

# MEMORY AND EMOTION

INTERDISCIPLINARY PERSPECTIVES

EDITED BY **Bob Uttl, Nobuo Ohta, and Amy L. Siegenthaler**





## Memory and Emotion

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*Memory and Emotion: Interdisciplinary Perspectives*

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# PREFACE

This volume was inspired by discussions at the Sixth Tsukuba International Conference on Memory held in March 2005 in Tsukuba, Japan. The theme of the conference was *Memory and Emotion* and we were fortunate to attract a stellar line-up of international experts in this field from a variety of disciplines, including cognition, neuroimaging, aging, and psychopathology.

This relatively new field is currently one of the fastest-growing areas of research in psychology and related disciplines. This book includes original articles that cover cutting-edge research in memory and emotion, providing the reader with what is up and coming with respect to research findings, methodological techniques, and theoretical advances. Many of the current “hot” topics in the field are covered, including the effects of stress, arousal, anxiety, and depression on memory; the influence of discrete emotions on memory; dissociative amnesia and post-traumatic stress disorder; false, recovered, and traumatic memories; flashbulb memories; the use of emotional memories in therapy; the influence of emotion on autobiographical memory; emotion–memory interactions across the adult lifespan; as well as the neural correlates of these and other phenomena. The field is ripe for expansion and we hope that many new, as well as current, researchers will be inspired by the ideas in this book to conduct studies paving the way for the next great theories and advances.

We are deeply grateful to the contributors to this book for their hard work in writing timely original chapters that reflect the current and upcoming thinking on emotion and memory. Further, we appreciate having had the opportunity to explore and expand upon ideas presented at the Sixth Tsukuba International Conference on Memory and thank the Japan Society for the Promotion of Science, the University of Tsukuba, the Tsukuba International Congress Center, and all attendees and staff for their contributions toward making the conference a tremendous success. Lastly, we thank Blackwell Publishing for publishing this book.

Bob Uttl  
Nobuo Ohta  
Amy L. Siegenthaler



# 1

## Memory and Emotion from Interdisciplinary Perspectives

**Bob Uttl, Amy L. Siegenthaler, and Nobuo Ohta**

### **Abstract**

*Links between emotion and memory have been recognized since the late 1800s; in the past two decades, however, interest has grown at an exponential rate. In this chapter, we identify some of the possible factors responsible for this rapid increase in interest, and provide an introductory overview of the chapters in this book. The chapters are grouped into three general themes: cognition, neuroscience and aging, and psychopathology. The sections complement each other well and we highlight some of the common themes weaving through them.*

An impression may be so exciting emotionally as almost to leave a scar upon the cerebral tissues.

William James (1890, p. 670)

## MEMORY AND EMOTION

Why memory and emotion? The view that emotion and memory interact was adopted by some of the earliest writers in psychology. While James (1890) seems to argue that emotions tend to make experiences so memorable as “to leave a scar upon the cerebral tissues,” Janet (1889) argued that traumatic experiences interfere with the formation of memory, while Freud (1915) suggested that strong unpleasant emotions might be actively suppressed and inaccessible to consciousness. Despite these early claims about the impact of emotion on memory, the radical behaviorism movement delegated emotion to the fringe of scientific inquiry and a number of prominent writers argued that emotion was an unnecessary concept (Lazarus, 1991a). Meyer (1933, quoted in Lazarus, 1991a) predicted:

