CHAPTER

6

Emotion and Memory: Implications for Self-Report

John F. Kihlstrom
University of California, Berkeley

Eric Eich
University of British Columbia

Deborah Sandbrand
University of California, Los Angeles

Betsy A. Tobias
University of Arizona

So much of social and behavioral science research on health and mental health depends on self-reports of current states, as when we collect information from patients about their presenting symptoms and complaints, or on self-reports of the past, as when we collect historical information about past episodes of illness and life experiences that may be risk factors for illness. The first is a problem of perception; the second is a problem of memory. Both perception and memory, especially as we encounter them in clinical research, are constructive and reconstructive activities in which judgment and inference play large roles. The study of perception, memory, and judgment is what cognitive psychology is all about, and indeed cognitive psychology has been quite successful in explaining how these basic mental functions operate. Over the past few years, however, psychologists have increasingly come to realize that cognitive processes are not isolated from the rest of mental life and in particular that our emotional and motivational states may affect what we perceive and remember as well as the judgments we make about the present and the past (for general reviews, see Blaney, 1986; Bower, 1981; Christianson, 1992b; Clark & Fiske, 1982; Eich, 1995a; Ekman

& Davidson, 1994; Ellis & Moore, in press; Fiedler & Forgas, 1988; Forgas, 1991; Johnson & Magaro, 1987; Kuiken, 1991; Niedenthal & Kitayama, 1994). Much of this literature has focused on memory.

AFFECTIVE VALENCE AND AFFECTIVE INTENSITY

Two emotional effects on memory have to do with the emotional valence, positive or negative, of the material to be remembered and the cues used for retrieval regardless of the mood state of the person doing the remembering. The more familiar of these is the affective valence effect: In general, information associated with positive affect is more easily remembered than that associated with negative affect (Fig. 6.1a). The tendency to remember that which is agreeable, and to forget that which is disagreeable, is some-

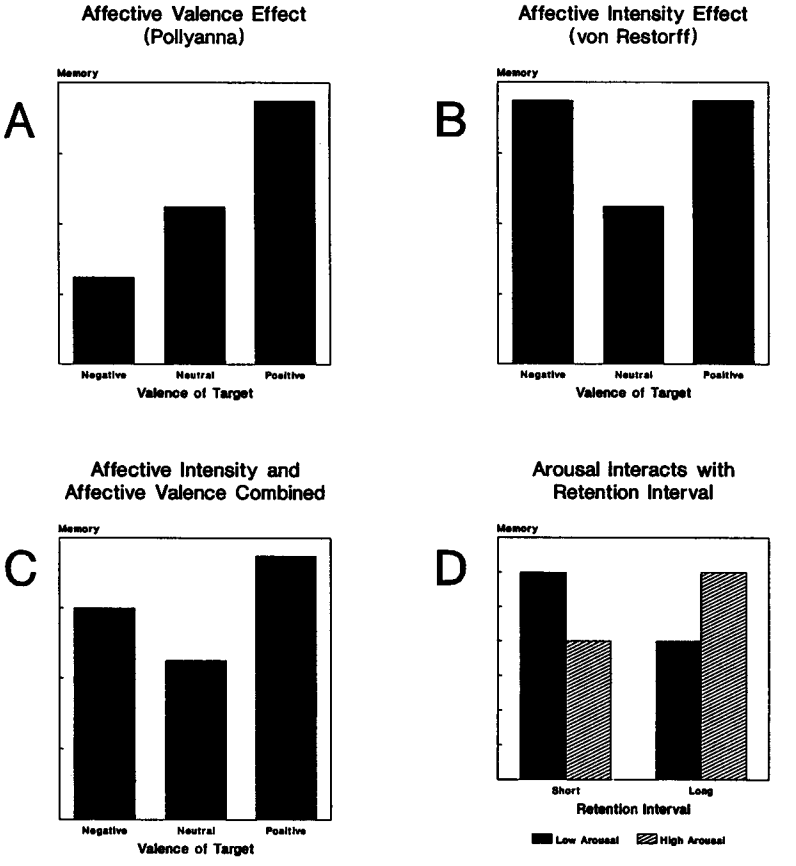

FIG. 6.1. Schematic depiction of affective arousal effects.

times taken as evidence for the psychoanalytic concept of repression (for reviews see Singer, 1990), but this is a mistake: As Rapaport (1942) noted, Freud's notion of repression covers material that is associated with primitive sexual and aggressive motives and the anxiety aroused by their conflict with social strictures, not the merely unpleasant. Nevertheless, the general tendency to favor positive over negative material is so intuitively appealing that it has acquired its own special label, the Pollyanna Principle (Boucher & Osgood, 1969; Matlin & Stang, 1978).

