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The effect of emotion on witness suggestibility

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THE EFFECT OF EMOTION ON WITNESS SUGGESTIBILITY

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TABLE OF CONTENTS

List of Tables……iii

List of Figures……iv

Abstract……v

Introduction and Review of Literature……1
Memory and Arousal……2
Weapon Focus Effect……6
Emotional Focus and Source Monitoring……7
Eyewitness Suggestibility……11
Individual Differences in Affect Intensity……13

Hypotheses……17

Materials and Methods……21
Participants……21
Design……21
Materials……21
Procedure……24

Results……27
Slide Items……28
Suggested Items……29
Control Items……31
Suggestibility Effect……32
Individual Differences in Affect Intensity……32

Discussion……34

References……40

Appendix A: The Short Affect Intensity Scale……43

Appendix B: Slide Presentation Sentences……45

Vita……46

LIST OF TABLES

Table1 Proportion of Accurate Responses on the Source Test by Focus and Event Type…...27

Table2 Proportion of Inaccurate Responses on the Source Test by Focus and Event Type….27

Table3 Proportion of Overall Accurate and Inaccurate Attributions to Item Types by Event Type……..…….32

Table4 Proportion of Items Attributed to the Event by Focus and Median Split AIM Scores for Neutral Event……...……33

Table5 Proportion of Items Attributed to the Event by Focus and Median Split AIM Scores for Emotional Event…….……...……..…33

LIST OF FIGURES

Figure1 Average Proportion of Slide Items Correctly Attributed to Slides by Event Type and Phase of Presentation……...…28

Figure2 Average Proportion of Suggested Items Misattributed to Slides by Event Type and Phase of Presentation…….…….……...…...30

Figure3 Average Proportion of Control Items Misattributed to Slides by Event Type and Phase of Presentation…….……...31

ABSTRACT

When witnesses are exposed to highly stressful and emotional events, the result is often increased arousal and a change in the pattern of attention. Both of these factors are likely to impact witnesses' memory for the event. In addition, witnesses are often exposed to post-event information from a variety of sources (e.g., investigators, other witnesses, media reports). The goal of the present study was to explore, in the context of the eyewitness suggestibility paradigm, the impact of emotional arousal and attentional focus on event memory and the incidence of eyewitness suggestibility. A secondary goal of this study was to explore the possible relationship between emotional arousal and individual differences in people's experience of, and reaction to, this arousal (Affect Intensity). The results revealed that emotional manipulation had an impact on subjects' memory for the event; emotion Ss recognized more event only items but only in the arousal phase of the slide sequence. The result also indicated that emotion Ss were more likely to misattribute post-event information to the event than were the neutral event subjects. Finally, the results showed that the magnitude of the suggestibility effect was significantly larger for emotional event subjects. The present study provides some empirical support that emotional arousal can have both positive and negative consequences on memory for the event. There was no support for the role of attentional focus and personality dimension of affect intensity on eyewitness performance.

INTRODUCTION AND REVIEW OF LITERATURE

Imagine yourself in the following situation: it is in the late afternoon when you leave your workplace, situated in a downtown area, heading for the parking-garage across the street. As you reach the elevator to go to the floor where you parked your car, a person approaches you with a handgun drawn and pointed at you. Stunned and panicked, you hear the elevator door opening; you jump in the elevator just before the door closes. Terrified and shaken you reach for your cell phone and call 911 for help and at the same time you hit the stop button. The elevator is blocked between floors; later you hear a man's voice identifying himself as a police officer. Later, at the police station, you recall the event.

This above scenario is a hypothetical example of a highly arousing eyewitness event, an event during which the witness experiences very strong emotional and physiological reactions as the result of a direct threat. According to a wide range of research done to understand how emotions (i.e., arousal resulting from exposure to either a positive or negative event) affect memory, we can expect that the witness in the above scenario to experience either an enhanced or diminished memory for the witnessed event. On one hand, there are studies that support the view that memory retention is better in response to events that are perceived by individuals as threatening, stressful or personally relevant and the accounts of the events are fairly well remembered, highly accurate and rich in perceptual detail (e.g., Cahill & McGaugh, 1995; Christianson, 1992; Christianson & Loftus, 1987). On the other hand, there are studies that support the opposite view; that memory retention will be impaired or partially diminished, at least for some types of information (e.g., Burke, Heuer, & Reisberg, 1992; Heuer & Reisberg, 1990, Reisberg, & Heuer, 2004; Pickel, French, and Betts, 2003). For example, research has found that participants who see a weapon during a simulated crime are

less likely to remember peripheral details of the event (the weapon focus effect; for a review, see Steblay, 1992). The goal of the following study is to better understand the conditions under which emotion helps or hinders memory for eyewitness events. In order to do this, the study will examine the effects of emotional arousal and attentional focus.

