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Functions of Remembering and Misremembering Emotion

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SUMMARY

Memory for the emotions evoked by past events guides people's ongoing behaviour and future plans. Evidence indicates that emotions are represented in at least two forms in memory with different properties. Explicit memories of emotion can be retrieved deliberately, in a flexible manner, across situations. Implicit memories of emotion are brought to mind automatically by cues resembling the context in which an emotional event occurred. One property they share, however, is that both types of memory are subject to forgetting and bias over time as people's goals and appraisals of past emotional events change. This article reviews the cognitive and motivational mechanisms that underlie stability and change in memory for emotion. We also address functions that remembering and misremembering emotion may serve for individuals and groups. Although memory bias is typically viewed as problematic, changes in representations of emotional experience often promote goal-directed behaviour and facilitate coping with challenging situations. Copyright © 2009 John Wiley & Sons, Ltd.

> Selection is the very keel on which our mental ship is built. And in the case of memory its utility is obvious. If we remembered everything, we should on most occasions be as ill off as if we remembered nothing.
>
> William James, 1890/1950, p. 680

Emotions are elicited by experiences that matter. Events that fulfil the goals we hold for ourselves or others evoke joy; events that thwart those goals evoke distress. When later remembering such experiences, people retrieve, not just a dry account of the events that unfolded, but also the feelings that were associated with those events. This feature of autobiographical memory has tremendous importance. Memory for past emotion plays a vital role in daily life by informing current preferences and plans for the future. People base decisions, ranging from the trivial (which movie to rent) to the profound (which career to pursue, whether to have children, whether to negotiate with an adversary), partly on how much joy, boredom, and aggravation they felt during similar circumstances in the past. Memory for emotion is of particular significance to research psychologists and clinicians because they routinely ask people to recall the intensity and frequency of past feelings such as depression, anxiety, and anger. But what if these memories are wrong? What if people

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selectively remember emotions as more or less intense than they actually were? Memory for autobiographical events is known to be subject to forgetting and bias over time. Much less is known about the accuracy with which people remember emotion. To begin to fill this gap, this article reviews theory and research on how emotion is represented in memory, whether emotional memories can be counted on to be accurate, and sources of bias. This provides a basis for analysis of the functions served by remembering emotion, by forgetting emotion, and by biases in memory for emotion.

According to one view, emotion *per se* does not persist in memory (e.g. Robinson & Clore, 2002a; Strongman, & Kemp, 1991). When people try to remember past feelings they cannot retrieve the fleeting emotional experience itself. Instead they construct a representation based on their memory for the circumstances in which the feelings were experienced and their beliefs about what they were likely to have felt. Reconstruction of this sort allows for error. Consistent with this view, a growing body of research documents inaccuracies in people's accounts of past emotions (e.g. Christianson & Safer, 1996; Levine, 1997; Robinson & Clore, 2002a). For example, a recent study found that Americans showed poor memory for their emotional reactions to the 11 September 2001 terrorist attacks even while retaining relatively accurate memory for facts about the attack (Hirst et al., 2009). In contrast, others have argued that representations of emotion persist in memory and are readily retrieved (e.g. LeDoux, 1996; van der Kolk, 1994). Researchers and clinicians taking this position have focused, not on what people say about their past emotions, but on the lasting effects of past emotional experiences on current feelings and behaviour. Reconciling these disparate viewpoints requires noting that emotion is a complex response that combines subjective feeling, physiological, motivational, and cognitive components. Moreover, there are multiple memory systems. Representations of emotion, then, may have different properties depending on the components of emotion retained and the memory system involved.

EXPLICIT AND IMPLICIT REPRESENTATIONS OF EMOTION

Theory and research have distinguished between explicit and implicit memory systems (e.g. Eichenbaum & Cohen, 2003; Jacoby, 1991; Tulving. & Schacter, 1990). Explicit memory refers to representations of specific experiences (episodic memory) or facts (semantic memory) that can be deliberately retrieved and verbally recounted to others. Explicit memories are accessible across situations and accompanied by a conscious feeling of remembering (episodic) or knowing (semantic). In contrast, implicit memory refers to representations of past experience that are not accessible to conscious awareness but nonetheless influence current feelings, thoughts, or behaviour. Phenomena that fall under the umbrella of implicit memory include priming, cognitive and motor skills, habituation, and conditioning. Rather than being voluntarily recalled, such memories are elicited involuntarily by specific retrieval cues. These two memory systems are associated with activity in different regions in the brain and are thought to fulfil different functions (for reviews see Eichenbaum & Cohen, 2003; Kihlstrom, Dorfman, & Park, 2007; Schacter, Chui, & Ochsner, 1993). Episodic memory (part of the explicit system) provides a moment by moment record of changes in the environment. In contrast, skill acquisition, habituation, and conditioning (parts of the implicit system) preserve key features of past experience in a manner less influenced by momentary changes in input.