Matlin and Stang (1978) reviewed a wealth of literature indicating that, on average, subjects favor positive over negative material in attention, perception, language, word associations, learning, memory, thinking, judgment, and social cognition, and they concluded that, "This preference for the pleasant seemed to invade every area of experimental psychology that we examined, and the effects were usually remarkably robust" (pp. 2–3). They further proposed, following Erdelyi (1974), that human information processing is necessarily selective and that the seeking of pleasure and avoidance of displeasure are the most important principles on which this selectivity is based.

While focusing their attention on the Pollyanna Principle, Matlin and Stang (1978) also acknowledged the operation of another, secondary principle, the Intensity Principle: that intense or highly polarized items are processed more efficiently than neutral or less intense items (Dutta & Kanungo, 1975). We refer to this principle as the affective intensity effect: Memories associated with some affect, or emotional arousal, are better remembered than those that are affectively neutral, regardless of whether the emotional valence is positive or negative (Fig. 6.1b). In part, the affective intensity effect is a special case of the familiar salience effect on memory, also known as the von Restorff effect, after the researcher who first noted it: More salient events are more memorable than less salient ones (von Restorff, 1933; see also Fabiani & Donchin, 1995; Hunt, 1995; Tversky & Kahneman, 1973). Apparently, possessing some emotional valence is one of the things that can render a memory salient.

Matlin and Stang (1978) attempted to reconcile the effects of affective valence and affective intensity by proposing a J-shaped function relating emotional valence to memorability (Fig. 6.1c). Items associated with both negative and positive affective valence are more memorable than those with no valence but items with a positive valence are more memorable than those with a negative valence. Unfortunately, this compromise is threatened by a methodological flaw (Banaji & Hardin, 1994). Although studies of affective intensity have usually controlled for the conditions under which the memories in question were encoded, studies of affective valence generally have not done so. There is now reason to think that positive events are more arousing than negative ones, on average, and that when intensity is con-

trolled, what looks like an affective valence effect may really resolve to an affective intensity effect (Banaji & Hardin, 1994). There may well be an affective valence effect on memory, independent of affective intensity, but further research will be necessary to demonstrate it convincingly.

An interesting aspect of the affective intensity effect is its interaction with time. More than 30 years ago, Kleinsmith and Kaplan (1963, 1964) performed an experiment in which they recorded physiological arousal during encoding and then tested memory at delays of 2 minutes to 7 days. At short intervals, items associated with relatively high arousal were poorly remembered; at long intervals, however, these same items were well remembered. The Kleinsmith and Kaplan effect has proved difficult to replicate but it shines through in a meta-analysis of replication attempts (Park & Banaji, 1997), and has been confirmed experimentally (Crowder et al., 1997).

The Kleinsmith and Kaplan (1963, 1994) effect is not an artifact of statistical regression but rather is a genuine crossover interaction: Memories associated with high levels of arousal are remembered poorly over the short term but well over the long term. The effect is of great interest in the context of the current controversy over recovered memories of childhood sexual abuse, although it should be noted that the retention intervals involved in these experiments, minutes and days, pale before the years and decades claimed in cases of recovered memory. In the final analysis, the important issue in the recovered memory debate remains that of providing independent corroboration for any incidents of abuse that a subject or patient might remember.

AROUSAL AND MOOD

The affective intensity and affective valence effects are sometimes construed as being generated by the affective properties of the memories themselves. But in the Kleinsmith and Kaplan (1963, 1964) experiment, the fate of the memories could not be predicted from the affective valence of the items in the abstract. The effect only emerged when the researchers considered the subject's actual affective response to each item. In other words, the subject's affective state is at least as important as the affective valence of what he or she is trying to remember—and, in fact, it may be that encoding or retrieving any affectively valenced material induces a corresponding emotional state in the subject.