In the remainder of the introduction, I first briefly review relevant research on emotion and event memory. Next, I introduce the source monitoring framework and the issue of emotional focus, followed by a discussion of eyewitness suggestibility. Finally, I will discuss potential individual differences in the way that people experience affect (*affect intensity).*

Memory and Arousal

A number of studies have tried to systematically examine the effect of arousal on various aspects of event memory. Among the first to do so was Heuer & Reisberg (1990). Subjects in this study watched a sequence of slides accompanied by a tape narration. In the neutral version, subjects heard and saw a story about a boy and his mother going to visit his father at work; in this version the father was a chief mechanic at a garage. The mother leaves the garage, stopping to call her boss to say that she will be late for work. In the arousal version, the mother and son visit the father at work; in this version the father is chief surgeon at a local hospital. In the middle slides subjects saw a surgery and the patient's badly damaged legs. The mother leaves the hospital, stopping to call her boss to say that she would be late for work. To assess subjects' level of arousal, heart rate was monitored and recorded. Subjects in both neutral and emotional conditions were instructed "to attend the story while your heart is monitored." The authors also included a memorizing and a problem-solving condition. Subjects in those two conditions watched only the neutral version of the story. Subjects in memorizing condition were told to "memorize both the central story line….as well

the circumstantial details." Those in the problem-solving condition were told that their task was to "discern what event was mimicked." All subjects returned to the lab two weeks later for surprise recall and recognition tests, and subjects' memory was assessed for two kinds of information—central and peripheral. Their definition for central information was "any fact or element pertaining to the basic story that could not be changed or excluded without changing the basic story line." For example the fact that the father was a surgeon and not a pediatrician was a central type of information; the color of the mother's sweater was considered peripheral information. Heuer & Reisberg (1990) found that emotion had multiple effects on memory. First, they reported that overall arousal promoted memory for central information; subjects in the arousal condition recalled significantly more central information. These subjects also outperformed all other groups in the recognition task, with better memory for the middle phase of the procedure. Second, the emotional arousal enhanced the subjects' range of attention in that arousal subjects had more detailed memory for both the emotional slides and for the slides that followed the emotional ones. Third, arousal affected the pattern of intrusion errors. Subjects in the neutral condition were more likely to err regarding the plot (i.e., subjects described or identified events that had not appeared at all), while subjects in the arousal condition erred about the character of the protagonists (i.e., subjects tended to confabulate, exaggerate or falsify the characters' feelings and reactions).

In a follow-up study, Burke, Heuer, & Reisberg (1992) examined in a more systematic way the relationship between arousal, retention interval, and the type of to-be-remembered material. The materials employed in this study were identical with Heuer & Reisberg (1990) study. One group of subjects viewed a series of slides depicting an emotionally arousing story while the other viewed a series of slides depicting a neutral story. Each of the two slide

series was subdivided in three phases according to the plot of the story: first phase—slides before the arousal manipulation was introduced, second phase—slides during the arousal manipulation, and third phase—slides following the arousal manipulation. Within each group, subjects were tested immediately (Exp.1 and 2), 1 week (Exp.1 and 2) or 2 weeks (Exp.1) later. At test, subjects' memory was assessed with a recognition test containing multiple-choice questions that focused on four different types of information about the event (e.g., gist, basic-level visual information, central details, and background details). As in their previous study, emotional arousal had two effects on memory. First, emotion improved overall memory for both central and peripheral details. Second, emotion aided memory for central aspects of the event and impaired memory for more peripheral aspects of the event in phase 2, but not in the other phases.

