Influences of emotion on context memory while viewing film clips

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Participants listened to words while viewing film clips (audio off). Film clips were classified as neutral, positively valenced, negatively valenced, and arousing. Memory was assessed in three ways: recall of film content, recall of words, and context recognition. In the context recognition test, participants were presented a word and determined which film clip was showing when the word was originally presented. In two experiments, context memory performance was disrupted when words were presented during negatively valenced film clips, whereas it was enhanced when words were presented during arousing film clips. Free recall of words presented during the negatively valenced films was also disrupted. These findings suggest multiple influences of emotion on memory performance.

The role of emotion in human memory has been approached from both psychological and biological perspectives (for reviews see Dolan, 2002; Hamann, 2001; McGaugh, 2003; Reisberg & Heuer, 2004). Seminal investigations by Cahill and colleagues (Cahill, Prins, Weber, & McGaugh, 1994; Guy & Cahill, 1999) demonstrated enhanced memory for information presented in a (negatively) emotional context. This enhancement was mediated by noradrenaline, and the effect was eliminated when participants were administered an adrenergic antagonist (propranolol hydrochloride) during study (Cahill et al., 1994). Such findings point to an emotional arousal system that facilitates memory storage during learning. Based on abundant animal and a growing body of human research, this emotional arousal system depends significantly on the amygdala (Dolan, 2000; LeDoux, 2000; McGaugh, 2003). For example, neuroimaging studies demonstrate amygdala activation during the encoding of emotionally laden stimuli (Hamann, Ely, Grafton, & Kilts, 1999). Moreover, in subsequent tests memory of emotional pictures was correlated with amygdala activation during encoding (see also Canli, Zhao, Brewer, Gabrieli, & Cahill, 2000).

Despite a growing body of research demonstrating enhanced memory for emotional events, studies of eyewitness memory and psychological trauma suggest reduced or distorted memory under emotional stress. Such studies typically assess memory for real-life, autobiographical events.

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For example, it is often reported that details of an unpleasant or traumatic event are not well remembered (for review see Christianson, 1992). Some laboratory studies corroborated the finding of reduced memory for information presented in the presence of unpleasant stimuli (Loftus & Burns, 1982; Peters, 1988). Yet even in evaluations of real-life events, such as those that assess so-called flashbulb memories (e.g., remembering the *Challenger* space shuttle disaster), memories can be enhanced for details of an emotional event (Brown & Kulik, 1977; Bohannon, 1988).

How can one reconcile both enhanced and reduced memory for emotional events? Easterbrook's cue utilization hypothesis (Easterbrook, 1959) offers an explanation based on selective attention. He proposed that emotional events produce a narrowing of attentional focus for emotional stimuli. This attentional focus benefits central information but does so at the expense of encoding peripheral information. Terms such as *weapon focus* and *tunnel memory* have been used to suggest central–peripheral trade-off effects (Loftus, Loftus, & Messo, 1987; Safer, Christianson, Autry, & Oserlund, 1998; Christianson & Loftus, 1991). Based on this view, subsequent memory performance is determined by the degree of attention directed to stimulus features (see also Reisberg & Heuer, 2004; Seibert & Ellis, 1991).

Cue utilization is consistent with other attentional effects on contextual memory. In one study (Jurica & Shimamura, 1999), attentional trade-offs between item (central) and source (contextual) information was observed in an study of the generation effect (Slamecka & Graf, 1978). Participants interacted with three people or sources in a simulated social conversation. These people were shown as faces on a computer screen who presented items in the form of a question (e.g., "What type of sports are commonly watched on television?") or in the form of a statement (e.g., "Many people think that dogs make great pets"). At test, participants were first asked to recall as many topics as possible. After this item recall test, a context recognition was given in which an item (question or statement) was presented along with the three faces used in the study phase, and participants determined the face associated with the item. A positive generation effect was observed on the item recall test. That is, topics presented as questions were remembered better than those presented as statements. For source memory, however, a negative generation effect occurred. That is, remembering who presented the item was better for topics presented as statements than those presented as questions. Thus, focusing attention to a question—by attempting to generate an answer—facilitated memory for item information but reduced memory for the source of that information. Based on these findings, cue utilization could be considered within a more general framework of item–source trade-off effects. That is, memory enhancement that results from heightened arousal occurs because of increased encoding of item information at the expense of encoding source information.