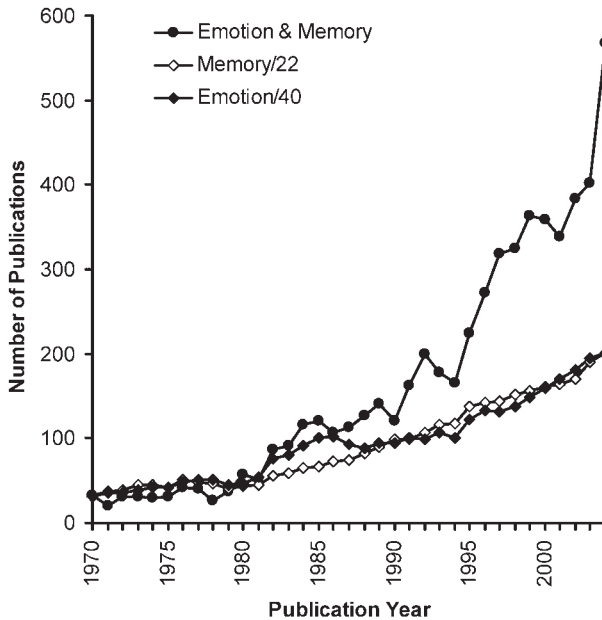
Why introduce into science an unneeded term, such as emotion, when there are already scientific terms for everything we have to describe? . . . I predict: the

“will” has virtually passed out of our scientific psychology today; the “emotion” is bound to do the same. In 1950 American psychologists will smile at both these terms as curiosities of the past. (p. 300)

Although anyone who today refers to *American Psychologist* (the journal rather than the person) realizes that, far from passing out of our vocabulary, emotion has increasingly become one of the most discussed and debated topics in contemporary psychology (for some sample commentaries, see Bower, 1981; Davidson, 2000; Frijda, 1988; Lang, 1995; Lazarus, 1981, 1984, 1991b; Reisenzein & Schonpflug, 1992; Staats, 1988; Zajonc, 1981, 1984; Zuk, 1994; though this is by no means an exhaustive list).

To determine just how prevalent the topics of emotion and memory have become in modern psychology, we conducted a “scientific inquiry” by performing keyword searches in the PSYCInfo database to see how many articles have focused on emotion within the past four decades, relative to articles that have focused on the venerable and uncontroversial area of memory, and more importantly, we examined the extent to which researchers became interested in the interactions between emotion and memory. The results of our search can be seen in Figure 1.1. For each year from 1970 to 2004, we searched for (1) articles containing the keyword “emotion” and its derivatives such as “emotional” (using “emotion\*” as a keyword); (2) articles containing the keyword “memory”; and (3) articles containing both of these keywords (“emotion” and “memory”). To facilitate comparisons among the trends, we standardized the number of articles to a common starting point by dividing the number of articles containing “memory” by 22 and by dividing the number of articles containing “emotion\*” by 40. It is clear that the interest in emotion has not been waning at all; indeed, in 1970, articles on emotion outnumbered articles on memory almost two to one (1,200 versus 700). More importantly, however, the number of articles concerned with the topics of both emotion and memory has been increasing at an exponential rate from about the mid-1980s, and much faster than the number of research articles concerned with either topic alone. While one may argue that our keyword search is not comprehensive, insofar as it did not search for alternative keywords such as “learning” or “depression”, even this rather basic measure allows us to conclude that emotion and emotion and memory as objects of scientific inquiry are well with us, and contrary to Meyer’s prediction, there is no indication that interest in this topic is about to disappear any time soon.

What could account for this increasing interest in the interactions between memory and emotions? We identified several trends that may have been contributing factors. First, the radical behaviorism movement was replaced by the cognitive revolution emphasizing the influence of thought on behavior (Neisser,



**Figure 1.1** Number of articles pertaining to emotion, memory, and emotion and memory by year of publication, as revealed by a keyword search of the PSYCInfo database. The number of articles is standardized to a common starting point by dividing the number of articles containing the keyword “memory” by 22 and by dividing the number of articles containing “emotion” by 40.

1967). Whereas early information processing models of cognition, frequently called box models, were rigid, static, and mechanistic, the newer class of models were flexible, emphasizing how information was processed, rather than how information moved from box to box (e.g., the levels of processing framework; Craik & Lockhart, 1972). Two more theoretical developments – the encoding specificity principle (Tulving & Thomson, 1973) and the idea of transfer appropriate processing (Morris, Bransford, & Franks, 1977) – emphasized context effects on memory and strengthened the notion that memory is dependent on the degree of overlap between study and test processing. From here, it was only a small step to the idea that mood could influence both the encoding and retrieval of information (e.g., Bower, 1981, 1992; Eich, 1980, 1989).

