is congruent with) that mood state.

Bower’s network theory

Bower (1981) and Gilligan and Bower (1984) put forward a semantic network theory designed to account for phenomena such as those mentioned in the previous paragraph (see Figure 18.6). The theory as developed by Gilligan and Bower (1984) makes six assumptions:

(1) Emotions are units or nodes in a semantic network, with numerous connections to related ideas, to physiological systems, to events, and to muscular and expressive patterns.

(2) Emotional material is stored in the semantic network in the form of propositions or assertions.

![FIGURE 18.6](image-url)
Thought occurs via the activation of nodes within the semantic network. Nodes can be activated by external or by internal stimuli. Activation from an activated node spreads to related nodes. This assumption is crucial—it means that activation of an emotion node (e.g., sadness) leads to activation of emotion-related nodes or concepts (e.g., loss; despair) in the semantic network. “Consciousness” consists of a network of nodes activated above some threshold value.

The above assumptions lead to several testable hypotheses:

- **Mood-state-dependent memory**: memory is best when the mood at retrieval matches that at the time of learning.
- **Mood congruity**: emotionally toned information is learned and retrieved best when there is correspondence between its affective value and the learner’s (or rememberer’s) current mood state.
- **Thought congruity**: an individual’s free associations, interpretations, thoughts, and judgments are thematically congruent with his/her mood state.
- **Mood intensity**: increases in intensity of mood cause increases in the activation of associated nodes in the associative network.

How do the four hypotheses relate to the six theoretical assumptions? So far as mood-state-dependent memory (typically assessed by recall) is concerned, associations are formed at the time of learning between the activated nodes representing the to-be-remembered items and the emotion node or nodes activated because of the participant’s mood state. At recall, the mood state at that time activates the appropriate emotion node. Activation then spreads from that emotion node to the various nodes associated with it. If the mood state at learning matches that at recall, this increases activation of the nodes of to-be-remembered items, and produces enhanced recall. However, the associative links between the to-be-remembered stimulus material and the relevant emotion nodes are likely to be relatively weak. As a result, mood-state-dependent effects are likely to be greater when the memory test is a difficult one offering few retrieval cues (e.g., free recall) than when it provides strong retrieval cues (e.g., recognition memory). When the memory test provides powerful retrieval cues, weak activation of list words via emotion nodes is unable to boost performance.

Mood-state-dependent effects are also predicted by other theories. According to Tulving’s encoding specificity principle (see Chapter 6), the success of recall or recognition depends on the extent to which the information available at retrieval matches the information stored in memory. If information about the mood state at the time of learning is stored in memory, then being in the same mood state at the time of retrieval increases this information matching. Theoretically, this should increase both recall and recognition.

Mood congruity occurs when people in a good mood learn (and remember) emotionally positive material better than those in a bad mood, whereas the opposite is the case for emotionally negative material. According to Gilligan and Bower (1984), mood congruity depends on the fact that emotionally loaded information is associated more strongly with its congruent emotion node than with any other emotion node. For example, those nodes containing information about sadness-provoking events and experiences are associatively linked to the emotion node for sadness (see Figure 18.6). To-be-remembered material congruent with the current mood state links up with this associative network of similar information. This leads to extensive or elaborative encoding of the to-be-remembered material, and thus to superior long-term memory. A similar process is involved during retrieval. Information congruent with an individual’s mood state will be more activated than information that is incongruent, and so can be retrieved more easily.

Thought congruity occurs for two reasons. First, the current mood state activates the corresponding emotion node. Second, activation spreads from that emotion node to other, associated nodes, which will tend to contain information emotionally congruent with the activated emotion node.
Mood-state-dependent memory

Mood-state-dependent memory has typically been studied by having the participants initially learn one or two lists of words. Learning occurs in one mood state (e.g., happy or sad), and recall occurs in the same mood state or in a different one (see Figure 18.7). When two lists are presented (e.g., Bower, Monteiro, & Gilligan, 1978; Schare, Lisman, & Spear, 1984), one list is learned in one mood and the other list is learned in a different mood. After that, participants are put back into one of these two moods and they are instructed to recall only the list learned first. Recall should be higher when the mood state at the time of recall is the same as that at the time of learning.

Schare et al. (1984) and Bower et al. (1978) obtained mood-state-dependent recall with the two-list design but not with the one-list design. It is possible that participants trying to recall the first list with the mood appropriate to the second list thought of some of the words from the second list, and this interfered with the task of recalling first-list words.

Ucros (1989) reviewed 40 published studies of mood-state-dependent memory. There was a moderate tendency for people to remember material better when there was a match between the mood at learning and that at retrieval. However, the effects were generally stronger when participants were in a positive mood than a negative mood. This may well be because individuals in a negative mood are motivated to change their mood state (discussed in more detail later).

Ucros (1989) also found that mood-state-dependent effects were stronger when the learning material had personal relevance. According to Bower’s (1992) causal belongingness hypothesis, memory is mainly affected by mood state when participants believe that their emotional state at learning is caused by the to-be-learned material. Causal attribution leads to an effective association between the material and the emotional state. This is much more likely to occur with personal events (e.g., feeling delighted after succeeding in an important examination) than when an emotional state is induced before presenting the learning task.

Kenealy (1997) noted various problems with previous research. First, the level of learning was not assessed in most studies. As a result, it is not clear whether poor performance reflected deficient memory or deficient learning. Second, there was no check in some studies that the mood manipulations had been successful. Third, only one memory test was generally used. However, the extent of any mood-state-dependent effects on memory often depends on the nature of the memory test. For example, Kihlstrom (1991) suggested that the effects of mood state will be weaker when rich and informative cues are provided within the retrieval environment (e.g., cues on a test of cued recall).