Although item–source trade-offs may account for some findings associated with emotion and memory (see Christianson, 1992; Easterbrook, 1959), they cannot completely account for extant findings. Some studies have shown that emotional stimuli enhance memory for both central and contextual information (Burke, Heuer, & Reisberg, 1992; Heuer & Reisberg, 1990; Doerksen & Shimamura, 2001). In one study, Heuer and Reisberg (1990) presented a series of slides depicting a story about a boy visiting his father at work. The neutral condition described the father as a mechanic working on a car, whereas the emotional condition described the father as a surgeon performing an operation. Memory for central information (e.g., father was a surgeon, not a pediatrician) and memory for peripheral information (e.g., color of mother's sweater) were both enhanced in the emotional condition. In a follow-up study by Burke et al. (1992), some aspects of the periphery were again enhanced, whereas other aspects, such as background information (e.g., what tool can been seen in the garage), were reduced in the emotional condition. In a source memory experiment, Doerksen and Shimamura (2001) asked participants to associate colors with emotionally valenced words or neutral words. Memory for the color associated with a word (i.e., contextual memory) was better for emotionally valenced words than for neutral words. Thus, in some conditions both item and contextual memory are enhanced by emotional stimuli.

Differences in methods may account for apparently paradoxical effects of emotion on aspects of memory. A variety of experimental factors could influence the contribution of emotion to memory. Such factors include the emotion elicited (happiness, sadness, disgust), the manner in which emotion is elicited, the type of material to be learned, the dependent variable used to assess memory, and other seemingly mundane factors (e.g., exposure duration, retention interval). Indeed, findings suggest that there are differences in memory performance with respect to some of these factors (see Bradley, Greenwald, Petry, & Lang, 1992; Metcalfe, 1998; Ochsner, 2000). Moreover, emotion can been elicited by diverse methods, such as the presentation of emotionally laden words, pictures, films, or even task situations (e.g., emotional stress elicited by a confederate). Not only are these methods qualitatively different, but they can vary significantly in the level of emotional arousal elicited. Thus, reading the word *suffocation* probably will not produce as much emotion as watching a film of a person being suffocated and certainly not as much emotion as actually experiencing it. It is even possible that the effect of emotion on memory is curvilinear (e.g., Yerkes–Dodson curve), such that low to moderate levels of emotional arousal enhance memory to a point, but further increases of arousal impair memory (see Christianson, 1992).

There is also an inherent confound in the assessment of emotional fac-

tors on memory. If the information to be learned is associated or bound with the emotionally laden stimulus, then it becomes difficult to compare memory performance between emotional and neutral conditions. That is, there is often overlap in the emotion-inducing stimulus and the stimulus that is to be remembered. Consider an experiment in which participants view a film about an assassination (emotional condition) and a film about a librarian (neutral condition). Later participants are asked to recall details about the film, such as an implement that a person was holding. In such studies, it is difficult to match or counterbalance the salience of the material learned between the two conditions because what is to be recalled is intricately associated with the emotional event. Whenever to-be-remembered items are associated directly with the emotional event (e.g., a weapon, perpetrator, or accident victim), it becomes difficult to compare performance between emotion and neutral conditions. A worthy attempt to circumvent this confound is the study by Cahill et al. (1994) in which the same slide presentation was presented to both emotion and control groups while they listened to different narratives (i.e., true accident vs. hospital training).