Second, in 1977, Brown and Kulik published their seminal paper on “flash-bulb memory,” a term referring to the almost iconic memory that results after experiencing or hearing about a surprising, important, and emotionally

arousing event (such as the assassination of President Kennedy, the explosion of the space shuttle *Challenger*, or the attack on the World Trade Center in New York). The hallmark of flashbulb memories is their distinctive and highly detailed nature; they were said to be well remembered and accurate, but later research has questioned these claims (e.g., Winograd & Neisser, 1992).

Third, an even greater and perhaps most significant impetus for research on the interactions between memory and emotion came a few years later when the United States, Canada, and other countries were consumed by widespread accusations of satanic ritual child abuse cases. In one of the best known cases, the McMartin Preschool case, Peggy McMartin Buckey, Virginia McMartin, Ray Buckey, and four school teachers were indicted in 1984 on 208 counts of abuse involving 40 children (Ramsland, n.d.). In all, this case was the longest US criminal trial in history, lasting six years and costing \$16 million, yet resulting in no convictions. The entire case was built on the witness testimony of children, who never spontaneously recalled any abuse, but who were led to believe that they had been abused by repeated suggestive questioning in the hands of counselors, interrogators, and examiners. The widespread media attention and mass hysteria that followed sparked copycat cases across the United States and Canada and hundreds of innocent people were accused and some convicted of child abuse.

The outrageous abuse allegations combined with the absence of any physical or corroborative evidence fueled research on the reliability and malleability of child eyewitness testimony and on the possibility that questionable interrogatory practices can “implant” memories (Goodman, 1984; Goodman & Lloyd, 1988; Loftus, 1979; Loftus & Ketcham, 1991). Additionally, a huge field became devoted to investigating the closely related topic of adults who began “recovering” memories during therapy of their own abuse from childhood, a topic which became a virtual industry and which quickly permeated popular culture and society (e.g., books by Bass & Davis, 1988, and Freyd, 1996). Fortunately, the “recovered memory” debate has since been largely settled in favor of scientific evidence debunking the authenticity of such claims; unfortunately, however, this provides little solace for the patients and families traumatized by false allegations.

Fourth, in 1980, spurred in part by the massive numbers of returning Vietnam war veterans suffering from longstanding and debilitating neuroses, the American Psychiatric Association added a new controversial diagnosis – Post Traumatic Stress Disorder (PTSD) – to the third edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-III). Although the concept of disorders such as combat fatigue and war neurosis had been recognized since the mid-1800s, until this time it had not been widely accepted that such “neurosis” could develop from an exogenous etiological event rather than from an inherent psychological weakness alone (Figley, 1978, 1985; Grinker & Spiegel, 1945).

Accordingly, a key criterion for the diagnosis is that an individual be exposed to a catastrophic external “stressor” outside the range of normal experience, such as war, torture, rape, natural disasters, and human-caused disasters. This distinguishes PTSD from the diagnosis of Adjustment Disorder, which is characterized by adverse psychological responses due to “ordinary” stressors such as divorce, loss of a job, death of a loved one, etc. One of the consequences of such extreme traumatic events – and one of the diagnostic criteria – is intrusive recollection of the event evoking intensive emotional responses, including panic, terror, dread, and grief.

Fifth, beginning in the mid-1980s, the increasing accessibility of brain imaging techniques, especially Positron Emission Tomography (PET) and functional Magnetic Resonance Imaging (fMRI), added yet another area of burgeoning research aimed at elucidating the neural correlates of emotion and the interrelations between emotion and memory, with a particular emphasis on the role of the amygdala (Aggleton, 1992; LeDoux, 1996; McGaugh, 2003). Since the mid-1950s, there had been evidence that the limbic system and amygdala had some role in emotional processes, based primarily on lesion data in both animals and humans (e.g., Kluver-Bucy syndrome; Gol, Kellaway, Shapiro, & Hurst, 1963; Marlowe, Mancall, & Thomas, 1975). In the last ten years, however, with the first neuroimaging evidence of the role of the amygdala in processing emotion (e.g., Morris et al., 1996), research in this area has increased rapidly to the point that the words “amygdala” and “emotion” are practically synonymous to most psychology undergraduate students.