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Researchers who have focused on explicit memory for emotion have questioned whether people are able to store emotional experience in memory and retrieve it at will. For example, Robinson and Clore (2002a,b) argue that emotional experience is continuous and fluctuating and that this ephemeral experience is not stored in memory. Instead, people construct a representation of how they must have felt based on their memory for the circumstances in which an emotion was experienced (e.g. what happened, what they thought, how they behaved, how others responded) and their beliefs about how they or others typically feel in such circumstances. For example, a person may remember having been angry when his car was towed. But rather than retrieving the subjective feeling itself, he remembers thinking the situation was unfair, kicking the curb and cursing, and his tendency to be short-tempered. Such episodic and semantic memories in turn may evoke a comparable but new emotion in the present. Similar claims have been made about bodily sensations such as cold, hunger, or pain (e.g. Van Boven & Loewenstein, 2005). People may remember *that* they felt cold last time they visited Chicago during the winter. They may remember shivering, seeing their breath, wearing multiple layers of clothing, but they cannot retrieve the physical sensation of cold.

In contrast, researchers who have focused on implicit memory for emotion argue that emotion is indeed represented in memory. According to attachment theory (Bowlby, 1969) and object relations theory (e.g. Fairbairn, 1954), memories of security or anxiety associated with early childhood relationships with caregivers provide the foundation for social and interpersonal relationships throughout life. Turning to recent experiences, researchers have demonstrated that fear conditioned visual stimuli can produce an autonomic response and influence evaluative judgment even when the stimuli are backward masked and presented so briefly that people are unable to identify what they have seen (e.g. Öhman & Soares, 1998; for a review see Öhman & Wiens, 2003). The fact that past emotions can influence current feelings, physiological responses, and judgments, even in the absence of conscious memory for emotion-eliciting events, suggests that representations of emotion persist in implicit memory.

Research using the Iowa Gambling Task also provides evidence for implicit memory for emotional experiences (Bechara, Damasio, Tranel, & Damasio, 1997). In this task, people choose cards from four decks. Each card drawn results in winning or losing money. People gradually learn to avoid drawing cards from decks that provide high payoffs but even higher overall risk (bad decks), and concentrate on drawing cards from decks that give lower payoffs but much lower overall risk (good decks). After some experience with the task, but long before they can consciously verbalize that certain decks are risky, people show an increase in skin conductance (an indicator of physiological arousal or stress) when considering selecting cards from the bad decks. Patients with damage to the amygdala or ventromedial prefrontal cortex, thought to be important for extracting and preserving the emotional significance of events, show no such stress response and continue to draw cards from the bad decks despite losing money overall. Thus, in addition to people's ability to reconstruct explicit memories of past emotions based on memory for eliciting circumstances, behaviours, and beliefs, the emotional significance of past events persists in an implicit memory system (Damasio, 1994).

Experimental and case studies of people with traumatic and organic amnesias provide further evidence that the emotional significance of events can be retained in the absence of conscious memory for the emotion-eliciting events (Christianson & Safer, 1996; Tobias, Kihlstrom, & Schacter, 1992). Such reports date back to a classic incident described by Claparede (1951). A patient with a profound deficit in episodic memory was unable to

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remember having ever met her physician moments after he left the room. On one occasion, the physician shook hands with her with a pin concealed in his hand. The next time she met the physician, she refused to shake his hand, despite having no recollection of the event. In a recent study, Turnbull and Evans (2006) had a patient with profound anterograde amnesia perform the Iowa Gambling Task on three occasions, each 1 week apart. Importantly, the card decks that were 'good' and ′bad' shifted between sessions. Despite his episodic memory impairment (the rules of the task had to be explained several times as he forgot them within a single session), the patient's performance was comparable to that of control participants. He showed progressive improvement across sessions, drawing more frequently from the advantageous decks. This suggests that implicit memory for the emotional significance of events, based on the history of reward and punishment associated with particular stimuli, persists over long periods (weeks), and is flexible to shifts in reward contingencies (but see Gutbrod, Krouzel, Hofer, Müri, Walter, & Radek, 2006 for a dissenting position).