In the present study, we assessed memory for neutral words presented during film clips that were designed to elicit different levels of emotional arousal. To avoid the confound mentioned earlier, the material used to elicit emotional arousal was separated from study material, in terms of both sensory modality and content. Specifically, emotional arousal was elicited by the presentation of four film clips (audio turned off): a neutral film, a positive film, a negative film, and an arousal film. While participants viewed these films, they listened to a list of neutral words. At test, memory for the films' content, free recall for the words, and context recognition memory were assessed. In the context recognition test, a word was presented along with names that identified the four films. Participants were asked to determine which film was being shown when the word was presented. In this way, we could assess the contribution of emotional valence (positive vs. negative) and arousal on tests of free recall and context recognition for words presented while participants viewed emotional films.

EXPERIMENT 1

METHOD

Participants

Forty undergraduate students (14 men, 26 women) from the University of California at Berkeley were paid or received course credit for participation in the experiment. The participants averaged 19.8 years of age and 14.1 years of education. All participants reported normal hearing and normal or corrected-to-normal vision.

Stimuli and design

We presented 2-min film clips that were classified as control (neutral) film, positive film, negative film, and arousal film. The control film came from a commercial cooking video of a person mixing a batter (face not shown). The positive film portrayed penguins running and jumping onto glaciers in a playful manner. The negative film portrayed a surgical arm amputation. The arousal film depicted a car chase scene in which a car runs through city and country streets. The control, positive, and negative films were obtained from a set developed by Fredrickson and Kahneman (1993), and some of them were used in other studies (Ekman & Friesen, 1974; Gross & Levenson, 1995). The arousal film clip was obtained from a commercial film. The films were recorded on videocassettes and presented on a combination TV–VCR player with the audio turned off.

Context memory was assessed using word lists, each composed of 15 words. Six lists were obtained from a pool of 90 neutral nouns (one to three syllables long). Four lists were used during the study phase, and words from two other lists were used as distractors during the context recognition test. Mean word frequency of the words was 94.0 entries per million (Francis & Kuc̆era, 1982) and was balanced across lists (list means ranged from 91.2 to 97.6 per million). Word lists were recorded on audiocassettes by the same female voice. To reduce primacy and recency effects, two buffer words were placed at the beginning and two at the end of each list. Buffer words were not included in analyses of the data.

Procedure

In the study phase, participants watched the four film clips (control, positive, negative, arousal) with the audio turned off. At the same time, they listened to words presented on headphones. Participants were instructed to pay attention to both the content of the film and to the words, but no instructions were given about the nature of testing. Between film clips a 2- to 3-min break was given. Both the presentation order of the films and assignment of word lists to films and distractors were counterbalanced across participants.

After viewing all four film clips, participants were administered a free recall test for words presented during the films. Participants were given 4 min to report as many words as possible in any order. After the free recall test, participants were tested on details of the films. This film survey test included seven questions for each film. Questions required short answers (e.g., "What is in the bowl at the beginning of the film clip?" [control film]; "What is the color of the car that is being chased?" [arousal film]). Because it is difficult to match for the salience of item information across film clips, this film survey test was designed simply to affirm that participants were paying attention to the content of the films. Participants were instructed to answer every question and to make their best guess if the answer was not known.

After the film survey test, the context recognition test was administered. Participants were presented the 60 study words (i.e., the four 15-word lists) randomly intermixed with 30 new words. For each trial, a word was presented visually with five choices, labeled as "Cooking Film," "Penguin Film," "Operation Film," Car Chase Film," and "New Word." Participants were instructed to determine which film clip was showing when the word was presented. They were to select "New

Word" if they thought that the test word had not been presented during the study phase. Thus, by one measure chance performance on this test is 20%. A Macintosh microcomputer using HyperCard software was used to present the test trials. Participants used a mouse to select one of the five choices, which were presented as screen buttons. The source test was self-paced, and participants were instructed to guess if they could not remember.