Historically, perhaps the most familiar consequence of the subject's affective state is known as the Yerkes-Dodson Law (Yerkes & Dodson, 1908; for recent reviews, see Anderson, 1990; Neiss, 1988): Arousal is related to task performance by an inverted-U-shaped function (Fig. 6.2a). In the memory context, of course, arousal level may affect both encoding and retrieval

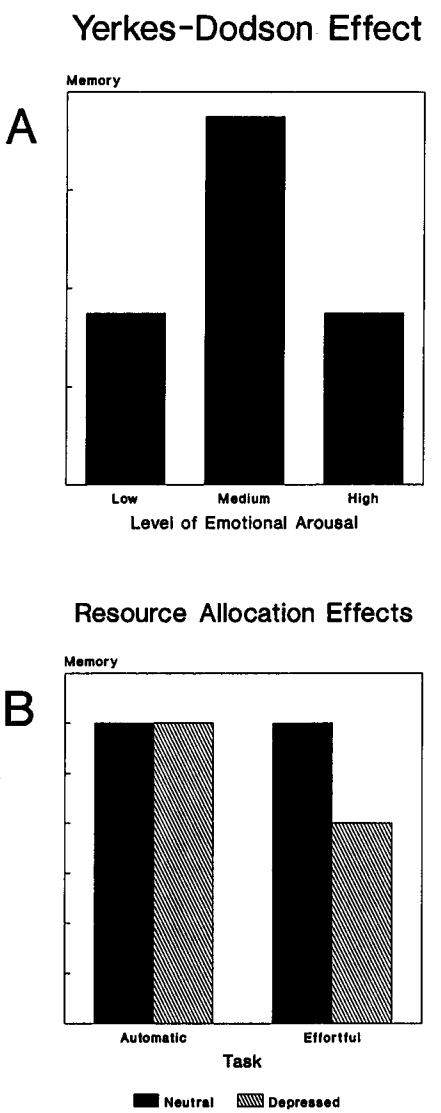

FIG. 6.2. Schematic depiction of arousal state effects.

operations. Although a number of competing explanations have been put forward for the effects of arousal on memory (for reviews, see Christianson, 1992a; Eysenck, 1976; Heuer & Reisberg, 1992; Mandler, 1992; Revelle & Loftus, 1992), in general terms we may hypothesize that low levels of arousal (e.g., during fatigue or drowsiness) are associated with low levels of attention, poor encodings of events as they occur, and poor memory for these

events later. Increasing arousal also increases the deployment of attention, resulting in better memory, but very high levels of arousal may increase the information processing load and thus effectively reduce the amount of information being processed—the result, again, is poor encoding, and poor memory, especially of peripheral details.

Shifting from undifferentiated arousal to valenced mood, Fig. 6.2b shows that the effects on memory of low arousal levels are paralleled in the resource allocation effects of depression on ongoing information-processing tasks, including the encoding and retrieval of memories (Ellis & Ashbrook, 1988, 1989; see also Hertel, 1994). In particular, depressed mood appears to increase the person's information-processing load (Ellis & Ashbrook, 1988, 1989)—or, alternatively, his or her level of initiative (Hertel, 1994). In the former case, the added internal cognitive activity drains attentional resources that would otherwise be devoted to other tasks; in the latter case, available attentional resources simply are not devoted to the task in the first place. Either situation results in poor encoding of material presented during a depressed mood and performance deficits on subsequent retention tests—especially if these tasks themselves are cognitively demanding.

The resource allocation effects of negative moods are fairly well documented at this point, but we have little information about comparable effects of positive mood states. Comparing the effects of positive and negative moods is of considerable theoretical importance in determining underlying mechanisms (Kihlstrom, 1989). For example, if resource allocation effects are mediated by the distracting effect of the person's mood-relevant thoughts, as Ellis and Ashbrook (1988, 1989) suggested, we should expect happy and sad moods to have the same effects on information processing. On the other hand, it might be that depressed moods have a more specific effect on attentional allocation policy—for example, by reducing people's interest in their surroundings and consequently their motivation to pay attention to them, as suggested by Hertel (1994). In this case, happiness and sadness should have opposite effects: The sad person's disinterest should impair cognitive processing, whereas the happy person's peppiness should facilitate it.