In sum, emotion can be represented in memory in at least two ways and the resulting representations have different properties. The explicit memory system allows people to consciously retrieve or reconstruct how they felt in the past based on memory for prior cognitions, episodic details, and semantic information. Importantly, people can do this without experiencing strong subjective feelings or physiological changes. Prior research makes clear, however, that explicit representation is not the only form in which past emotion persists in memory. The implicit memory system allows representations of past emotional experience to persist and thereby influence current feelings, preferences, and decisions even when there is no recollection of the original experience. Implicit memory for emotion becomes accessible without deliberation in the presence of retrieval cues that bear a close resemblance to the situation in which the emotion was originally experienced. When implicit memory for emotion becomes accessible, the resulting experience shares many of the properties of the original emotional experience. It is vivid, accompanied by subjective feelings and physiological changes, and commandeers attention, thought, and behaviour. Distinguishing between explicit and implicit representations helps clarify how investigators have reached conflicting conclusions about a key property of memory for emotion – its accuracy.

IS MEMORY FOR EMOTION ACCURATE?

At a broad level, memory for past emotion is generally accurate. People almost never remember happiness as anger, or neutral events as thrilling. However, researchers investigating explicit memory have found evidence of subtle but consistent errors, with people typically overestimating the intensity of past emotions (e.g. Christianson & Safer, 1996; Fredrickson, 2000; Wilson, Meyers, & Gilbert, 2003). In contrast, researchers investigating implicit memory for emotion, particularly fearful memories, maintain that emotional memories are retained permanently and accurately (e.g. Fanselow & Gale, 2003; LeDoux, 1996; van der Kolk, 1994). Below, we review evidence for forgetting and bias in memory for emotion, beginning with explicit memory which has been most studied. Bias in the direction of overestimating emotional intensity often results from people's tendency to focus on moments of peak emotional intensity. But this is not the only source of bias. Importantly, work on current appraisals of past events shows that emotions can be remembered as either more or less intense than initially reported. Moreover, systematic

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differences in how individuals appraise past events can influence the direction of bias in their memory for past emotions. Turning to implicit memory for emotion, we review evidence that, despite impressive persistence, it too is subject to forgetting and bias as goals and appraisals of past emotional events change. Understanding sources of stability and bias in memory for emotion in turn highlights the functions such memories serve.

Sources of bias in explicit memory for emotion

Moments of peak intensity

People often exaggerate when recalling past emotions, remembering them as more intense or frequent than they reported at the time. People overestimate the emotions experienced during individual events, such as donating blood (Breckler, 1994) and across a series of similar events that span longer time frames (Fredrickson, 2000; Thomas & Diener, 1990). For example, Wirtz, Kruger, Scollon, and Diener (2003) had students rate their emotions seven times a day at random intervals during their spring-break vacations. When later asked to recall how they had felt, students overestimated the intensity of both positive and negative emotion. Fredrickson and Kahneman (1993) found that one reason for this overestimation is people's tendency to focus on moments of peak emotional intensity. They had people watch a series of emotional film clips and rate the intensity of their emotional reaction after each clip. People's most intense reaction to the film clips (as well as their final reaction) disproportionately contributed to their later recall of the overall intensity of their emotions. Similarly, researchers assessing memory for the emotions experienced during vacations, travel delays, and medical procedures have found that peak emotions contribute more strongly to later memory than do less intense emotions (Fredrickson, 2000; Morewedge, Gilbert, & Wilson, 2005; Wilson et al., 2003; Wirtz, Kruger, Scollon, & Diener, 2003).

Emotional intensity reflects people's appraisals of an event's importance and its relevance to their goals and concerns (Frijda, Ortony, Sonnemans, & Clore, 1992). Thus, the most salient instances of past events are typically those that elicited the most intense emotions. These instances are most likely to be encoded in memory and also most likely to be retrieved (Fredrickson, 2000; Levine & Edelstein, 2009). Allocating greater attention to instances of peak emotional intensity at encoding, and accessing instances of peak intensity at retrieval, contribute to people's tendency to exaggerate past emotional experience.

Changing appraisals of emotional events

The intensity of past emotions is not always overestimated, however. Drawing on appraisal theories of emotion, Levine (1997) argued that the reconstruction of explicit memory for emotions can consist of either over- or underestimation. According to appraisal theories, people experience emotions when they evaluate circumstances as being relevant to their goals, desires, or values. Specific types of appraisals elicit specific emotional responses (e.g. Levine, 1996; Oatley & Johnson-Laird, 1987; Scherer, Schorr, & Johnstone, 2001; Smith & Lazarus, 1993). Levine proposed that when gaps exist in people's memories for past emotions, emotional memories are reconstructed based on recall of the emotion-eliciting circumstances and their appraisals of those circumstances. If people's appraisals have changed since the occurrence of the emotion-eliciting event, they should show a bias towards recalling emotions that are consistent with their current appraisals. Whether

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emotions are over- or underestimated should thus depend on how people's interpretations of the emotion-eliciting event have changed (also see Ross, 1989).