Independent ratings of film clips on pleasantness, arousal, and dominance

A separate group of participants ($n = 21$) rated each film on the basis of three dimensions: pleasantness, arousal, and dominance. The raters were shown the four film clips without sound and no word presentations. Immediately after each film, they were given the Self Assessment Manikin (SAM) scale developed by Bradley and Lang (1994; Bradley et al., 1992). The SAM scale includes ratings on three dimensions, each scored on a 5-point scale: pleasantness (1, *very unhappy;* 5, *very happy*), arousal (1, *very calm;* 5, *excited*), and dominance (1, *not in control;* 5, *very in control*). Mean ratings on these dimensions for each film were calculated (in Bradley & Lang, 1994, the scores on the 5-point scale are doubled, for a scale of 2–10). The pattern of these ratings with respect to memory performance is discussed in the *General Discussion*.

RESULTS AND DISCUSSION

Table 1 displays performance on the film survey, word recall, and context recognition tests. On the film survey test, an ANOVA did not reveal a significant main effect of memory for film details across clips, $F(3, 39) = 1.95$, $p = .12$. Planned comparisons between films suggested that memory for details of the negative film was poorer than memory for details of the control film, $F(1, 39) = 5.59$, $p < .05$). No other comparisons approached statistical significance. As mentioned earlier, the film survey test should be viewed merely

Table 1. Percentage (*SE*) of correct responses on film survey, word recall, and source recognition tests in Experiment 1

	Film type			
	Control	Negative	Positive	Arousal
	Experiment 1			
Film survey	58.6% (2.7)	49.5% (2.5)	54.9% (2.6)	55.7% (3.1)
Word recall	18.5% (2.0)	7.0% (1.5)	15.7% (2.3)	18.2% (2.4)
Source recognition	29.5% (2.5)	22.8% (2.2)	29.3% (2.4)	36.5% (3.2)
	Experiment 2			
Film survey	58.7% (3.3)	58.6% (2.9)	63.2% (2.9)	65.7% (3.3)
Word recall	16.7% (2.2)	7.3% (1.7)	15.0% (2.1)	19.3% (2.3)
Source recognition	31.8% (2.1)	25.2% (2.2)	30.5% (2.6)	37.2% (2.8)

Note. Standard errors in parentheses.

as an indication that participants were paying attention to the film because it is difficult to match for the salience of details across different films. The survey showed that participants had good memory for the details of all four films, with somewhat less memory for details of the negative film.

Free recall performance for words presented during the film clips revealed a significant main effect, $F(3, 39) = 8.33$, $p < .01$. Planned comparisons indicated that word recall was significantly lower for words presented during the negative film than for words presented during the other three films ($ps < .01$). Comparisons of word recall performance between any the other three films did not approach statistical significance.

Performance on the context recognition test revealed an interesting pattern (Table 1). There was an overall main effect of memory performance across the four film clips, $F(3, 39) = 6.9$, $p < .01$. In planned comparisons, context memory for words presented during the negative film was significantly lower than context memory for words presented during the other films, $ps < .05$. Moreover, context memory for words presented during the arousal film was significantly better than context memory for words presented during the control, $F(1, 39) = 5.4$, $p = .02$, or negative film, $F(1, 39) = 4.9$, $p = .02$). Thus, findings from the context recognition test revealed multiple effects: disruption during the negatively valenced film and enhancement during the arousing film.

EXPERIMENT 2

In Experiment 1, viewing a negatively valenced film reduced context memory for words presented during the film. However, an arousing film clip actually enhanced context memory. A positively valenced film did not affect context memory compared with a neutral film. Because these findings were based on a single set of films, it was necessary to ensure that the effects were not based simply on extraneous factors specific to the content of the films used in Experiment 1. In Experiment 2, a different set of films was used to elicit positive emotion, negative emotion, and arousal. As a way to compare this second set of films with the first, we used the same control film as that used in Experiment 1 (cooking film). Other than the films used in this experiment, the methods were identical to those used in Experiment 1.