This brief overview of some potential catalysts for the rapid increase in the number of research studies investigating the links between memory and emotion suggests that this is one area of scientific inquiry that has been motivated to a large degree not only by scientific curiosity but also by real-life controversies and widespread public interest. In the next section, we provide a brief overview of the chapters contained in this volume, highlighting the current topics and debates in this rapidly expanding field.

## OVERVIEW OF CHAPTERS

The chapters in this book are organized into three general themes. The first section, Memory, Emotion, and Cognition, consists of four chapters discussing basic research in the field, primarily from the laboratory but also from real-life events. The second section, Memory, Emotion, Aging and the Brain, consists of three chapters presenting research that has extended these basic research findings to the elderly population, as well as a discussion of the current neuroimaging literature investigating emotion and memory. The last section, Memory, Emotion, and Psychopathology, consists of four chapters investigating

the application of research techniques to special populations, such as individuals with anxiety, individuals and couples in therapy, and victims of childhood sexual abuse and other traumatic experiences.

The first section begins with a chapter by Reisberg, who draws a distinction between arousal-based and cognitively-based hypotheses of emotion. Although the contribution of arousal to the production of emotion has been recognized since the time of the James-Lange and Cannon-Bard theories of emotion, the importance of cognitive processes was not given true credence until the advent of the Schachter and Singer (1962) Two-Factor theory. Reisberg argues that the arousal-based model is still too influential in guiding the questions asked by emotion researchers and that more attention ought to be devoted to understanding the cognitive contributions. The arousal-based model is too simple, he argues, to explain the diverse effects of emotion on memory, such as improved memory for an event's center or gist and worsened memory for the peripheral details of an event. While biological arousal may be a necessary condition for the enhancement of memory consolidation, it is not on its own sufficient. Cognitive factors, such as attention, rehearsal, personal relevance, and meaning, also play a very important role and deserve a more prominent place in research studies. This idea is also picked up and discussed in the chapters by Levine and Pizarro, by Mathews, and by Goodman and Paz-Alonso. Reisberg argues that researchers have neglected to focus on some crucial questions by letting arousal-based models guide their thinking.

That the arousal-based model of emotion is too limited is also emphasized by Levine and Pizarro in the next chapter. Drawing on research inspired by appraisal theories of emotion, they argue that the particular emotion (e.g., happy, fearful, angry, sad) that one is experiencing will have a large influence on what kind of information is deemed of central importance, and thus subject to further cognitive influence. For example, they argue, positive and negative emotions have very different effects on cognitive processes, even when they evoke similar levels of arousal. Positive emotions tend to promote heuristic, creative, and flexible modes of information processing, while negative emotions tend to promote a more analytic, data-driven mode of information processing. Drawing on appraisal theory, Levine and Pizarro argue that discrete emotions provide "an elegant general-purpose solution to the problem of monitoring information relevant to an individual's many current goals".

In the next chapter, Christianson and Engelberg investigate how research from both laboratory studies and real-life events can be applied to forensic situations in order to develop a better understanding of factors affecting the reliability of memory among bystanders, victims, and perpetrators. While most investigations have focused on how emotion affects memory, Christianson and Engelberg look at the flip side: memory for specific emotions. They argue that recalling the particular emotion experienced during a stressful event can serve



as a powerful cue in retrieving information from episodic memory. The ultimate goal of this line of research is to develop effective interviewing techniques to aid both forensic and clinical psychologists in eliciting accurate information from their witnesses, victims, and patients. Factors influencing the recall of traumatic memories are discussed further in the chapters by Goodman and Paz-Alonso and by Kihlstrom.