Consistent with this view, Levine (1997) assessed people's memory for the emotions evoked by Ross Perot's abrupt withdrawal from his United States presidential candidacy in July of 1992. Perot's supporters described their emotional reactions and appraisals of Perot shortly after his withdrawal and again after he re-entered the presidential race and participated in the election. Changes in memory for emotions were found in the direction of supporters' current appraisals of Perot. Those who still supported Perot in November overestimated how hopeful they had felt about Perot's candidacy when he first dropped out of the race and underestimated how angry they had felt. In contrast, those who had turned against Perot underestimated how hopeful they had felt and demonstrated stable recall of anger. Similarly, Wilson et al. (2003) found that people's memories for how happy they had felt during the 2000 U. S. presidential elections were predicted by their current attitudes towards the candidates.

In general, our studies have shown that, the greater the change in people's beliefs concerning an emotion-eliciting event, the greater the instability in their memories for past emotions. Moreover, changes in specific appraisals are associated with instability in memory for specific emotions. For example, change in beliefs about whether an outcome was desirable is associated with changes in memory for how happy one felt, but has no effect on memory for how surprised one felt. Change in beliefs about whether an outcome was expected is associated with bias in memory for surprise, but not happiness (Levine, Prohaska, Burgess, Rice, & Laulhere, 2001; Levine, Whalen, Henker, & Jamner, 2005). Mixed valence emotions, which engender a need to reappraise events to resolve conflict, are particularly poorly remembered (Aaker, Drolet, & Griffin, 2008).

Finding an association between current appraisals and memory for emotion, however, does not indicate that changes in appraisals actually cause changes in how emotions are remembered. So Safer, Levine, and Drapalski (2002) conducted an experimental study of students' memory for how anxious they had felt before an important exam. The release of students' exam grades was timed to allow an assessment of how changes in appraisals affected memory for anxiety. Specifically, one group of students recalled how anxious they had felt before they found out their grade; the other group recalled their anxiety after finding out their grade. Compared to those who had not yet learned their grades, students who knew they did well on the exam underestimated how anxious they had been before the exam and students who knew they did poorly overestimated their pre-exam anxiety. Thus, students' current beliefs about their grades led to changes in their memory for their past feelings of anxiety.

The impact of changes in appraisals on memory for emotion increases with the passage of time. In a series of studies, Robinson and Clore (2000b) demonstrated that, as episodic memory for contextual detail becomes less accessible, people increasingly base their reports about past emotional experience on semantic knowledge about the types of emotions they typically feel in particular situations or on beliefs about emotions more generally. In one study, they primed a common cultural belief about emotion (that women are more emotional than men) and then asked people to rate the extent to which they had experienced several emotions over time frames ranging from the last few hours to the last few years. People's ratings of their past emotions were more consistent with primed beliefs when recalling how they had felt over long time frames than when recalling recent and short time frames. As episodic memory becomes less accessible, then, semantic beliefs contribute increasingly to memory for past emotional experience. Together this evidence

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suggests that, after brief delays, retrieving moments of peak intensity often leads to overestimation of past emotions, but as the interval between experienced and remembered emotion increases, current appraisals and beliefs can result in biases in the direction of either over- or underestimation.

Individual differences

People also differ in systematic ways in how they remember past emotions, with some people remembering experiences as better than they actually were and others remembering similar experiences as worse than they actually were. Safer and Keuler (2002) found that, among clients terminating psychotherapy, those who scored high on negative personality traits such as neuroticism tended to overestimate in recalling their pre-psychotherapy emotional distress, whereas those who scored high on positive traits such as ego strength tended to underestimate their pre-psychotherapy distress. Similarly, Feldman Barrett (1997) found that neurotics overestimated negative emotion whereas extraverts, to a lesser extent, overestimated positive emotion.

Enduring differences in the way people remember past emotions may stem in part from people's goals and the strategies they use to regulate emotion (e.g. Richards, Butler, & Gross, 2003). Lench and Levine (in press) examined the association between people's motivation to attend to positive versus negative stimuli and their memory for positive and negative emotion. People completed trait assessments of their general motivation to approach positive outcomes or avoid negative outcomes. They then completed a series of difficult anagrams (unscrambling letters to form words) and provided online ratings of how happy and anxious they felt as they completed each anagram (Lench & Levine, 2008). Approach goals (to attain success) and avoidance goals (to avoid failure) were self-reported in a first study and experimentally manipulated in a second study. Later, participants recalled the average intensities of happiness and anxiety they had experienced during the anagram task.