METHOD

Participants

Forty undergraduate students (16 men, 24 women) from the University of California at Berkeley were paid or received course credit for participation in the

experiment. The participants averaged 19.2 years of age and 13.5 years of education. All participants reported normal hearing and normal or corrected-to-normal vision.

Stimuli and design

Other than the film clips selected for the positive, negative, and arousal conditions, the design of this experiment was the same as that used in Experiment 1. The positive film clip consisted of two segments; the first showed bears playing with each other, and the second showed dogs performing tricks. The negative film clip portrayed a ritual of self-mutilation in which people used sharp rocks to inflict bruises. The arousal film depicted downhill skiers racing and performing stunts (but never falling). The control film was the same cooking film used in Experiment 1. The control, positive, and negative film clips were obtained from a set developed by Fredrickson and Kahneman (1993).

Procedure

The procedure was identical to that used in Experiment 1. In summary, word lists were presented (through headphones) while participants watched film clips. Three memory tests were given: film survey test, word recall test, and context recognition memory test.

Independent ratings of film clips on pleasantness, arousal, and dominance

The same group of participants ($n = 21$) who rated the film clips used in Experiment 1 also rated the clips used in this experiment. These participants simply viewed the film clips (no memory task) and later were asked to rate them. Mean ratings for the dimensions of pleasantness, arousal, and dominance are shown in Table 2. The pattern of these ratings with respect to memory performance will be discussed in the *General Discussion*.

RESULTS AND DISCUSSION

Table 1 displays performance on the film survey, word recall, and context recognition tests. Performance on the film survey test revealed no significant differences across film clips, $F(3,39) = 1.8$, $p = .15$, and none of the planned comparisons reached statistical significance. On the word recall

Table 2. Mean pleasantness, arousal, and dominance ratings in Experiment 2

	Film type			
	Control	Negative	Positive	Arousal
Pleasantness ratings	3.24 (.15)	1.29 (.07)	4.14 (.12)	3.64 (.13)
Arousal ratings	1.52 (.20)	3.86 (.15)	2.50 (.17)	3.29 (.17)
Dominance ratings	4.33 (.20)	1.86 (.14)	4.10 (.14)	3.74 (.15)

Note. Ratings based on 5-point scale (standard errors in parentheses).

test, there was a significant main effect across films, $F(3,39) = 8.4$, $p < .01$, and planned comparisons showed that word recall was poorest for words presented during the negative film, ps $< .01$. Word recall performance was comparable for the other three films. Thus, word recall performance in this experiment replicated that observed in Experiment 1.

Context recognition performance also revealed the same pattern observed in Experiment 1 (see Table 1). There was an overall main effect of film type, $F(3,39) = 5.51$, $p < .01$, and context memory performance was significantly lower for words presented during the negative film: control vs. negative, $F(1, 39) = 5.0$, $p < .05$). Moreover, context memory for the words presented during the arousal film was generally enhanced. Specifically, compared to the control film clip there was marginal enhancement of context memory performance for words presented during the arousal film, $F(1, 39) = 3.2$, $p = .07$). This effect was statistically significant when the arousal film was compared with the combined performance of the control and positive film, $F(1, 39) = 5.5$, $p = .02$).

GENERAL DISCUSSION

In two experiments, participants listened to neutral words while watching film clips. Later, they were given tests of film content (film survey test), word recall, and context recognition. The film clips were classified as neutral, positive, negative, and arousing. Of particular interest was context recognition performance. In this test, participants were presented a test word and asked to identify the film that was showing when they originally heard the word. Memory for words associated with negatively valenced films (arm amputation or self-mutilation film clips) was *less than* memory for words associated with the other film clips. Memory for words presented during negatively valenced film clips was also lower on the word recall test.