Kenealy (1997) addressed all these issues in a series of experiments. In one study, the participants looked at a map and learned a set of instructions concerning a particular route until their learning performance exceeded 80%. The following day they were given tests of free recall and cued recall (the visual outline of the map). There were strong mood-state-dependent effects in free recall but not in cued recall (see Figure 18.8). Thus, mood state can affect memory even when...
learning is controlled, but does so mainly when no other powerful retrieval cues are available.

**Mood-state-dependent memory: Dissociative identity disorder**

Bower (1994) argued that research on patients with **dissociative identity disorder** (formerly called multiple personality disorder) is relevant to his network theory. Such patients have two or more separate personalities, each having its own characteristic mood state. According to Bower (1994), information learned when one personality is in control should be relatively inaccessible to explicit memory (involving conscious recollection) when control passes to a different personality. This is sometimes termed inter-identity amnesia. In essence, the prediction is that mood-state-dependent memory effects extend to dissociative identity disorder.

Bower (1994) argued that there would be less evidence for mood-state-dependent effects with tests of implicit memory (not involving conscious recollection). The reason is that the stimuli relevant to implicit memory tests are “uncontrollable” or “obligatory” (Bower, 1994, p. 230), and so not subject to mood-dependent states.

Nissen et al. (1988) studied explicit and implicit memory in a 45-year-old woman with 22 different personalities ranging in age from 5 to 45. One of her personalities was Charles, who was 45 years old and an aggressive heavy drinker. Another personality was Bonnie, 36, who was very social and whose main interests were in the theatre. In one study, the same story was read to five of the personalities in turn, with each personality providing almost immediate recall. There was no systematic improvement in recall across personalities, suggesting the existence of mood-state-dependent forgetting or inter-identity amnesia in explicit memory. On another task, memory for words was tested by means of an implicit memory test (word completion) and an explicit memory test (recall). Memory performance was much worse when the personality at the time of test differed from that at learning. Thus, the findings on explicit memory supported Bower’s (1994) theory but those on implicit memory did not.

There are two major limitations in most studies of memory in dissociative identity disorder. First, very few studies have included more than one patient. Second, and more important, there are various reasons why a patient with dissociative identity disorder might apparently fail to remember information previously learned by a different personality. The information may be genuinely inaccessible or it may be more-or-less deliberately withheld. It is very useful to include a control group of healthy individuals instructed to simulate the effects of inter-identity amnesia.

Huntjens et al. (2003) compared memory performance in patients with dissociative identity...
disorder, healthy controls instructed to simulate inter-identity amnesia, and healthy controls. All participants learned two lists (List A and List B). List A contained the names of vegetables, animals, and flowers, and List B contained the names of different vegetables, different animals, and pieces of furniture. The first two groups learned List A in one identity and then learned List B in a different identity or a feigned identity. Finally, recall for List B was tested by free recall.

What findings would we expect? List B recall for the categories shared by both lists (i.e., vegetables and animals) should be subject to proactive interference (in which memory is disrupted by similar previous learning; see Chapter 6). However, this should not be the case for the category unique to List B (pieces of furniture). If patients with dissociative identity disorder have inter-identity amnesia, they should not show proactive interference because the information from List A would be inaccessible to them. In fact, all three groups showed comparable amounts of proactive interference (see Figure 18.9), indicating that memory of List A words disrupted List B recall. What is especially striking is that Huntjens et al. (2003) only analysed the data from those dissociative identity disorder patients denying any memory of having learned List A at all!

The findings of Huntjens et al. (2003) suggest strongly that patients with dissociative identity disorder do not show mood-state-dependent effects in explicit memory. As Huntjens et al. (2003, p. 296) concluded, “Reports of inter-identity amnesia, although possibly reflecting the patient’s subjective experience, should not be taken as evidence for objective episodic memory impairment for neutral material.”

Bower (1994) argued that patients with dissociative identity disorder should not exhibit mood-state-dependent effects with implicit memory. Thus, the prediction is that patients should show clear evidence of implicit memory when tested in a different identity from the one in control at the time of learning. The relevant studies have produced inconsistent findings (see Huntjens et al., 2005, for a review). In their own study, Huntjens et al. used participants with dissociative identity disorder, healthy controls told to simulate dissociative identity disorder, and healthy controls given no special instructions. All groups performed a serial reaction time task. The same repeating sequence of stimulus locations was used across
There is then a memory test for the list or the story after the participant’s mood has returned to normal. Mood congruity is shown by recall being greatest when the affective value of the to-be-learned material matches the participant’s mood state at learning. Alternatively, emotionally toned material can be learned when the participant’s mood state is fairly neutral. Recall is subsequently tested when the participant is in a positive or negative mood state. Mood congruity is shown if he/she recalls more information congruent than incongruent with his/her mood state at recall.

Bower, Gilligan, and Monteiro (1981) studied mood congruity. Participants hypnotised to feel happy or sad read a story about two college men, Jack and André. Jack is very depressed and glum, because he is having problems with his academic work, with his girlfriend, and with his tennis. In contrast, André is very happy, because things are going very well for him in all three areas. Participants identified more with the story character whose mood resembled their own while reading the story, and they recalled more information about him.

Mood congruity

One common procedure to test for mood congruity is as follows. First, a mood is induced, followed by the learning of a list or the reading of a story containing emotionally toned material. There is then a memory test for the list or the story after the participant’s mood has returned to normal. Mood congruity is shown by recall being greatest when the affective value of the to-be-learned material matches the participant’s mood state at learning. Alternatively, emotionally toned material can be learned when the participant’s mood state is fairly neutral. Recall is subsequently tested when the participant is in a positive or negative mood state. Mood congruity is shown if he/she recalls more information congruent than incongruent with his/her mood state at recall.