In the last chapter of this section, Koriat addresses one of the oldest questions in the emotion literature, first posed by William James: do feelings drive behavior or is it behavior that causes feelings? Koriat examines the cause-and-effect relation between subjective emotional feelings and behavior from the modern viewpoint of metacognitive research. This body of research indicates substantial support for both points of view, that monitoring (feelings) affects control (behavior) and that control affects monitoring. Thus, although drawing on a quite different body of literature, Koriat reaches conclusions similar to those of Reisberg and Levine and Pizarro, namely, that biological and cognitive contributions to emotion and memory are far from mutually exclusive, and that equal consideration must be given to both domains in order to understand the relation between emotion and memory more completely.

The next section puts the contribution of biological factors front and center as we turn to neuroimaging studies of emotion and memory and how emotion and memory processes change with the aging brain. First, a chapter by Dolcos, LaBar, and Cabeza begins by providing an excellent tutorial overview of the methodology employed in neuroimaging studies and what can be learned about cognition from employing such techniques – information that is critical in evaluating the neuroimaging studies discussed in later chapters by Mather and Mathews. Next they discuss the extant neuroimaging studies of emotion and memory, most of which support the modulation hypothesis that emotional events are remembered better because the amygdala enhances the function of medial temporal lobe structures such as the hippocampus. Further studies also suggest an important role for the prefrontal cortex in emotional memory, possibly mediated through the enhancement of strategic encoding processes. Dolcos et al. conclude by highlighting a number of issues in emotion and memory research in which neuroimaging has just begun to scratch the surface, such as the role of emotional valence, the mechanism of emotional memory in people with affective disorders (e.g., depression, anxiety, PTSD) and in healthy and pathological aging, as well as mechanisms through which trauma may impair memory, themes which are discussed in the other chapters of this book.

The next two chapters deal with the influence of aging on emotion and memory. Mather describes a wide body of literature suggesting that older adults may show a bias to enhance positive information and diminish the impact of negative information, a finding known as the positivity effect. Similar to Levine and Pizarro's argument that discrete emotions may have evolved to aid in

goal-regulation mechanisms, Mather also contends that the positivity effect in older adults may be the result of goal-directed processes used to regulate emotion; she suggests that older adults, compared to their younger counterparts, have a chronically active goal to regulate emotion. Mather puts forth a model to explain the positivity effect; she argues the effect depends on the following preconditions: (1) emotional goals must be activated; (2) cognitive control processes regulating emotions must be available; and (3) individuals must be free to engage in strategic processing of their own choice and allocate their available resources accordingly. She argues that the positivity effect observed in older adults cannot be accounted for by mood-congruent memory effects or by declines in physiological arousal or integrity of the amygdala.

In the memory literature, researchers frequently place more emphasis on retrieval processes than on encoding processes. In the next chapter, however, Uttl and Graf examine not only age differences in retrieval, but also age differences in the encoding of emotional versus non-emotional information. They find that much of the difference in what older versus younger adults remember about pictures of complex scenes can be explained by what they encode initially. While Uttl and Graf did not code for positive versus negative emotions specifically, they found no decline in encoding and retrieval of emotional information with age. Whether the positivity effect is a true phenomenon or a “rose-colored glasses” view of aging, however, is yet unclear. Employing meta-analytic methods, Uttl and Graf review in detail much of the same literature reviewed by Mather and conclude that the present experimental evidence for the positivity of older adults’ memories is not entirely convincing one way or the other. Thus, it is important to maintain a healthy skepticism about reported findings and to evaluate the underlying research methods as stringently as the proposed theories.