Arousing film clips (car chase or ski jump film clips) enhanced context memory. This effect was not observed on the free recall test, which could suggest that arousal has particular effects on the association of central information to its context. Thus, with respect to context memory, arousing film clips enhanced performance, whereas negatively valenced film clips reduced performance. The positively valenced film clips used in this study (playful penguins and other animals) did not produce reliable differences on word memory performance compared with the control film clip (cooking show). Perhaps the positively valenced film clips selected, though rated high in pleasantness, did not elicit as strong a positive influence compared with other possible film types (e.g., sexually arousing or humorous films).

Independent ratings of pleasantness, arousal, and dominance were assessed for each film clip using the SAM rating scale (Bradley & Lang, 1994). Across the two experiments, ratings for the two film clips used in the same emotion condition were very similar to each other, so we averaged ratings across the two clips in each condition. As shown in Table 2, the ratings across these three dimensions provide interesting clues concerning the pattern of memory performance across conditions. Compared with the neutral film, negative films were rated low on both pleasantness and dominance, $p < .01$, but high on arousal, even higher than the arousal films, $p < .01$. The arousal films were rated generally high on all three dimensions (with ratings above 3.0), perhaps indicating high interest value. The positive films were rated significantly higher on pleasantness than any other film, $p < .05$, but low on arousal compared with the negative and arousal films. In sum, the negative films showed a pattern of low–high–low, with respect to ratings on pleasantness, arousal, and dominance, whereas the arousal films showed a pattern of high–high–high across these ratings.

The particularly high arousal ratings for the negatively valenced film clips prevent firm conclusions concerning the differential role of valence and arousal on context memory. Indeed, in most real-life emotional situations (e.g., witness to a crime or accident), both valence and arousal are likely to be extremely high. Of course, it is possible to use rating responses in the laboratory to manipulate valence and arousal independently, such that certain emotion conditions are equated on ratings of arousal but vary on ratings of valence. However, because valence and arousal are inherently correlated, such stimuli may be rather contrived, reduced in potency, or not truly equated. Despite these limitations, a recent study in which arousal ratings were equated across valence conditions showed that memory for negatively valenced pictures was better than for neutral pictures, although context memory for words presented with negatively valenced pictures was worse (Touryan, Halberg, & Shimamura, 2003). In the present study, the surprising result is that context memory performance was both reduced during negatively valenced films and enhanced during arousing films, which suggests that multiple influences were involved in the modulation of context memory during the presentation of these film clips.

Considering extant findings of enhanced memory for negative emotional events (Cahill et al., 1994; Guy & Cahill, 1999), the disruption of context memory under such conditions appears anomalous. Yet context memory, as tested in the present study, was assessed for information peripheral and irrelevant to the emotional event. In such instances, context memory appears to be impaired when associated with negatively valenced stimuli. Such findings are consistent with Easterbrook's cue utilization view (Easterbrook, 1959). That is, emotional states may cause a focusing of attention to central information at the sacrifice of encoding contextual

or peripheral information. This explanation is also related to notions of tunnel memory, weapon focus, and an attentional magnet (see Loftus et al., 1987; Reisberg & Heuer, 2004; Safer et al., 1998; Seibert & Ellis, 1991; Strange, Hurlemann, & Dolan, 2003; Touryan et al., 2003). The view can also be well described within the source monitoring framework proposed by Marcia Johnson (Johnson, Hashtroudi, & Lindsay, 1993; Johnson, Nolde, & De Leonardis, 1996). In this framework, a multitude of processes are involved in establishing a rich episodic trace, including the encoding of information related to central, contextual, processing, and emotional aspects of an event (Johnson et al., 1993). Depending on the processing demands, encoding one aspect of an event may benefit or impair processing of other aspects.