Consistent with prior research showing that the intensity of past negative experiences is often exaggerated, people remembered having felt less happy and more anxious than they initially reported. But this tendency to exaggerate negative feelings was qualified by people's motives and by the specific goals they set for the task. People with approach motivation and goals actually underestimated their distress by rating themselves as happier than they had been during this unpleasant task. In contrast, people with avoidance motivation and goals both experienced more anxiety, and overestimated more in recalling how anxious they had felt, relative to other participants. Lench and Levine (in press) also assessed the relation of peak emotion to remembered emotion, and whether this relation differed depending on people's motivation and goals. The strongest relationship between peak happiness and remembered happiness was found for people with approach motivation and goals. The strongest relationship between peak anxiety and remembered anxiety was found for people with avoidance motivation and goals. Thus retrieving moments of peak emotional intensity leads to exaggerating past emotion (Fredrickson, 2000), but the particular peaks to which people attend (e.g. happiness *vs.* anxiety) appear to be influenced by their motivations and goals.

People's strategies for regulating emotion also affect their memories for past emotions. In a recent study, Italian students rated the intensity of their emotions as they prepared for their high school exit exam (Levine, Tinti, Schmidt, & Businaro, 2009). They also described the strategies they were using to regulate their emotions (e.g. positive reappraisal, emotion suppression). After their exam, students recalled how they had felt

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during that stressful preparatory period. The results showed that, even after controlling for students' current emotions and how well they did on the exam, the more students engaged in positive reappraisal while preparing for the exam, the more happiness, interest, and curiosity they felt at the time of exam preparation, and the more they further exaggerated these positive emotions when recalling them later. Other emotion regulation strategies are associated with underestimation in recalling emotions. For example, people with a repressive coping style underestimated negative emotion relative to their previously recorded reports in daily diaries, whereas highly anxious people overestimated negative emotion (Cutler, Larsen, & Bunce, 1996).

In sum, explicit memory for emotion is often inaccurate and the retrieval context heavily influences how past emotions are remembered. Overestimation results from selective retrieval of moments of peak emotional intensity. Biases in the direction of over- or underestimation can result, however, from changes in people's appraisals of emotion-eliciting events, increasing reliance on semantic beliefs about emotion over time, and individual differences in people's traits, goals, and strategies for regulating emotion.

Sources of bias in implicit memory for emotion

Much less is known about sources of bias in implicit memory for emotion. Some researchers have argued that implicit memory for emotion, particularly fear, is indelible (Fanselow & Gale, 2003; LeDoux, 1996; van der Kolk, 1994). This claim is based primarily on findings that conditioned fear is remarkably long-lasting. Even after being extinguished, classically conditioned avoidance responses can re-emerge after a delay or after exposure to a stressful stimulus. Thus, extinction modifies behaviour but it does not seem to erase the original emotional memory (e.g. Quirk, 2002). Like explicit memories, however, evidence suggests that implicit memory for emotion is sensitive to recent experience and goals. For example, Henderson (1985) exposed rats to repeated pairings of a tone with shock, leading the rats to display fear when they heard the tone. After either 1 day or 60 days, the rats received a shock, unsignalled by the tone, that was either milder or stronger than the shock used during conditioning. When re-exposed to the tone, those rats that had recently experienced mild shock showed less fear in response to the tone than those that had recently experienced strong shock. Importantly, the difference in the intensity of the fear response following mild versus strong shock was much greater after 60 days than after 1 day. Thus, over time, memory for the intensity of fear had become increasingly malleable; that is, increasingly subject to bias in the direction of recent experience.

Research on humans also shows that implicit emotional memories can develop gradually as a result of repeated pairing of stimuli with positive or negative outcomes. Once established, these memories are nonetheless subject to change as a result of further experience and as a result of current goals and emotions (for a review see Gawronski & Bodenhausen, 2006). For example, racial prejudice results in part from repeated pairings of members of stigmatized groups with negative stimuli. Olson and Fazio (2006) exposed some white participants to images of black faces followed by positive stimuli. Participants then completed an implicit measure of racial prejudice. Participants in a control condition showed bias on an implicit association measure by responding faster to positive words after viewing white faces than black faces, suggesting more positive attitudes towards whites than blacks. This tendency was reduced in the experimental condition. Indeed, participants were actually somewhat faster to respond to positive words after viewing black faces than white faces, changes that persisted days after the initial conditioning. Other research

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indicates that people with the same history of prior positive or negative experience with stimuli evaluate those stimuli more positively on implicit measures if they are relevant to their current goals than if they are not relevant. Thus, implicit memory for emotion reflects not only whether a stimulus has been desirable in the past but also whether it is desirable at the moment given a person's current goals (Ferguson & Bargh, 2004).

In summary, both explicit and implicit memories for emotions are subject to forgetting over time. As explicit memories are forgotten, people increasingly draw on current interpretations of prior events and goals to help them infer how they must have felt (Levine & Safer, 2002). The impact of implicit memory for emotion on current feelings, thoughts, and actions is also influenced by recent experience and goals.