The last section of the book focuses on the interaction between emotion and memory in special populations, such as people with anxiety, individuals and couples in therapy, and victims of childhood sexual abuse and other traumatic experiences. Mathews examines some of the traditional findings in the emotion and memory literature from the perspective of individual differences. While acknowledging the important roles of arousal and rehearsal in emotional memory, he argues for a special role of selective attention in emotional memory. Specifically, he suggests that anxiety-prone individuals are more likely to selectively attend to and thus remember emotionally threatening stimuli. Further highlighting a theme throughout this book that both biological and cognitive factors are necessary, Mathews also presents evidence that while emotional differences (e.g., anxiety) can influence encoding, it is equally true that different types of encoding may influence emotion. He presents evidence from a neuroimaging study that fear-related activations in the brain, often thought to be automatic, can in fact be modulated by cognitive control processes, and

further that these activations are associated with individual differences in fearfulness and attentional control. Importantly, for clinical applications, Mathews and his colleagues have also shown that control over emotional encoding can be learned through behavioral training techniques.

In the next chapter, Singer describes in detail how he has been able to do just that, namely, aid patients in acquiring control over their emotional memories and reactions, through the use of self-defining memories in his clinical practice. Emotional memories are ubiquitous in psychotherapy practice, but Singer, through careful research, argues that a certain kind of autobiographical memory, the self-defining memory, has an important role to play in therapeutic healing by virtue of being a vivid, emotional, familiar, and well-networked memory which is connected to enduring goals and conflicts in one's life. He suggests that therapists can use positive self-defining memories to aid clients in extracting lessons and meaning relevant to goal conflicts in their lives, while at the same time teaching strategies to avoid excessive rumination on negative memories. Here, again, the function of goals as an important aspect of self-regulation of emotion is highlighted, as in earlier chapters by Levine and Pizarro and by Mather.

In the last two chapters of this book, we turn to a discussion of the most extreme form of emotional memories, traumatic memory. A serious scientific discussion of this topic is important as it touches on some of the topics most familiar, yet most misunderstood, in popular psychology books and magazines, such as recovered and false memories of abuse, dissociative amnesia, and post-traumatic stress disorder.

In forging a connection between the laboratory and the real world, Goodman and Paz-Alonso present an overview of how basic research on memory processes can explain memory for stressful events. While traumatic events are typically retained better than ordinary memories, they are also susceptible to forgetting, interference, and distortion; they argue, that, like ordinary memories, traumatic memories are also affected by factors such as time delay, distinctiveness, personal involvement, rehearsal, and arousal. Turning to a discussion of childhood sexual abuse, however, they conclude that while normal memory processes can explain the majority of traumatic memory phenomena, there does seem to be an additional need to appeal to "special" memory mechanisms such as dissociation, especially when the trauma is chronic and experienced during the vulnerable childhood years.

The book closes with an intriguing chapter by Kihlstrom that provides a historical overview and discussion of the relationship between trauma and memory. He notes that the idea that trauma can cause amnesia has been present in psychological literature for over a century, since the time of Freud and Janet, who first suggested the mechanisms of repression and dissociation. In the modern literature, we encounter terminology such as memory suppression and "hot"

and “cool” memory systems. Despite the popularity of the idea that trauma can cause amnesia, however, Kihlstrom argues quite convincingly that there is little to no evidence for this claim. Indeed, consistent with the ideas presented in the other chapters of this book, it would seem that the emotion associated with trauma serves to increase, rather than decrease, the saliency of and memory for such events. If this is the case, then it would seem that researchers, the popular press, and the public in general have devoted an incredible amount of time for naught in attempting to explain, portray, and understand a phenomenon that does not exist.

## CONCLUSIONS

As separate fields of inquiry, emotion and memory each have a long and well-established history. In the last two decades, however, interest in the interactions between emotion and memory has increased at a rate far exceeding the rate of increase in either topic alone. While part of this increased interest may be attributable to changing emphases in the scientific field of psychology itself, it is more likely that this increase was inspired by real-world events and controversies, and increasing public awareness and interest in these topics. The chapters of this book provide a snapshot of the current debates and state of research from diverse areas of psychology in this rapidly growing field. It is our hope that researchers will be inspired by the ideas presented in this book to go out and gather the necessary evidence to advance both scientific and public understanding of the interactions between emotion and memory.

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