According to Bower (1994), the performance of the patients with dissociative identity disorder should not have suffered when they switched identities. In contrast, their performance should have deteriorated after switching identities if implicit memory is influenced by mood-state-dependent effects. The findings were much more in line with the latter prediction (see Figure 18.10). However, the healthy controls simulating dissociative identity disorder showed the same pattern of results as the patients, and it is unlikely that this was attributable to a change in mood state. As Huntjens et al. (2005, p. 387) concluded, “Because of the ability of simulators to mimic inter-identity amnesia, the results of patients cannot be interpreted unambiguously. Their pattern of performance can both indicate inter-identity amnesia or simulation of inter-identity amnesia.”

FIGURE 18.10

Mean response times on a serial reaction time task across blocks for dissociative identity disorder patients, healthy controls and healthy simulators. From Huntjens et al. (2005) with permission from Elsevier.
(1981) assumed that the cognitive changes were responsible for mood congruity. However, mood congruity may actually depend on the arousal changes. Varner and Ellis (1998) compared these possibilities in two experiments in which participants were presented with word lists. Some words were associated with being depressed and the rest were related to the organisation of skills when writing an essay. There were four conditions: depressed mood induction, arousal induction (stepping on and off a wooden platform), neutral mood induction, and schema induction (reading statements relevant to writing an essay). There was a test of free recall after list presentation.

What were the findings? Mood congruity was found in the depressed mood induction condition but not in the arousal induction condition (see Figure 18.11). Varner and Ellis (1998) obtained similar findings when the various induction procedures were used after learning but before recall. Thus, mood congruity can affect retrieval as well as learning, and depends on mood state rather than arousal.

Rusting and DeHart (2000) pointed out that there is more evidence of mood-congruent retrieval with positive than with negative affect. How can we explain this? People in a negative mood are much more likely to be motivated to change their mood. As Rusting and DeHart (2000, p. 738) expressed it, “When faced with an unpleasant emotional state, individuals may regulate their emotional states by retrieving pleasant thoughts and memories, thus reducing or reversing a negative mood-congruency effect.”

Rusting and DeHart (2000) tested the above hypothesis. Participants were presented with 20 positive words, 20 negative words, and 20 neutral words, and wrote 60 sentences each containing one of the words. Then there was a negative mood induction in which participants imagined experiencing distressing events. After that, some participants were told to engage in positive re-appraisal of the distressing events (“List some good things that could occur as a result of any of the negative events in the stories”). Others were told to continue to focus on negative thoughts, and the control participants were left free to choose the direction of their thoughts. Finally, all participants were given an unexpected test of free recall for the 60 words.

The findings depended very much on the mood-regulation strategies used by the participants (see Figure 18.12). Those in the continued focus condition showed the typical mood-congruity effect, whereas those in the positive re-appraisal condition showed mood incongruity. These effects were much stronger among participants who had previously indicated that they were generally successful at regulating negative moods. Many failures to find mood-congruent effects probably occur because individuals in a negative mood are motivated to improve their mood.
Thought congruity

Thought congruity has been studied in various ways. One method is to put participants into a positive or negative mood state before asking them to make various judgements. Thought congruity is shown if the judgements are positive or lenient among participants in a positive mood state but negative or harsh among those in a negative mood state.

Forgas and Locke (2005) provided good evidence for thought congruity. Experienced teachers were first of all given a mood induction to put them into a happy or sad mood state. After that, they were given four vignettes describing workplace situations (e.g., a colleague cutting in front of you in a photocopier queue). For each vignette, the teachers had to make judgements based on imagining themselves in the situation described. Mood state influenced the participants’ judgements. More specifically, “Happy mood produced more optimistic and lenient causal attributions while those in a negative mood were more critical” (Forgas & Locke, 2005, p. 1071).

Several studies designed to test the affect infusion model (discussed shortly) have failed to find evidence of thought congruity. In essence, judgements that require extensive processing are often influenced by mood state, but those that can be made easily are less likely to be (e.g., Sedikides, 1994).

Mood intensity

There has been relatively little work on the mood intensity hypothesis. However, Rinck, Glowalla, and Schneider (1992) considered a related issue—the emotional intensity of the stimulus material. Participants put into a happy or sad mood rated words for pleasantness–unpleasantness. There was a mood-congruency effect for the intensely emotional words (but not the weakly emotional words) on a later unexpected recall test.

More direct evidence in favour of the mood intensity hypothesis was discussed by Eich (1995) in a review of mood-state-dependent memory. The predicted effects of mood state on memory were obtained more often when free recall was used rather than recognition memory. Of relevance here, mood-state-dependent memory was obtained most consistently when the induced mood states were strong rather than weak.
Evaluation

Bower’s network theory has been extremely influential, and has played a key role in opening up an entire research area. There is reasonable empirical support for most of the predicted phenomena flowing from the theory, including mood-state-dependent recall, mood congruity, and thought congruity. However, there have been many failures to obtain the predicted effects, which are sometimes eliminated by the motivation of individuals in a negative mood state to improve their mood.

There are several limitations with Bower’s theoretical approach. First, it predicts that mood will influence cognitive processing more generally than is actually the case. This issue is discussed in more detail shortly. Second, as Forgas (1999, p. 597) pointed out, the theory “is notoriously difficult to falsify . . . The problem of falsifiability mainly arises because in practice it is difficult to provide a complete a priori specification of the kind of cognitive contents likely to be activated in any particular cognitive task.” Third, the theory is clearly oversimplified. Emotions or moods and cognitive concepts are both represented as nodes within a semantic network. In reality, however, moods typically change slowly in intensity, whereas cognitions tend to be all-or-none and there is rapid change from one cognition to another. As Power and Dalgleish (1997, p. 74) pertinently remarked, “A theory that gives emotion the same status as individual words or concepts is theoretically confused.”