CONSIDERING FUNCTION

Alan Baddeley (1988) encouraged investigators to give serious consideration to the role memory phenomena play in normal human activity. Considering function, he argued, will help investigators look at those phenomena in new ways, ask new questions, and come up with productive answers. So, why do people remember emotions? And if it is important that emotion be represented in memory, why are these representations subject to forgetting and bias?

Functions of remembering emotion

We suggest that remembering emotion serves several functions. By summarizing and cueing critical information about past events, remembered emotion informs individuals' decisions about whether to seek out or avoid similar situations in the future. Remembered emotions also help the individual maintain a coherent sense of self over time (Conway, 2005). Moreover, shared memories of emotion may guide group members towards decisions that benefit the larger cultural group. These functions are consistent with theories holding that autobiographical memories serve future-directive, self-defining, and social functions (Bluck, 2003; Bluck & Alea, 2002; Bluck, Alea, Habermas, & Rubin, 2005; Pillemer, 1998, 2003).

Summarizing the significance of past events and cueing event memory

Remembering past emotion is important because it provides an efficient means of accessing essential information about events without retrieving inessential details. Remembered emotion conveys that an event is relevant to a person's goals. It further indicates the degree of urgency (intensity), whether goals are likely to be attained or obstructed (valence), and the types of cognitive or behavioural actions likely to be useful for maintaining, changing, or adapting to the situation (discrete emotions). Given limitations on attention and working memory, it is far more efficient to remember emotion than to remember all the features of events that evoked the emotion. Consistent with this view, people often remember that they had a positive or negative reaction to an event (e.g. a conversation, book, movie) without remembering much of the content (Zajonc, 1980). Recalling past emotions thus alleviates the need to store detailed descriptions of events, while letting people know whether to seek out or avoid similar situations in the future. Long after the details of a past experience become inaccessible, people appear to retain the emotional 'essence' of the experience and use this retained essence to help them recall the gist of what occurred (Safer, Breslin, Boesch, & Cerqueira, 2007).

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Guiding decision making

By conveying the significance of past events, and cueing important features of those events, memory for emotion helps people make decisions about the future. For example, Wirtz et al. (2003) found that the emotions students remembered having felt during their spring break vacations, rather than their anticipated or experienced emotions, best predicted their intentions to repeat those vacations in the future. Redelmeier, Katz, and Kahneman (2003) investigated people's memory for pain (which includes both a sensory and emotional component) caused by colonoscopy. They compared control patients to those for whom the colonoscope remained in place for an additional 1–3 minutes, resulting in a period of relatively mild pain at the end of a moderately painful procedure. Consistent with findings that ending states are particularly salient in retrospective evaluations of emotional experience (Fredrickson, 2000; Kahneman, Fredrickson, Schreiber, & Redelmeier, 1993), patients with this *additional* mild pain actually remembered the overall experience as less painful than the controls. These patients were also more likely than controls to repeat the procedure within 6 years, after controlling for prior colonoscopies, abnormal findings, and procedural indications. Thus, the pain remembered, rather than the pain actually experienced, affected the decision to repeat the procedure in the future. These studies indicate that people choose to seek out or avoid particular experiences based in part on their memories for how experiences made them feel. They support a slight modification of Thorndike's (1911) classic law of effect. The most fundamental rule about learning may be that individuals seek to repeat behaviours that they *remember* as resulting in satisfaction and avoid behaviours that they *remember* as resulting in discomfort. Thus, research shows that actual and remembered experiences often differ, and more than just learning from experience, we may also learn from the memory of our experience.

Transmitting culture

Remembering emotion not only allows individuals to maintain and learn from important life experiences, it allows them to pass that knowledge along to others (Bluck et al., 2005). Human beings are 'cultural animals' who process and retain much more complex social knowledge than social animals – knowledge that helps them survive, reproduce, and raise offspring (Baumeister, 2005; Bluck & Alea, 2002; Webster & Gould, 2007). Memory for emotional experience is an important component of cultural knowledge that allows members of the culture to benefit from the cumulative emotion experiences of the entire group without necessarily having to experience that emotion. Emotional memories are passed along via parents, teachers, peers, and social, political, and religious groups through channels as varied as facial and vocal expression, deliberate instruction, gossip, news, music, and storytelling (Rimé, 2009). Moreover, memories of past emotions are not simply passed like a package from person to person – culture contributes to the contents of the package. What people remember is shaped by the social dynamics of the situation in which emotions are recalled. The way people talk about emotional experiences with others, in turn, shapes how they later remember them (Hirst & Manier, 1996). Thus, memories of emotion may be seen as a basic building block of the stories that individuals, groups, and even societies construct and reconstruct about themselves (e.g. Collins, Pillemer, Ivcevic, & Gooze, 2007).