MOOD-DEPENDENT MEMORY

Perhaps the most dramatic and controversial effects of the person's mood state are seen in mood-dependent memory, which occurs when retrieval of material is enhanced by reinstating the mood that the individual was in when the material was initially encoded (Bower, 1981). The notion of mood-dependent memory, illustrated in Fig. 6.3a, is based on an analogy with the state-dependent memory produced by pharmacological substances that act

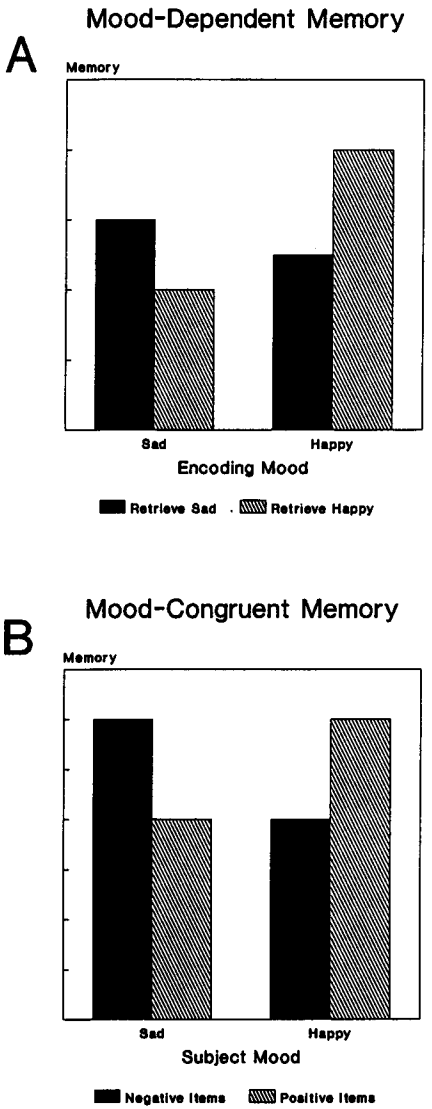

FIG. 6.3. Schematic depiction of mood-dependent and mood-congruent memory effects.

directly on the central nervous system (Overton, 1984; for reviews see Eich, 1980, 1989); conceptually similar environment-dependent memory effects have been observed in experiments where the encoding and retrieval phases take place in different physical environments (e.g., Godden & Baddeley, 1975; Smith, Glenberg, & Bjork, 1978), at different times of day (e.g., Holloway, 1978), or while listening to different kinds of music (e.g., Balch & Lewis, 1996).

In all these cases, the memorability of an event is a function of the congruence between the context in which the memory is encoded and that in which retrieval is attempted. These context effects, in turn, exemplify a more general encoding specificity principle in memory, which states that memory is best when the processing operations performed at the time of retrieval match those that were performed at the time of encoding (Tulving & Thomson, 1973; see also Kihlstrom & Barnhardt, 1993).

Some early support for mood-dependent memory came from studies of patients with bipolar affective disorder (Weingartner, Miller, & Murphy, 1977) and normal subjects threatened with electric shock (Macht, Spear, & Levis, 1977). Following those early studies, however, mood dependence assumed a "now you see it, now you don't" quality. Mood-dependent memory has rarely been observed in straightforward designs in which subjects study a single word list in one mood and are tested for memory in the same or a different mood (e.g., Bower, Monteiro, & Gilligan, 1978). Bower et al. (1978) were able to produce the effect using an interference design employing two word lists but subsequent conceptual replications have yielded mixed results (e.g., Bower, Gilligan, & Monteiro, 1981); interestingly, environment-dependent effects on memory also appeared to be unreliable (Fernandez & Glenberg, 1985). In the face of these failures to replicate, Bower and Mayer (1989) concluded that mood dependence was evanescent rather than robust and that most of the earlier positive results, including Bower's own, may well have been spurious outcomes—a point of view apparently shared by some other reviewers of this literature (Blaney, 1986; Leventhal & Tomarken, 1986).