Cahill & McGaugh (1995) followed up on the findings of Burke, Heuer, & Reisberg (1992) by examining whether the results could be explained by the different visual materials that were seen by subjects in the arousal and neutral conditions. In Exp.1, using identical materials and procedures, Cahill & McGaugh replicated findings of Burke, Heuer, & Reisberg (1992). In Exp.2 they changed the slide sequence such that subjects saw identical slides in both neutral and arousal conditions. Arousal was induced by a narration that accompanied the slides in the phase 2 of the arousal version (Phase 1 and 3 were highly similar). The free recall and recognition tests were administered two weeks later to all subjects. In both experiments, subjects in the arousal condition showed a significant increase in emotional reactions relative to those in the neutral condition. Arousal condition subjects also recalled more elements of the story than the neutral condition subjects; the enhanced memory for the slides was the result of better recall in phase 2. Although the authors found no overall

differences in recognition performance between subjects in the neutral and arousal conditions, a phase-by-phase analysis of the recognition test revealed enhanced memory in the emotional group subjects for phase 2 (which contained the emotional manipulation). However, unlike Burke, et al. (1992), Cahill & McGaugh found better memory in the arousal condition for both central and peripheral details in phase 2.

Research on emotion and memory has found that emotional arousal can sometimes increase retention. This finding has been largely attributed to biochemical changes in the brain (e.g., increased release of adrenaline; Cahill, Prins, Cahill, & McGaugh, 1994) and to greater activation of the amygdala, which increases memory formation through connections to the hippocampus (e.g., McGaugh, Ferry, Vazdarjanova, & Roozendaal, 2000). Other researchers (Burke, Heuer, & Reisberg, 1992; Cahill & McGaugh, 1995; Heuer & Reisberg, 1990; Laney, Campbell, Heuer, & Reisberg, 2004) have argued that arousal, per se, is not solely responsible for the obtained results.

Instead, it is argued that emotional arousal causes *attentional narrowing* (i.e., arousal causes a decrease in the range of cues to which an individual can attend). This narrowing of attention leads directly to the exclusion of peripheral cues, resulting in a poorer memory for those peripheral aspects of an emotional event. This attentional narrowing is also responsible for the beneficial effects of emotion on memory for the central elements of the event. Specifically, arousal is thought to act as an attention magnet—a very specific allocation of mental resources on those central aspects that contain the arousing information. This particular pattern of findings is found as well in research on the weapon focus effect.

Weapon Focus Effect

A second area of research to explore the issue of emotion and memory concerns the *weapon focus effect* (for a review, see Steblay, 1992). The weapon focus effect is a phenomenon in which the presence of a weapon (e.g., a gun, a knife, a sword, etc.) in the possession of a perpetrator decreases a witness's ability to remember what the perpetrator looked like and/or other details of the crime, as measured by identification performance or recall of physical features (e.g., Kassin, Tubb, Hosch, and Memon, 2001; Pickel, French, and Betts, 2003; Shaw and Stolnick, 1999; Wells and Olson, 2003).

In a classic demonstration of the effect, Loftus et al. (1987) showed Ss a series of slides depicting an event in a fast-food restaurant. In the experimental version of the slide sequence, half of the Ss saw a male perpetrator confronting the cashier with a gun. In the control condition, the other half of the subjects saw the same person holding a check. Using an eye-tracking device, the eye movements of subjects were recorded while they watched the slide sequence. The results showed that subjects focused more often, and for longer periods of time, on the gun in comparison to the check. In addition, performance of the subjects in the weapon was poorer than the control condition on a lineup identification task. Loftus et al. (1987) argued that their results supported the weapon salience hypothesis, according to which witnesses are attending only to the weapon while ignoring all the other details of the witnessed event (e.g., Pickel, 1998). An alternative view is that the weapon focus effect is due to heightened arousal. According to this view, the weapon indicates a threat, which induces emotional arousal among the witnesses, focusing their attention toward the source of the threat (weapon) and away from the perpetrator. The arousal hypothesis is a variation of Easterbrook's cue-utilization theory. The presence of a weapon signals to the witness the

existence of a threat which causes both an increased level of emotional arousal and a decreased level of attentional capacity, and as a result, the attention of the witness is focused on central (the weapon) rather than peripheral (physical features of the perpetrator) aspects of the scene. This hypothesis is supported by empirical data from subsequent research. For example, Kramer et al., (1990) experiment presented participants with a series of slides showing the perpetrator with the weapon totally exposed and participants in the control version saw the weapon hidden or partially exposed. It was found that participants in the experimental condition remembered fewer details about the person holding the gun than participants in the control condition. In addition, they reported that the experimental condition participants also reported higher levels of arousal. Kramer suggested that participants at high levels of fear (stress) or emotions probably attend to only a few details because fewer attentional resources are available as the result of the attentional narrowing.