Affect infusion model

A theoretical approach that is more general in scope than Bower’s network theory is the affect infusion model (e.g., Bower & Forgas, 2000; Forgas, 1995). The starting point for this model is the notion of affect infusion, which occurs when affective information selectively influences attention, learning, and memory. At the heart of the model is the assumption that there are four processing strategies varying in the extent to which they involve affect infusion. Here are the four strategies:

1. Direct access: This involves the strongly cued retrieval of stored cognitive contents and is not influenced by affect infusion. For example, our retrieval of strongly held political attitudes would not be altered by changes in mood.

2. Motivated processing strategy: This involves information processing being influenced by some strong, pre-existing objective (e.g., enhancing our current mood state). There is little affect infusion with this processing strategy.

3. Heuristic processing: This strategy (which requires the least amount of effort) involves using our current feelings as information influencing our attitudes. For example, if asked how satisfied we are with our lives, we might casually respond in a more positive way on a sunny day than an overcast one (Schwarz & Clore, 1983).

4. Substantive processing: This strategy involves extensive and prolonged processing. People using this strategy select, learn, and interpret information, and then relate it to pre-existing knowledge. Affect often plays a major role when this strategy is used, because it influences the information used during cognitive processing. Use of this strategy typically produces findings in line with those predicted by Bower’s network theory.

What are the crucial differences between the affect infusion model and Bower’s (1981) network theory? Bower assumed that mood or affect typically has various different effects on processing. In contrast, it is assumed within the affect infusion model that mood often has little or no effect on cognition (e.g., when people use direct access or motivated processing). Mood or affect does influence processing and performance when the heuristic or substantive processing strategies are used. However, the way heuristic processing causes mood or affect to influence performance is clearly different from that envisaged by Bower (1981). In sum, one of the four processing strategies identified within the affect infusion model (i.e., substantive processing) has the effects predicted by Bower (1981). The other three processing strategies represent a considerable development and extension of network theory.
Evidence

We will briefly consider a few studies showing the use of each of the four processing strategies. Direct access is used mainly when judgements are made about familiar objects or events and so the relevant information is readily accessible in long-term memory. For example, Salovey and Birnbaum (1989) found that mood had no influence on estimates of familiar positive healthy events (e.g., those involved in maintaining health), suggesting the use of direct access. In contrast, mood did influence estimates of unfamiliar negative health events (e.g., chances of contracting a given illness) about which participants possessed little relevant knowledge.

Bower and Forgas (2000) argued that people in a sad mood often engage in motivated processing to try to improve their mood, and we saw some evidence of this in a study by Rusting and DeHart (2000). Forgas (1991) asked happy or sad participants to select a work partner for themselves. Descriptions about potential partners were provided either on information cards or on a computer file. Sad participants selectively searched for rewarding partners, whereas happy participants focused more on selecting task-competent partners. Thus, rather than showing mood-congruent processing, sad individuals actively attempted to reduce their sad mood by selecting a partner who would be supportive.

The strategy of heuristic processing (which requires the least amount of effort) involves using our current feelings as information influencing our attitudes. For example, Schwarz and Clore (1983) found that people expressed more positive views about their happiness and life satisfaction when questioned on a sunny rather than a rainy, overcast day. This happened because they were feeling better when the weather was fine, and this influenced their views about overall life satisfaction. However, when participants’ attention was directed to the probable source of their mood (i.e., the weather) by a previous question, then their mood state no longer influenced their views about life satisfaction. In these circumstances, superficial heuristic processing was no longer feasible.

Sedikides (1994) compared the effects of substantive processing and direct access. Participants had to make judgements about themselves involving central or peripheral self-conceptions. Sedikides argued that judgements about central self-conceptions are easily made and should involve direct access. In contrast, judgements about peripheral self-conceptions require more extensive processing and so involve substantive processing. As predicted from the affect infusion model, mood state influenced judgements of peripheral self-conceptions but not those of central self-conceptions.

Evaluation

The theoretical assumption that affect or mood will influence cognitive processing and judgements when certain processes are used (heuristic or substantive processing) has received much support. Some of this support comes from studies designed to test Bower’s (1981) network theory. There is also reasonable support for the additional assumption that affect or mood will not influence cognitive processing when other processes (direct access or motivated processing) are used. The affect infusion model has more general applicability than the network theory, and is much better equipped to explain non-significant effects of affect or mood on performance.

The central limitation of most of the research is that the precise cognitive processes used by participants performing the various tasks are not clearly specified. For example, it is plausible that more extensive processing is required to make unfamiliar judgements than familiar ones. However, it would be useful to know which additional processes are involved in the former case. The model is also limited in not focusing enough on differences in processing associated with different mood states. For example, individuals in a positive mood tend to use heuristic processing, whereas those in a negative mood use substantive processing. In one study, Chartrand et al. (2006) found that participants in a positive mood relied on superficial stereotypical information whereas those in a negative mood engaged in more detailed non-stereotypical processing.
Much of the research discussed in the previous section was concerned with the effects of mood manipulations on cognitive processing and performance. However, it is also possible to focus on cognitive processing in individuals who are in a given mood state most of the time. For example, we can study patients suffering from an anxiety disorder or from depression. Alternatively, we can study healthy individuals having anxious or depressive personalities. This may seem like an easy research strategy to adopt. However, a significant problem is that individuals high in anxiety tend to be high in depression, and vice versa. This is the case in both normal and clinical populations.