In the most recent turn of events, Eich and his colleagues developed a paradigm in which mood dependence can be reliably produced in the laboratory (Eich, 1995b). For example, Eich and Metcalfe (1989) employed a musical mood-induction procedure and asked subjects to study a list of words; later, they went through the musical mood-induction procedure again and attempted to remember the items they had studied previously. Testing revealed strong evidence of mood dependence: Items studied while subjects were sad were remembered better when the subjects were also sad during the memory test and items studied while they were happy were remembered better when they were happy. The same experiment also illustrated the resource allocation effects of sad mood on encoding and retrieval: Compared to the condition where subjects were happy during both encoding and retrieval, memory was relatively poor when subjects were sad while encoding, regardless of whether the retrieval state was happy or sad, and when subjects were sad while retrieving, regardless of whether the encoding state was happy or sad. Other experiments in Eich's laboratory have yielded similar effects for the retrieval of autobiographical memories as opposed to word lists (Eich, Macaulay, & Ryan, 1994). Eich, Macaulay, and Lam (1997)

reported good evidence for mood-dependent memory in bipolar affective disorder (manic-depressive illness).[1]

Mood dependence can affect memory processes even if subjects are not engaged in tasks that would ordinarily be considered to involve memory. At issue here is the distinction between explicit memory, or conscious recollection, and implicit memory, or the influence of memory on task performance, independent of conscious recollection (Schacter, 1987). Almost all studies of emotion and memory involve explicit memory tasks such as free recall, cued recall, and recognition. Implicit memory tasks have been studied in the literature on resource allocation effects, where it has been found that depression impairs performance on explicit memory tasks, which typically make considerable demands on attentional resources but not on implicit memory tasks, which are less dependent on attention (e.g., Ellis & Ashbrook, 1988, 1989). Macaulay, Ryan, and Eich (1993) found evidence of mood dependence in performance on a category-generation test of implicit memory.

From one point of view, it might be thought that mood dependence would have little or no effect on implicit memory. After all, as a general rule, implicit memory transfers when explicit memory does not (Roediger & McDermott, 1993). As an example, performance on at least some implicit memory tasks is spared in cases of multiple personality disorder (also known as dissociative identity disorder), even when the interpersonality amnesia profoundly impairs performance on explicit memory tasks (e.g., Eich, Macaulay, Loewenstein, & Dihle, 1997; Nissen, Ross, Willingham, MacKenzie, & Schacter, 1988; for a review, see Kihlstrom & Schacter, 1995). On the other hand, Tobias (1992; Tobias, Kihlstrom, & Schacter, 1992) suggested that mood dependence might be greater in implicit, compared to explicit, memory. It is known that drug-state dependency effects on explicit memory are cue dependent: The effect is found when the memory task employs relatively impoverished retrieval cues, such as free recall, but not with relatively rich cues, such as cued recall or recognition (Eich, 1980, 1989). According to Tobias (1992), implicit memory tasks involve the most impoverished retrieval cues of all—after all, they do not even specify that the subject should retrieve a memory. Her first study, which compared stem-cued recall to stem completion, found no evidence of mood dependence on either explicit or implicit memory. However, her second study, which compared free recall to a novel test of free association, found a small but significant mood-dependent effect on implicit, but not explicit, memory. Although further studies along these

[1]Interestingly, Eich (1995a; Eich & Birnbaum, 1988) argued that drug state- and environment-dependent memory is, in turn, mediated by emotional states; Balch and Lewis (1996) made the same claim for music-dependent memory, and given what we know about circadian effects on arousal levels, it may well be that emotional state accounts for time-dependent memory as well.

lines need to be performed, the important point is that mood-dependent memory may affect performance even on tasks that do not seem to involve conscious recollection of the past.

Mood-dependent memory is not merely a curiosity of mental life but may have broad practical and theoretical implications. For example, mood-dependent memory may be implicated in the perseveration of clinical episodes of depression in affective disorder patients. That is to say, negative mood may make negative memories more available, thus reinforcing the negative mood, which makes negative memories even more available, and so on in a vicious cycle. More important, in the present context, it means that it may be hard for people who are currently depressed to remember times when they were happy, and vice versa, making cognitive-behavioral therapy more difficult and distorting their memories of childhood and other possibly critical events.