Emotional Focus and Source Monitoring

The Source Monitoring Framework (SMF) of Marcia Johnson (Johnson, Nolde, & De Leonardis, 1996; Johnson, Hashtroudi, & Lindsay, 1993; Johnson, Foley, Suengas, & Raye, 1988) characterizes the process involved in determining the origin of memories, knowledge, or beliefs. At its core, SMF proposes that people determine the source of an item through a judgment process (i.e., rather than simply retrieving a source "tag" from memory). At the time of encoding, various features of events (e.g., visual, semantic, contextual, and affective detail) become part of the memory trace. According to this view, different sources of information have, on average, different phenomenal characteristics associated with them. For instance, memories of perceived events are more likely to include records of perceptual detail (color, shape, sound) and contextual detail (time, place), than memories of imagined events

that are more likely to include records of cognitive processes such as organization, elaboration and identification (Johnson, Foley, Suengas, & Raye, 1988). At retrieval, people judge the activated qualities of a given memory against their knowledge of event characteristics. Thus, one way that source attribution errors can occur is when an activated memory trace has characteristics that are typical of an alternate source (e.g., when memories of imagined items contain much visual or contextual detail).

Although research clearly demonstrates that the level of emotionality of an event can affect memory (e.g., Burke, Heuer, & Reisberg, 1992), another issue concerns the consequences of focusing on one's experienced emotions during the event. According to SMF, focusing on some aspects of an event (e.g., emotion) at encoding may sometimes lead to a paucity of detail about other aspects (visual or contextual detail) that would be needed to make an accurate attribution of the memory (e.g., Johnson, Nolde, & DeLeonardis, 1996).

Several studies have examined this issue in the context of SMF. For example, Johnson, Nolde, & De Leonardis (1996) examined the potential consequences of emotional focus on memory for content and memory for source. Specifically, they hypothesized that the relation between emotion and memory is dependent on the specific nature of the perceptual and reflective processing induced by emotion. Subjects heard statements of varying affective valence (Exp. 1), or watched a videotape in which two people made various affective statements (Exp. 2 and 3). In Exp.1 and 2, subjects in the self-focus condition were told to focus on how they felt about the statements and in the other-focus condition they were told to focus on how the speakers felt. A third self/speaker-focus condition (subjects' task was to think about how they felt about the speaker) was added in the Exp. 3. The acquisition phase was followed by a source-memory test for which subjects were asked to identify for each

statement whether speaker A or B had made the statement, or whether the statement was new. The authors reported that self-focus resulted in equal or better recognition for the content of the statements than did other-focus, but poorer identification of the source of the statements (Exp.1-3). In addition, the deficit of self-focus relative to other-focus was eliminated when participants focused on how they felt about the speakers rather than on how they felt about what was being said (Exp. 3). These findings indicate that whether emotional focus is likely to produce confusion among external source of memories depends on whether it reduces the processing that binds content with the kinds of perceptual, contextual, and semantic features of external events that are important cues for source. Thus, focusing on how one feels about some topic sometimes results in more impoverished encoding of perceptual and contextual information that are necessary for accurate source monitoring in some situations.

Mather & Johnson (1998) explored whether thinking about feelings and reactions to a story would increase the likelihood of integrative memory distortion. Subjects were told either to focus on the details of the story (factual focus condition) or to focus on their feelings and reactions to the story (emotional focus condition). Subjects heard one of two short taped stories. In one version, the couple agrees that they don't want children, but don't get married, and in the other version, they disagree about having children, but end up happily married. Subjects were given the information about the outcome (married or engagement broken) in the last line of the story. Two week later, subjects were contacted by phone and were asked to free-recall the story. The results showed that subjects in the emotional focus condition recalled significantly fewer accurate story elements than those in the factual focus condition. Of particular interest was the finding that subjects in the emotional focus condition were more likely than subjects in the factual focus condition to make integrative distortions; they were

significantly more likely to distort the story to make it internally consistent (e.g., by having the couple who disagreed about children later break up). Thinking about one's reactions to an event rather than thinking about the details of the event led people to remember the event as being more coherent. Mather & Johnson (1998) explanation for their study's findings was that making subjects think about their own emotional reactions during encoding created an emotional context for the story. At the time of test (after a delay) they wrongly interpreted their emotional assessment of the outcome as factual details of the story.