One important difference between anxiety and depression concerns the negative events associated with each emotion. More specifically, past losses are associated mainly with depression, whereas future threats are associated mainly with anxiety. For example, Eysenck, Payne, and Santos (2006) presented participants with scenarios referring to severe negative events (e.g., the potential or actual diagnosis of a serious illness). There were three versions of each scenario, depending on whether it referred to a past event, a future possible event, or a future probable event. Participants indicated how anxious or depressed each event would make them. As can be seen in Figure 18.13, anxiety was associated more with future than with past events, whereas the opposite was the case for depression.

Why is it important to study cognitive processes in anxious and depressed individuals? One of the key assumptions made by many researchers in this area (e.g., Beck & Clark, 1997; MacLeod, Campbell, Rutherford, & Wilson, 2004; Williams, Watts, MacLeod, & Mathews, 1997) is that vulnerability to clinical anxiety and depression depends at least in part on various cognitive biases. Another key assumption is that cognitive therapy should focus on reducing or eliminating these cognitive biases as a major goal of treatment. The most important cognitive biases are as follows:

- **Attentional bias**: selective attention to threat-related stimuli presented at the same time as neutral stimuli.
- **Interpretive bias**: the tendency to interpret ambiguous stimuli and situations in a threatening fashion.
- **Explicit memory bias**: the tendency to retrieve mostly negative or unpleasant rather than positive or neutral information on a test of memory involving conscious recollection.
Implicit memory bias: the tendency to exhibit better performance for negative or threatening than for neutral or positive information on a memory test not involving conscious recollection.

It seems reasonable to assume that someone possessing most (or all) of these cognitive biases would be more likely to develop an anxiety disorder than someone lacking these biases. However, there are two issues that need to be addressed here. First, do patients with an anxiety disorder or depression typically possess all of these cognitive biases or only certain ones? As we will see, theorists differ among themselves concerning the answer to that question. Second, there is the causality issue. Suppose we find that most depressed patients possess various cognitive biases. Does that mean that the cognitive biases played a role in triggering the depression, or did the depression enhance the cognitive biases? Much of what follows represents various attempts to address these two issues.

Beck's schema theory

Beck (e.g., 1976) has been the most influential theorist in this area. The essence of his approach is that some individuals have greater vulnerability than others to developing depressive or anxiety disorders. Such vulnerability depends on the formation in early life of certain schemas or organised knowledge structures. According to Beck and Clark (1988, p. 20):

The schematic organisation of the clinically depressed individual is dominated by an overwhelming negativity. A negative cognitive trait is evident in the depressed person’s view of the self, world and future . . . In contrast, the maladaptive schemas in the anxious patient involve perceived physical or psychological threat to one’s personal domain as well as an exaggerated sense of vulnerability.

Beck and Clark (1988) assumed that schemas influence most cognitive processes such as attention, perception, learning, and retrieval of information. Schemas produce processing biases in which the processing of schema-consistent or emotionally congruent information is favoured. Thus, individuals with anxiety-related schemas should selectively process threatening information, and those with depressive schemas should selectively process emotionally negative information. While Beck and Clark (1988) emphasised the role of schemas in producing processing biases, they claimed that schemas would only become active and influence processing when the individual was in an anxious or depressed state.

It follows from Beck’s schema theory that individuals with clinical anxiety or depression should typically possess all four of the cognitive biases described above. The reason is that the schemas allegedly have pervasive influences on cognitive processing. It is worth noting that essentially the same predictions follow from Bower’s (1981) network theory with its emphasis on mood-congruity effects.

Evidence relevant to Beck’s theoretical approach will be discussed in detail shortly. However, we will note two very general limitations of it at this juncture:

First, the central theoretical construct of ‘schema’ is amorphous [vague], and often seems to mean little more than ‘belief’. Second, the evidence for the existence of specific schemas is often based on a circular argument. Behavioural evidence of a cognitive bias in anxious patients is used to infer the presence of a schema, and then that schema is used to ‘explain’ the observed cognitive bias. In other words, there is generally no direct or independent evidence of the existence of a schema. (Eysenck, 1997, pp. 95–96).

Williams et al. (1997)

An important theory in the area of anxiety, depression, and cognitive biases is that of Williams et al. (1997). They argued that anxiety and depression fulfil different functions, and this has consequences for information processing. Anxiety
has the function of anticipating danger or future threat. As a result, it is “associated with a tendency to give priority to processing threatening stimuli; the encoding involved is predominantly perceptual rather than conceptual in nature” (Williams et al., 1997, p. 307). In contrast, if depression involves the replacement of failed goals, “then the conceptual processing of internally generated material related to failure or loss may be more relevant to this function than perceptual vigilance” (Williams et al., 1997, p. 315).

It should be noted that the approach of Williams et al. (1997) is not only applicable to patients suffering from an anxiety disorder or from depression. It is also of relevance to healthy individuals having an anxious or a depressive personality. We will be focusing mainly on findings from clinical samples, but the general pattern of results is similar within healthy populations (see Eysenck, 1997, for a review).

Williams et al. (1997) made use of Roediger’s (1990) distinction between perceptual and conceptual processes. Perceptual processes are essentially data-driven processes, and are typically involved in basic attentional processes and in implicit memory. In contrast, conceptual processes are top-down processes, and are typically involved in explicit memory (but can be involved in attentional processes and implicit memory). Williams et al. assumed that anxiety facilitates the perceptual processing of threat-related stimuli, whereas depression facilitates the conceptual processing of threatening information. This leads to various predictions:

1. Anxious patients should have an attentional bias for threatening stimuli, but depressed patients should not when only perceptual processes are involved.
2. Anxious and depressed patients should have an interpretive bias for ambiguous stimuli and situations.
3. Depressed patients should have an explicit memory bias but anxious patients should not.
4. Anxious patients should have an implicit memory bias, but depressed patients should not provided that only perceptual processes are involved.