MOOD-CONGRUENT MEMORY

Concern about memory distortion is strengthened by another set of mood-memory effects, which go by the label of mood-congruent memory: Mood state facilitates the processing of material with a similar emotional valence and impairs the processing of material with the opposite valence (for reviews, see Blaney, 1986; Bower & Forgas, in press; Johnson & Magaro, 1987; Leventhal & Tomarken, 1986). The effect is illustrated in Fig. 6.3b. Conceptually, mood-congruent memory effects can be separated into those that operate at the encoding stage (mood-congruent encoding) and those that operate at the retrieval stage (mood-congruent retrieval) but the outcome of these processes is the same: better memory for information whose affective valence matches the valence of the person's mood at the time information processing occurs.

Mood-congruent encoding appears to be mediated by attentional processes: Happy subjects pay more attention to positive items, whereas sad subjects pay more attention to negative ones. Among patients, mood-dependent encoding is more likely to occur in cases of depression than of anxiety disorder, perhaps because anxious individuals are hypervigilant and deploy attention away from threat cues (Mathews & MacLeod, 1994; Mineka, 1992). In the present context, however, mood-congruent retrieval is the more important effect because it raises the possibility that the subject's mood state at the time of inquiry may bias his or her self-reports of past experiences—happy subjects more likely to retrieve happy memories, and sad subjects more likely to retrieve sad ones. In fact, *prima facie* evidence for mood-congruent retrieval comes from studies of autobiographical memory where both clinical and nonclinical subjects have been found to access

personal memories that are affectively congruent with mood state at time of retrieval more readily than incongruent ones (e.g., Lloyd & Lishman, 1975; Teasdale & Fogarty, 1979; Teasdale & Russell, 1983).

Demonstrations of mood-congruent memory have sometimes been interpreted as instances of mood dependence on the assumption that unpleasant events induce unpleasant mood states in those who experience them and pleasant events induce pleasant mood states. This is an interesting theoretical controversy—unfortunately, one with little empirical evidence on either side. As a practical matter, however, whether taken together or separately, mood dependence and mood congruence raise the question of whether subjects' self-reports of past experience might be distorted by the mood state they are in at the time they make the report. Thus, for example, depressed or anxious individuals might exaggerate the frequency or severity of trauma, loss, abuse, or other negative events from childhood because such memories are more accessible to them at the time of retrieval. This is an extremely important empirical question, but it is also a fiendishly difficult one to answer. One reason for the difficulty, of course, is that the best way to evaluate memory bias is to compare the subject's memories to an objective record of what happened in his or her life and this sort of information is generally not available except in longitudinal databases. As an alternative, one could test memory when people were in a negative mood state and then again in neutral and positive mood states, but this is also difficult to manage.[2]

PUTTING RESEARCH INTO PRACTICE

In principle, mood-dependent retrieval is a big problem for investigators who rely on self-reports. But is it a problem in actual practice? A recent study by Brewin and his colleagues (Brewin, Andrews, & Gotlib, 1993) concluded that it is not. Brewin et al. covered three common criticisms of retrospective reports of early experiences: (a) that memories of childhood are imperfect and unreliable; (b) that syndromes such as anxiety and depression generally impair memory function; and (c) that depression biases retrieval away from positive material and toward negative material. They

[2]Complicating the picture somewhat, Parrott and Sabini (1990) also obtained evidence for mood-incongruent memory: Subjects in positive moods recalled more negative autobiographical memories than did subjects in negative moods, and vice versa. Although the conditions under which mood incongruence occurs are not well understood, Parrott and Sabini suggested that mood congruence occurs when subjects perceive the memory task as related to their current mood, and mood incongruence when they perceive it to be unrelated. Mood incongruence, in their view, occurs by virtue of a self-regulatory process in which subjects recall mood-incongruent memories in an attempt to produce a balanced self-concept and autobiographical record.

find the evidence for the first two criticisms wanting. They concluded that, in general, our recollection of the past is "reasonably free of error" (Baddeley, 1990, p. 310), and that anxiety and depression confer no special impairment on memory functioning. Most important, Brewin et al. found inconsistent and unconvincing evidence that negative mood biases memory toward negative events and they concluded that although mood may distort memory for relatively recent events, it has little impact on memory for childhood. This led them to conclude that retrospective reports of childhood experiences can be taken at face value, although they did propose some strategies for enhancing accurate recall and minimizing bias and error.