Marsh, Tversky, & Hutson (2004) examined the consequences of emotional versus factual retellings within an eyewitness paradigm. Subjects in the study viewed a violent scene from a movie. Afterwards, subjects in the factual focus condition were asked to verbally report the events in the film in the order they occurred, and to provide as much detail as possible. Subjects in the affective focus condition were asked to talk about their emotional reactions to the film, their thoughts and feelings. The subjects in the control conditions did not talk about the film. Following a delay, each of the subjects completed five memory tasks: a perpetrator recall task, free recall of the film, an emotion memory test, cued-recall questions, and a picture recognition test. They found that having subjects talking about their emotions led to better memory for one's emotions, but also led to subjectivity and a greater proportion of major errors in the free-recall. They also found that factual accounts were longer than emotional ones, and contained more perceptual detail, including spatial, temporal, and activity elements of the event. The emotional accounts contained far more expressions of affect and feelings as well as references to self. The major finding was that the very act of talking about the witnessed event led to changes in the memory, and the focus of retelling affected those changes. Importantly, having subjects focused on emotion while reviewing

the event led to factual errors when they later recounted the original event.

Eyewitness Suggestibility

Eyewitness suggestibility is thought of as the extent to which people exposed to an event come to report information that had been suggested to them in a post-event questionnaire as seen or heard in the witnessed event. In eyewitness suggestibility studies (e.g., Loftus, Miller, & Burns, 1978), participants are exposed to a videotape or slide sequence depicting a crime. Next, they read a narrative describing the witnessed event or answer questions about it. Thus, the participants are exposed to misleading suggestions (e.g., that a thief stole a ring when he had not) through the narrative or questions. Finally, participants are tested on their memory for the event. Suggestibility is indicated by the extent to which participants report the misleading information as being from the witnessed event. Earlier research proposed that the underlying mechanism for eyewitness suggestibility involves the incorporation of suggested information into a witness memory for the event (e.g., Loftus, Miller, & Burns, 1978; McCloskey & Zaragoza, 1985a). Later research supports a different view; specifically, that errors observed in eyewitness suggestibility can be characterized as source misattributions (Johnson, et al., 1993; Lindsay, 1994; Zaragoza & Lane, 1994, although c.f., Eakin, Schreiber, & Sergent-Marshall, 2003). Thus, participants are misattributing information obtained from a post-event source to the witnessed event. In the context of the SMF (Johnson, et al., 1993), these source misattributions (i.e., misattributing post-event items to the event) can increase as the similarity of event items and suggested items is increased. For example, Zaragoza & Lane (1994, Exp. 1) found that putting suggestions in the context of a questionnaire increased source misattribution errors relative to when the suggestions occurred in a narrative. Specifically, they argued that participants are

more likely to form a visual image of the suggested items (reinstating the original event) when answering the questions than when reading the narrative (see Zaragoza, Lane, Ackil, & Chambers, 1996, for a study that directly manipulated imagery), and thus their memories of suggested items were more likely to include perceptual and contextual detail consistent with having seen the items in the event.

Although there is vast quantity of research on eyewitness suggestibility, to date only one study has specifically manipulated the emotionality of the stimuli (although the study does not employ a standard eyewitness suggestibility design). Porter, Spencer, & Birt (2003) examined suggestibility using a modified paradigm. Subjects viewed either a series of eight highly positive, neutral, or highly negative emotional scenes (pictures were selected from the International Affective Picture System). After each picture, they had to verbally provide a description of the picture they just saw and their responses were recorded. Half of the subjects in each of the three emotional conditions (positive, negative and neutral) were asked to verbally answer 10 questions in the format of a post-event questionnaire, with half of the questions containing misleading information. The remaining subjects were not exposed to the misleading questions. All the subjects took a free recall memory test followed by 10 open-ended questions. They found that the inclusion of misinformation in the context of the questionnaire had a significant impairing effect on accuracy; misled subjects were less accurate (42.6%) to questions related to misinformation than nonmisled Ss (79.5%). For misled subjects, there were no overall differences in the accuracy of the memories for either the positive, neutral, and negative scenes. However, when broken down by item type, it was found that subjects in the negative emotion condition recalled *fewer* central details than those in the positive condition; they also recalled more peripheral details and emotion-oriented

details than those subjects in the neutral condition. Perhaps the most important finding of the study was the fact that emotion had a clear impact on susceptibility to the misinformation. Subjects who saw the highly negative scenes were twice as likely to recall seeing a suggested item in the pictures as those in the other two conditions. It should be noted that, unlike traditional suggestibility studies, this study did not use control items to assess the degree of suggestibility of subjects.