The persistence of implicit and explicit memory for emotion

Considering these various functions of memory for emotion may help to explain the need to represent emotion in two systems, implicit and explicit. Implicit memory for emotion

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allows people to respond quickly and (often, but not always) adaptively to rewarding and threatening situations they have encountered in the past. Implicit memories thus promote survival by allowing past experience to inform current preferences and behaviours. Indeed, the inability to draw on implicit memory of emotion, which can occur in patients with frontal lobe lesions, has been associated with markedly poor judgment and decisions (e.g. Bechara et al., 1997). A key feature of implicit memory of emotion, however, is that it elicits an emotional response in the present with all the accompanying physiological arousal, narrowing of attention to goal relevant information, and consideration of a restricted range of actions. This re-experiencing of emotion has drawbacks that make it important for emotion to be represented in two memory systems.

If people are to plan flexibly for the future (be it deciding what movie to rent, what career to pursue, or whether to negotiate with an adversary), they must also be able to retrieve explicit memories of emotion. Flexibility depends on the ability to consciously reflect on emotion, to remember *that* an event elicited emotion, and be able to communicate that memory to others, without being subject to the resource costs of re-experiencing emotion in the present. The importance of explicit memory for emotion can be illustrated by research on memory for physical pain. One can remember past pain experiences explicitly, such as when women describe their pain during labour, but thankfully, such explicit recall does not lead to re-experiencing the pain itself (Morley, 1993). The explicit memory does not commandeer attention, thought, physiology, and behaviour, in the same way that the actual labour pain would. In summary, representations of emotion in implicit memory serve as an automatic signal of the relevance of events for people's goals that bypasses the need for reappraisal. Explicit memory allows for deliberate retrieval of past emotion with greater flexibility and fewer physiological and cognitive costs. Thus, there are important reasons to remember emotions, reasons that justify their double representation in memory.

Functions of forgetting emotion

If memory for emotion is so important, why are these memories subject to forgetting and bias over time? Memory distortion is typically viewed as problematic. In the case of emotion, memory distortion has been described as interfering with people's ability to learn from past emotional experience and make informed choices for the future (e.g. Wilson et al., 2001, 2003). The risks of remembering too much, though, may be even greater. From the volatile emotions of infancy, through the mood swings of adolescence, and throughout adulthood, emotion provides an ongoing indicator of the relation between events and an individual's well being. Most emotions are mild but even in adulthood intense emotional experiences are far from rare. William James (1890/1950) argued that selection is essential for a functioning memory system. A memory system that preserved each of these experiences indelibly would be too unwieldy to serve the functions of guiding preference and future behaviour and transmitting culture.

If memory must be selective, which memories should be forgotten? Remembered emotions signal whether circumstances that have been encountered in the past should be sought out or avoided. If a person's goals or beliefs have changed, however, remembered emotion may no longer serve as a useful guide. The more time passes, the more likely it is that such changes will have occurred. Environments also change over time, with longer time frames associated with greater change. As a result, distant memories generally serve as a less useful guide to goal-directed behaviour than recent memories. For this reason, the

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forgetting of distant memories may be adaptive (Anderson & Schooler, 2000; Henderson, 1985). Indeed, the failure of implicit memories of emotion to be forgotten over time, and as conditions change, is a debilitating feature of post traumatic stress disorder (Krans, Näring, Becker, Holmes, this volume; Rubin, Berntsen, & Bohni, 2008).

Forgetting or minimizing past negative emotions may be particularly important for the self-defining function of autobiographical memory. Research on adolescents who contemplated or attempted suicide is consistent with this view. For example, Klimes-Dougan, Safer, Ronsaville, Tinsley, and Harris (2007) asked young adults to recall whether or not they had reported suicidal thoughts or behaviours in a clinical interview for at-risk youths 6 years earlier. Participants were given several prompts to try to recall the prior clinical interview. Young adults who had forgotten their previously reported suicidal thoughts, plans, or behaviours were currently functioning better than those who remembered them, as indicated by both clinician and self-report measures. Two epidemiological studies, one in Germany (Christl, Wittchen, Pfister, Leib, & Bronisch, 2006) and one in Australia (Goldney, Winefield, Winefield, & Saebel, 2009) found similar results. Both studies asked youths on two occasions, 4 years apart, about suicide attempts and ideation in their lifetime. They compared youths who, in describing their lifetime experience, answered 'yes' both times to those who answered 'yes' the first time but not the second. The results indicated that youths who did not remember their earlier experience of suicide ideation or behaviour were functioning much better on measures of mental health than were those whose memories remained consistent over the two time periods. Although forgetting negative feelings is often characterized as a defense mechanism to keep such feelings from consciousness, it may be better described as an 'offence mechanism' that facilitates coping (e.g. Coifman, Bonanno, Ray, & Gross, 2007; Klimes-Dougan et al., 2007; Rice, Levine, & Pizarro, 2007). Clinical efforts may be most effectively directed towards enhancing these adaptive processes.