Our view is that Brewin et al. (1993) were premature in their conclusions about the accuracy of childhood memory and its invulnerability to emotional distortion. Remembering is inherently a reconstructive process (Bartlett, 1932; Ross, 1989) with lots of opportunity for bias and error (Roediger, 1996) and one's emotional state must cast a light—or a shadow—over that process. Moreover, anxiety and depression very likely put a considerable drain on cognitive resources—even if, like sleep-deprived subjects, the anxious and the depressed can pull themselves together for a short while and perform adequately on standard laboratory tests.

Most important, the evidence on which Brewin et al. (1993) based their sanguine conclusions about mood-congruent memory seems inadequate. Very few experimental studies involve clinically significant alterations in mood, or, for that matter, clinically significant memories; very few have independent confirmation of the quality that is really necessary to evaluate memories for distortion and bias. Moreover, surprisingly little of the evidence pertaining to childhood memory comes from the recall and interpretations of discrete events. In fact, a great deal of it involves test–retest correlations on scales rating such things as parental discord or care; another large segment involves factual knowledge, such as where the subject lived or who took care of the subject during the birth of a sibling. This is not within the definition of episodic memory.

In this context, a strong cautionary note is offered by a recent study of memory in soldiers who participated in the Persian Gulf War (Southwick, Morgan, Nicolaou, & Charney, 1997). One month after their return from the theater of operations, the soldiers completed a questionnaire concerned with combat-related traumatic events (e.g., an extreme threat to personal safety, observing bizarre disfigurement from wounds, seeing others killed or wounded). Two years later, they completed the questionnaire again, and this time they reported significantly more traumatic experiences than they had initially. Moreover, scores on a scale of combat-related post-traumatic stress disorder (PTSD) were significantly correlated with these changes in the follow-up reports. One interpretation of these findings is that individuals who show symptoms of PTSD exaggerate their histories of traumatic events,

possibly as part of an attempt to explain their current problems. The same danger exists in other studies of memory in individuals with anxiety, depression, and PTSD.

One area in which we agree with Brewin et al. (1993) is in their call for more research in this area. Beginning with classical psychoanalysis, a variety of theories implicate childhood experiences as the cause of adult psychopathology—a viewpoint that has been revived in recent speculations about the role of incest and child sexual abuse in eating disorders and other mental illnesses. It is a fact that many mental patients frequently report a high level of childhood trauma, abuse, and neglect, but what we need to know is whether these reports are reliable and whether there is any causal relation between the trauma and the illness. We do not know this for sure. Everything we know about mood and memory justifies our suspicion that memory-based self-reports may not be reliable, but this knowledge is also limited. Therefore, clinical practitioners and researchers should treat retrospective reports of childhood and adult experiences as just that—reports to be verified, not historical truth. If we want to know the truth about such things as the association between childhood experience and adult depression, the approach is not through memory, with all its vagaries, but through history: not through retrospective self-reports, but through prospective studies of objective data.

ADDENDUM: WHY RETROSPECTIVE ANALYSES CAN GIVE FALSE IMPRESSIONS OF CAUSAL RELATIONS

Certainly the commonest approach to questions such as the relation between childhood experience and adult psychopathology is retrospective: Subjects who have been classified as depressed or nondepressed, for example, are then asked to report on their childhood experiences; or, in some cases, objective data is available concerning these experiences. Such analyses frequently provide evidence for an association between antecedent and consequent—giving the impression, for example, that certain kinds of childhood experiences are actually associated with depression in adults. It cannot be said too often that such retrospective methods tend to overestimate the strength of the relation between antecedent and consequent (Dawes, 1993, 1994).