**Experimental evidence: Cognitive biases**

We have seen that four main cognitive biases have been identified: attentional bias, interpretive bias, explicit memory bias, and implicit memory bias. We will consider the evidence concerning the existence of each of these biases in clinically anxious and depressed groups. There are several anxiety disorders including generalised anxiety disorder (chronic worry and anxiety about several life domains), panic disorder (frequent occurrence of panic attacks), post-traumatic stress disorder (anxiety and flashbacks associated with a previous traumatic event), and social phobia (extreme fear and avoidance of social situations). The most common form of clinical depression by far is major depressive disorder, characterised by sadness, depressed mood, tiredness, and loss of interest in various activities. The reader should be forewarned that some of the findings are somewhat inconsistent and difficult to interpret.

**Attentional bias**

We start by considering attentional bias. Two main tasks have been used to study attentional bias (see Eysenck, 1997, for a review). First, there is the dot-probe task. In the original version of this task, two words are presented at the same time, one to an upper and the other to a lower location on a computer screen. On critical trials, one of these words is threat-related and the other is neutral. The allocation of attention is measured by recording speed of detection of a dot that can replace either word. It is assumed that detection latencies are shorter in attended areas. Therefore, attentional bias is indicated by a consistent tendency for detection latencies to be shorter when the dot replaces the threat-related word rather than the neutral one.

The first experiment to study attentional bias systematically was carried out by Halkiopoulos (unpublished). In his research, carried out at the start of the 1980s, he used the auditory modality. Participants were given a task in which pairs of words were presented at the same time, one to each ear. They were instructed to attend to one ear and to repeat back aloud all the words
presented to that ear while ignoring words on the unattended ear. A tone was sometimes presented to one ear very shortly after a pair of words had been presented, and the participants were instructed to respond to this tone as rapidly as possible. Anxious individuals high in trait anxiety (but not those low in trait anxiety) responded faster to the tone when it followed a threatening word to the same ear than when it followed a threatening word to the other ear. This provided the first clear evidence of attentional bias in anxiety.

Attentional bias has also been studied by using the emotional Stroop task. The participants name the colours in which words are printed as rapidly as possible. Some of the words are emotional (e.g., stupid; inadequate) whereas others are neutral. Attentional bias is shown if participants take longer to name the colours of emotion-congruent words than neutral words, on the assumption that the increased naming time occurs because emotion-congruent words have been attended to more than neutral words. However, there has been some dispute about the appropriate interpretation of findings with the emotional Stroop. According to De Ruiter and Brosschot (1994, p. 317), “The increased Stroop interference might . . . be the result of an attempt to avoid processing the stimulus because it contains emotionally valenced [loaded] information.”

There is reasonably convincing evidence that anxious individuals typically show an attentional bias (see Heinrichs & Hofmann, 2001, for a review). For example, Calvo and Avero (2005) reviewed studies on the effects of trait anxiety on attention to threat-related pictures. Attentional bias associated with high anxiety was found in 58% of the studies and the findings were non-significant in the remaining 42%. The main qualification that needs to be placed on that statement is that there is more convincing evidence for an attentional bias in attention at early than at later stages of attentional allocation (e.g., Calvo & Avero, 2005; Mogg, Millar, & Bradley, 2000).

Relatively little is known about attentional bias and depression. As Rinck and Becker (2005, p. 63) pointed out, “The empirical evidence regarding attentional biases in depression is scarce and heterogeneous, making it very difficult to draw firm conclusions.” Williams et al. (1997) reviewed seven studies, six of which found evidence for an attentional bias in depression. However, all of these studies used the emotional Stroop task, and findings from that task are difficult to interpret.

In spite of the inconsistencies in the literature on depression and attentional bias, we can make some sense of the findings. Williams et al. (1997) argued that depression is associated with biases in conceptual processes rather than the more automatic perceptual ones. Accordingly, there might be an attentional bias in depression provided that conceptual or elaborative attentional processes are required. Support for this position comes from studies by Matthews and Antes (1992) and by Rinck and Becker (2005) in which depressed individuals showed an attentional bias on tasks involving controlled attentional processes. For example, Matthews and Antes measured the eye movements of depressed and non-depressed individuals presented with slides containing “sad” and “happy” regions. Depressed participants focused relatively more on the sad regions and less on the happy ones. Mogg and Bradley (2005, p. 29) reviewed the relevant literature, and concluded that “Where an attentional bias has been found in depressed patients, it seems to occur mainly for self-relevant negative information which is presented under conditions that allow or encourage elaborative [conceptual] processing.”

Interpretive bias

There is general agreement that anxious and depressed individuals possess interpretive biases. So far as anxiety is concerned, Eysenck, MacLeod, and Mathews (1987) asked healthy participants of varying levels of trait anxiety to write down the spellings of auditorily presented words. Some of the words were homophones having separate threat-related and neutral interpretations (e.g., die, dye; pain, pane). There was a correlation of +0.60
between trait anxiety and the number of threatening homophone interpretations.

A potential problem with the homophone task is that the participants may think of both spellings. In that case, their decision as to which word to write down may involve response bias (e.g., which spelling is more socially desirable?). Eysenck, Mogg, May, Richards, and Mathews (1991) assessed response bias using ambiguous sentences (e.g., “The doctor examined little Emily’s growth”). Patients with generalised anxiety disorder were more likely than healthy controls to interpret such sentences in a threatening fashion, and there were no group differences in response bias.

Research on depressed individuals consistently indicates that they have an interpretive bias. Various studies (discussed by Rusting, 1998) have made use of the Cognitive Bias Questionnaire. Events are described briefly, with participants having to select one out of four possible interpretations of each event. Depressed patients typically select more negative interpretations than healthy controls.