An alternative view by Davidson may explain the disruptive influence of negative emotional states. Davidson (1998, p. 313) suggested two fundamental aspects of emotion: approach and withdrawal, wherein fear and disgust act to "increase the distance between the organism and a source of aversive stimulation." Both of the negatively valenced film clips used in the present study probably elicited disgust as the primary emotion. Thus, the characterization of an emotional withdrawal effect during the disgusting film clips may aptly describe the memory influences observed in this study.

It should be noted that findings from other studies using peripheral or contextual information are not entirely consistent with the present findings. Both Heuer and Reisberg (1990) and Doerksen and Shimamura (2001) observed enhanced source memory for information associated with negatively valenced stimuli, even when the information was peripheral to the emotional event. Findings by Heuer and Reisberg were somewhat inconsistent because both enhancement and reduction of peripheral information were observed (i.e., background vs. peripheral condition). Doerksen and Shimamura reported enhanced context memory for the color of words when the words were emotionally valenced (both positively and negatively). In this case, the type of stimulus used to elicit emotion (emotional words) may differ in both the quality and the magnitude of the emotion elicited compared with film clips. As mentioned earlier, Touryan et al. (2003) used pictorial stimuli rather than words as emotional stimuli and demonstrated disrupted memory for peripheral stimuli when viewing negatively valenced pictures, which is consistent with the present findings.

Findings of enhanced context memory during arousing film clips suggest multiple and diverse effects of emotional arousal on memory. In the present study, viewing an arousing film (without negative influences) significantly boosted context memory performance. As indicated by ratings of the films on pleasantness, arousal, and dominance, these arousing

films were generally high on all three aspects. As mentioned earlier, it is unclear to what degree arousal without negative valence or influences of high dominance mediated the enhancement in context memory. Based on independent ratings, the negatively valenced film clips were most arousing. To the extent that item–context trade-off effects have been observed for negatively valenced stimuli (Burke et al., 1992; Christianson & Loftus, 1991; Touryan et al., 2003), one could suggest that the arousing film clips enabled a more pervasive memory-enhancing effect, whereas the negatively valenced film clips were accompanied by an anomalous withdrawal disposition, such as those suggested by Davidson (1998). Therefore, negatively emotional states, particularly highly arousing states, may elicit conflicting dispositions that could be conducive to item–context trade-offs or tunnel memory.

Because multiple influences—both beneficial and disruptive—were observed under conditions of emotional arousal, any general conclusions about the influences of emotion on memory must be tempered by a qualifications. One concern is context-dependent mood effects, which tend to last for many minutes and depend on the overarching mood state of the participant (see Bower, 1981; Eich, Macaulay, & Ryan, 1994; Hertel, 2004). In such instances, mood states can produce a contextual basis for memory encoding and retrieval. Because the emotional conditions presented in this study lasted for 2 min, it is possible that the effects are related to such mood-induced states. However, such effects are subtle unless significant mood induction techniques are used and rich autobiographical memories are requested (see Eich et al., 1994; Eich & Macaulay, 2000). Nevertheless, mood-dependent memory effects may have played a role in the pattern of the present findings, which may account for the multiple effects of emotions on context memory performance.

In conclusion, the present study demonstrated that the viewing of negatively valenced films reduces context memory, whereas the viewing of arousing films enhances context memory. The finding of reduced memory during a negative event may appear anomalous with other findings suggesting enhanced memory in such situations. However, we analyzed memory for contextual information that was peripheral to the emotion-inducing event. Interestingly, a study by Morgan et. al. (2004) found similar results in which military personnel subjected to high-stress interrogations during survival school training exhibited less memory for the interrogator (i.e., face identification) than those who experienced low-stress interrogations. Taken together with the present experiment and other studies, an emotional event can produce complex influences on memory, particularly both benefits and costs for various aspects of memory. Indeed, the kind of emotion elicited (happiness, sadness, disgust), the kind of stimuli used to

elicit emotion (words, pictures, film clips), and kind of memory assessed (free recall, item recognition, context memory), may be important variables in assessing the full scope of emotional factors on memory.

Notes

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