To give an example (which in turn we owe to Dawes), consider the relation between smoking and lung cancer. We know from solid epidemiological research that smoking is a huge risk factor for lung cancer: About 1 in 10 smokers contract lung cancer, compared to about 1 in 200 nonsmokers, an increased risk of about 2,000%. Consider now a study in which an

investigator compares smoking history in 400 individuals with lung cancer, compared to 400 cancer-free controls. The resulting table, conditioning on the consequent lung cancer, would look something like Fig. 6.4a: The vast majority of cancer victims would be found to be smokers, and smoking would be very rare in controls. The diagonal formed by the two critical cells, smoker-with-cancer and nonsmoker-without-cancer, accounts for 82% of the sample and the resulting correlation is a very high *phi* = .64.

But this turns out to be a gross overestimate of the actual relation between smoking and lung cancer. The reason is that there are relatively few smokers in the population and a study that conditions on the consequent oversamples this group and inflates the correlation between antecedent and consequent. Assume, for the purposes of illustration, that the base rate of smoking in the population is 25%. If we drew a random sample of the population for study, the actual relation between smoking and lung cancer proves to be quite a bit weaker: As illustrated in Fig. 6.4b, the diagonal still accounts for 77% of the cases, but taking the base rates into account, the correlation coefficient drops to *phi* = .25. The correlation remains significant (statistically and clinically), but it is greatly diminished in strength.

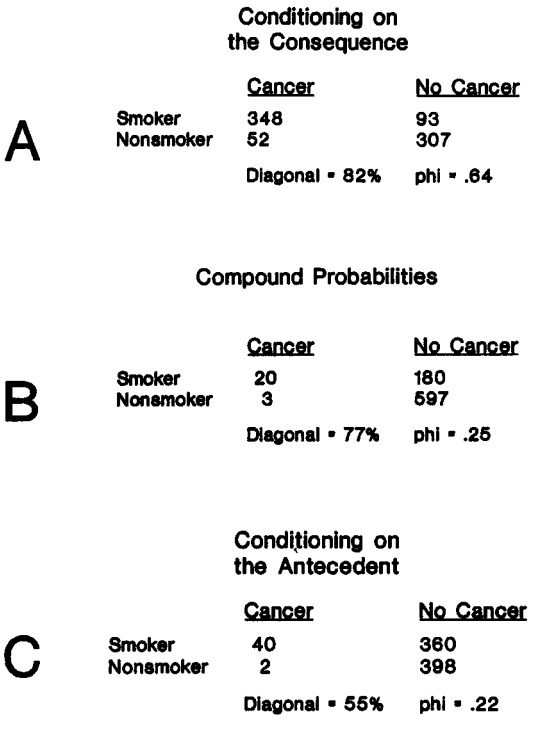

FIG. 6.4. Varieties of antecedent-consequent relations (after Dawes, 1993).

Now what happens if we condition on the antecedent, that is, if we follow 400 smokers and 400 nonsmokers to determine how many contract lung cancer? When we do this, applying the probabilities known from a study with proper sampling, we find (see Fig. 6.4c) that the diagonal is reduced still more, to 55%, but that correlation is not distorted, *phi* = .25.

The distorting effects of conditioning on the consequent, which is the typical method in these kinds of studies, is inevitable—as Dawes (1993, 1994) showed, the source of the distortion is in the algebra by which probabilities are calculated. This distortion is inevitable so long as the base rate of the antecedent is substantially different from 50%, and it increases the further the base rate departs from this value. The proper way to determine the strength of relation between antecedent and consequent is to study a random (or stratified, or otherwise unbiased) sample of the population; failing that, it is far better to condition on the antecedent than to condition on the consequent. Longitudinal follow-up studies, then, have two virtues: They obviate many of the problems involved in collecting self-reports of potentially important antecedent variables, and they introduce relatively little distortion into the relations between the variables of interest.

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The Science of Self-Report

Implications for Research and Practice

Edited by

Arthur A. Stone
State University of New York

Jaylan S. Turkkan
The National Institute on Drug Abuse, The National Institutes of Health

Christine A. Bachrach
National Institute of Child Health and Human Development

Jared B. Jobe
National Institute on Aging

Howard S. Kurtzman
National Institute of Mental Health

Virginia S. Cain
Office of Behavioral and Social Sciences Research, The National Institutes of Health

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