Pyszczyski, Holt, and Greenberg (1987) had depressed and non-depressed students rate the likelihood of various possible future events. Depressed participants rated negative future events as more likely to happen than did non-depressed ones, whereas the opposite was the case for positive future events.

Memory biases

It will be remembered that Williams et al. (1997) predicted that explicit memory bias would be found more often in depressed than in anxious patients, but the opposite would be the case for implicit memory bias. In their review of the relevant studies, Williams et al. (1997, pp. 285–288) concluded that the evidence supported their position:

Out of nine studies using indirect [implicit] tests of memory in anxious subjects or patients, seven have found significant bias towards negative material . . . no study has yet found word congruent bias in implicit memory in depression . . . all published studies appear to find explicit memory biases in depression, yet only a third of the studies on trait anxiety or GAD [generalised anxiety disorder] find explicit memory biases.

Rinck and Becker (2005) have provided a more recent review of the findings, concluding that they are less consistent than claimed by Williams et al. (1997). We will consider memory biases in depression first, followed by anxiety. It remains the case that depressed patients typically exhibit an explicit memory bias. However, Murray, Whitehouse, and Alloy (1999) raised an issue regarding the interpretation of this finding. They asked healthy participants low and high in depression as assessed by the Beck Depression Inventory to perform a self-referential task (“Describes you?”) on a series of positive and negative words. Then the participants provided free recall or forced recall, in which they were required to write down a large number of words. There was the typical explicit memory bias in depression with free recall, but no bias at all with forced recall (see Figure 18.14).

What do these findings mean? According to Murray et al. (1999, p. 175), they "implicate an important contribution of diminished motivation and/or conservative report criterion in the manifestation of depression-related biases and deficits in recall."

Williams et al. (1997) concluded that no published studies showed implicit memory bias in depressed individuals. Since then, however, there have been several reports of implicit memory bias in depression (e.g., Rinck & Becker, 2005; Watkins, Martin, & Stern, 2000). The precise reasons for these mixed findings are not known. However, Rinck and Becker argued that implicit memory bias is more likely to be found in individuals with a clinical level of depression, and their demonstration of implicit memory bias involved patients with major depressive disorder.

Williams et al. (1997) concluded that there was much more evidence for implicit memory bias than for explicit memory bias in anxious individuals. More recent research has mostly indicated
that anxious patients have an implicit memory bias, but suggests they also have an explicit memory bias. In a review, Coles and Heimberg (2002) concluded that patients suffering with each of the main anxiety disorders exhibit implicit memory bias. However, the evidence was weakest for social phobia, and Rinck and Becker (2005) failed to find an implicit memory bias in social-phobic participants. Coles and Heimberg found clear evidence in the literature for an explicit memory bias in panic disorder, post-traumatic stress disorder, and obsessive-compulsive disorder. However, there was little support for this memory bias in generalised anxiety disorder or social phobia, and Rinck and Becker (2005) subsequently found no evidence for explicit memory bias in social-phobic participants.

**Evaluation**

There is indisputable evidence that anxious and depressed patients show various cognitive biases. Such evidence indicates the value of considering anxiety and depression in terms of cognitive processes. The evidence does not seem to support predictions from Beck’s schema-based theory that clinically anxious and depressed individuals should show the complete range of attentional, interpretive, and memory biases. More specifically, there are relatively few convincing findings showing that depressed individuals have an attentional bias or an implicit memory bias.

How successful is the theoretical approach of Williams et al. (1997)? Their assumption that the pattern of cognitive biases differs between anxious and depressed individuals seems to be correct. On balance, anxious individuals show more evidence than depressed ones of attentional bias. The exception is that depressed individuals sometimes have an attentional bias when conceptual or elaborative processing is involved (Mogg & Bradley, 2005), but this can be explained by Williams et al. (1997). As predicted, anxious individuals show more evidence than depressed ones of attentional bias and implicit memory bias, and depressed individuals show more evidence than anxious ones of explicit memory bias. However, some of the findings are less supportive of this approach. This is especially the case with respect to explicit memory bias, which should theoretically not be present in anxious patients. In fact, patients with panic disorder, obsessive-compulsive disorder, and post-traumatic stress disorder all show explicit memory bias (Coles & Heimberg, 2002). However, and more in line with the theory, patients with generalised anxiety disorder and social phobia generally do not. Thus, the theoretical approach of Williams et al. (1997)
Experimental evidence: Causality

As mentioned earlier, evidence that patients with an anxiety disorder or major depressive disorder possess various cognitive biases can be interpreted in various ways. Of crucial importance is the need to establish the direction of causality—do cognitive biases make individuals vulnerable to developing anxiety or depression, or does having clinical anxiety or depression lead to the development of cognitive biases? Of course, it is also possible that the causality runs in both directions. This issue is significant. Cognitive biases have much greater practical and theoretical importance if they help to cause clinical anxiety and depression than if they are merely the by-products of a pre-existing disorder.

Attentional bias

MacLeod et al. (2002) trained some of their healthy participants to develop an attentional bias. This was done by altering the dot-probe task so that the target dot always appeared in the location in which the threatening word had been presented. In another group of participants, the target dot always appeared in the non-threat location. When both groups were exposed to a moderately stressful anagram task, those who had developed an attentional bias exhibited more anxiety than those in the other group.

Interpretive bias

Mathews and Mackintosh (2000) made use of a variety of methods to induce healthy individuals to develop interpretive biases for ambiguous information. Their key finding was that participants who actively generated personally relevant meanings developed an interpretive bias leading to a significant elevation in experienced anxiety. Mathews and Mackintosh (2000, p. 602) concluded that their findings “provide evidence consistent with a causal link between the deployment of interpretive bias and anxiety.”