Functions of bias

As memory for emotion becomes less accessible over time, it becomes more subject to bias (e.g. Henderson, 1985; Levine, 1997; Robinson & Clore, 2002a,b). One feature of bias in memory for emotion that has mystified investigators is why people exaggerate so often when recalling past emotions (e.g. Wilson et al., 2003). Surely they should learn from prior mistakes as expectations based on memories of past emotions are repeatedly disconfirmed. People, who repeat an experience, only to find that the experience is not as thrilling or devastating as they remembered, should logically become better estimators of past experiences over time. The fact that they do not leads one to consider the functions that may be served by remembering past emotions as more intense or frequent than they really were. Safer et al. (2002) found that students who did poorly on their midterm exam recalled more pre-exam anxiety than they had actually reported. The more students overestimated their pre-exam anxiety, however, the more they planned to study for the final exam. Thus, exaggerating emotion may promote attention to goals and spur people's efforts to attain them (e.g. Norem & Illingworth, 2004).

We have argued that one function of memory for emotion is to guide goal-directed behaviour. If so, it may be possible to predict when past emotion will be over-estimated and when it will be underestimated. To the extent that a problem is ongoing, unresolved, and has implications for the future, memory for past emotions concerning the problem

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should be accurate or exaggerated (for related views see Walker & Skowronski, this volume; Wilson & Gilbert, 2008). This may explain why memory for the emotions elicited by life-threatening trauma and social rejection show notable persistence over time (e.g. Chen, Williams, Fitness, & Newton, 2008; Porter & Peace, 2007). Exaggerating past distress may motivate those who are mobilizing resources to cope with a threat. Once a situation has been resolved, however, past emotion should be underestimated or forgotten, marking what Taylor (1991) referred to as the minimization phase of coping.

In addition to mobilizing efforts directed towards coping with ongoing challenges, exaggerating past negative emotion may help people maintain positive illusions about their ability to cope (Taylor & Brown, 1988). For example, Safer and Keuler (2002) found that approximately two-thirds of terminating psychotherapy clients overestimated in remembering their pre-therapy distress. Clients who did not show objective improvement in therapy were particularly likely to overestimate their pre-therapy distress, thereby apparently perceiving a greater positive change with therapy than was warranted. In contrast, clients who improved the most tended to underestimate past distress. Good current functioning was associated with the retrospective reappraisal that past negative experiences were 'not so bad'. Safer, Bonanno, and Field (2001) found similar memory biases in a sample of widows and widowers after the midlife death of a spouse. In contrast, illusory perceptions of growth from traumatic experiences, based on exaggerating past negative experiences, may be a coping strategy for people who are not functioning so well.

In summary, two important functions of memory for emotion are to guide goal-directed action and to help individuals develop a coherent picture of their lives, rather than to serve as an indelible record of the past (Christianson & Engelberg, 1997; Conway & Pleydell-Pearce, 2000; Schacter, 2001). Although memory accuracy is often considered crucial for effective decision-making and self-knowledge, forgetting and selection in memory for emotion may be better thought of as learning. Much like an updated map that reflects current road conditions is the most useful to guide driving, updating memory for emotions based on recent experience and goals may be a flexible, adaptive process that enables memory to serve as a more useful guide for future behaviour (Levine, Safer, & Lench, 2006). Thus, forgetting and bias in memories for past emotion may reflect in part learning and updating of information to reflect changes in one's ongoing emotional environment.

In conclusion, memories for past emotions inform people's current feelings, thoughts, and behaviour by efficiently encapsulating critical information about past events. Emotions are represented in at least two forms in memory. Explicit memories, based on semantic and episodic knowledge, can be deliberately retrieved under varying circumstances and easily shared with others. Because they do not reproduce the subjective and physiological components of emotion, these memories can be retrieved and communicated without powerfully redirecting a person's thoughts and behaviours. In contrast, implicit memories of emotion become accessible without deliberation under circumstances that closely resemble the context in which an emotional event occurred. Such memories serve the function of directing current attention, thinking, and behaviour towards avoiding aversive states or attaining desired states. The ability to remember past emotions is critical for guiding preferences and behaviours of both individuals and cultural groups. Yet the ability to forget and update such memories may be just as important. Forgetting and bias make it possible for decisions to be guided by recent and relevant emotional experience and promote effective coping. It is thus the persistence and construction of relevant memories, rather than retention of exact copies of past experience, that allow people to effectively navigate their complex world and live to tell others about their experiences.

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