Wilson, MacLeod, and Mathews (2006) used homographs having a threatening and a neutral meaning (e.g., stroke; fit; sink). Extensive training was provided so that one group of healthy participants would focus on the threatening interpretations of these homographs whereas the other group would focus on the neutral interpretations. After training, both groups were exposed to a video showing near-fatal accidents. The group that had been trained to produce threatening interpretations of homographs became more anxious than the other group during the showing of the video.

Reasonable evidence that interpretive bias in the form of dysfunctional attitudes plays a role in the development of major depressive disorder was reported by Lewinsohn, Joiner, and Rohde (2001). They measured dysfunctional attitudes (e.g., “My life is wasted unless I am a success”; “I should be happy all the time”) in adolescents not having a major depressive disorder at the outset of the study. One year later, Lewinsohn et al. assessed the negative life events experienced by the participants over the 12-month period. They also assessed whether the participants were suffering from major depressive disorder. Those who experienced many negative life events had an increased likelihood of developing major depressive disorder only if they were initially high in dysfunctional attitudes or interpretive bias (see Figure 18.15). Since
dysfunctional attitudes were assessed before the onset of major depressive disorder, it appears that dysfunctional attitudes or interpretive bias is a risk factor for developing that disorder when exposed to stressful life events.

Evaluation

Research to date has produced promising findings suggesting that training attentional and interpretive biases can influence individuals’ subsequent mood state. As Mathews (2004, p. 1033) argued, “Not only can training lead to persisting alterations in encoding bias, but consequent mood changes have provided the most convincing evidence to date that such biases play a causal role in emotional vulnerability.”

There are two limitations with the research discussed in this section. First, the emphasis has been much more on anxiety than on depression, and it is not altogether clear that the possession of cognitive biases triggers vulnerability to depression. Second, there is some artificiality about the experiments that have been carried out. As Mathews and MacLeod (2002, p. 349) concluded, “It remains uncertain whether induced biases are really the same as those occurring naturally in clinically anxious patients. The biases induced in most of the studies . . . are likely to be very transient compared with those occurring naturally.”

CHAPTER SUMMARY

- Cognitive determinants of emotion

According to Lazarus’s appraisal theory, cognitive appraisal is always of fundamental importance in determining emotional experience. According to appraisal theory, each distinct emotion is elicited by a specific pattern of appraisal. Smith and Kirby (2001) have extended appraisal theory by distinguishing between rapid and automatic associative processes and a much slower reasoning process, with both types of process occurring in parallel. The output of these processes is monitored by appraisal detectors. It is likely that cognitive appraisal is sometimes a consequence rather than a cause of emotional experience. In addition, appraisal theory de-emphasises the social context in which emotion is typically experienced.
Multi-level theories
Multi-level theories designed to identify the key cognitive processes underlying emotion have the advantage of recognizing the complexity of the cognitive system. It is assumed in many multi-level theories that emotional reactions can be triggered by preattentive or automatic processes. There is much support for this assumption. LeDoux has identified separate slow-acting and fast-acting circuits for processing threat, with only the former circuit involving extensive cognitive processing. It is assumed within the Interactive Cognitive Subsystems framework that knowing with the heart involves implicational meaning, whereas knowing with the head involves propositional meaning. Multi-level theories have considerable promise but at present are rather difficult to test.

Mood and cognition
According to Bower’s semantic network theory, activation of an emotion node leads to activation of many related nodes in the semantic network. Such patterns of activation produce several effects including mood-state-dependent memory, mood congruity, and thought congruity. There is evidence for all of these effects. However, they are found more often with positive than with negative mood states, because individuals in a negative mood state are motivated to change their mood state. There is some evidence that patients with dissociative identity disorder show inter-identity amnesia, which resembles mood-state-dependent forgetting. However, recent research has cast doubt on the reality of this phenomenon. According to the affect infusion model, affective information influences heuristic and substantive processing but not direct access or motivated processing. There is much support for these assumptions, and this model has more general applicability than Bower’s network theory. However, more remains to be discovered about the factors determining which of the four processes will be used by a given individual on a given task.

Anxiety, depression, and cognitive biases
There is evidence for several cognitive biases including attentional bias, interpretive bias, explicit memory bias, and implicit memory bias. According to Beck, anxious and depressed individuals should exhibit all four biases. According to Williams et al. (1997), anxiety and depression should be associated with different patterns of biases. Anxious individuals should have attentional bias, interpretive bias, and implicit memory bias, whereas depressed individuals should have interpretive bias and explicit memory bias. Research is more supportive of the latter theory, but it appears that patients with most anxiety disorders have an explicit memory bias. There is increasing evidence that cognitive biases can play a causal role in triggering anxiety and depression, but further research is needed.

FURTHER READING


affect infusion: the influence of affect or mood on processes such as attention, learning, memory, and judgement.

attentional bias: selective attention to threat-related stimuli when presented at the same time as neutral ones.

dissociative identity disorder: a mental disorder in which the individual claims to have two or more personalities that appear to know little about each other; it is claimed that there is inter-identity amnesia.

explicit memory bias: the tendency to retrieve relatively more negative or unpleasant information than positive or neutral information on a test of explicit memory dependent on conscious recollection.

implicit memory bias: the tendency to have relatively better memory performance for negative than for neutral information on a test of implicit memory not involving conscious recollection.

interpretive bias: the tendency to interpret ambiguous stimuli and situations in a threatening way.

mere exposure effect: an effect in which stimuli presented previously (even when not perceived consciously) are preferred to new stimuli.

mood congruity: learning and memory are better when the affective value of what is learned or remembered matches the individual’s mood state.

mood-state-dependent memory: the finding that memory is better when the mood state at retrieval is the same as that at learning than when there is a discrepancy between the two mood states.
References


REFERENCES


REFERENCES