Individual Differences in Affect Intensity

Although emotion can affect memory (e.g., Heuer & Reisberg, 1990), not everyone appears to experience emotion to the same intensity. Larsen, Diener, & Emmons (1986) examined individual differences in affective responsiveness to emotional provoking stimuli in two experiments using naturally occurring life events. According to their view, some individuals modulate the intensity of emotional stimuli such that they consistently experience stronger or more intense emotional reactions. Other individuals are less emotionally reactive to similar levels of emotion-provoking stimulation. In Experiment 1, subjects recorded two events per day for eight consecutive weeks and rated their affective reactions to those events on "goodness" to "badness" scale. In addition to subjects' subjective ratings, a team of independent raters using a similar scale also rated these events (objective event ratings). In Experiment 2, subjects took a standardized life event description questionnaire using a 10-point response scale, with each point describing affective reactions of varying intensity. Based on their responses to the AIM, subjects were divided in high and low affect-intensity groups. The AIM is a 40-item questionnaire used to assess the characteristic strength or intensity with which an individual typically experiences his or her emotions. Items from the AIM were written based on a construct definition of affect intensity that emphasize the

distinction between frequency of emotional experiences (e.g., "I am happy quite often") and intensity of experienced emotion (e.g., "When I am happy the feeling is one of intense joy"). The AIM had been found to correlate significantly with measures of peripheral physiological arousal, and to assess the general tendency to experience emotions more strongly, regardless of their direction (i.e., positive or negative). Larsen, Diener, & Emmons (1986) reported consistent findings across both experiments. They found that subjects scoring high on the AIM reacted more strongly to the naturally occurring events in their lives than subjects' low on the AIM, regardless of whether those events evoked positive or negative emotions. Furthermore, subjects' high on AIM were found to respond with more intense emotions to moderate and low levels of affective stimulation.

In a follow up study, Larsen, Diener, & Cropanzano (1987) examined the idea that individual differences in affect intensity are related to how people interpret emotional stimuli, specifically, whether individuals high on affect-intensity differ from individuals on low affect-intensity in terms of the cognitive processes they engage during exposure to emotionally relevant stimuli. In the first phase of the study, subjects completed the AIM and subjects were divided into high (75^{th} percentile and above) and low (25^{th} percentile and below) levels of affect intensity. In the laboratory phase, subjects viewed twice a series of 15 slides depicting positive, negative and neutral affect stimuli. After the first exposure to the slides, the experimenter prompted the subjects after each slide to write down "anything that went through your mind when you looked at the slides the first time." All the responses were scored along eight separate rating dimensions that tapped into different cognitive constructs: physical sensations, emotional arousal (served as manipulation checks for the effectiveness of the slides to induce emotion), personalizing statements and empathic statements (assessed

aspects of personalization), global generalization and fantasy elaboration (assessed aspects of overgeneralization) and focus of feelings and emotion details (assessed selective abstraction). Larsen, Diener & Cropanzano (1987) reported that emotional slides (positive and negative) prompted subjects high on AI to report more physical sensations and more emotional arousal than they did during the neutral slides. Subjects high on affect-intensity dimension were found to engage in more personalizing, generalizing and empathic cognitions as well as more global and elaborate thinking than subjects low in this dimension. They also reported that group differences were found only in response to emotional stimuli, not in response to nonemotional or neutral stimuli (i.e., high affect-intensity subjects did not engage in these cognitive processes during exposure to neutral stimuli). What is also important is the fact that the cognitive processes that discriminated between high and low individuals generalized across positive as well negative emotions. The results of this study support the idea that individuals that have the tendency to have strong emotional responses also have the tendency to deploy different type of cognitive processes when exposed to emotional stimuli than individuals low in AI.

Finally, Larsen, Billings, & Cutler (1996) examined individual differences in how people cognitively interpret emotional situations in terms of active information generation (i.e., the amount of specific useful information and distinctive detail individuals convey in their account of an emotional event). In the first phase of the study, subjects completed the AIM and the first part of the Event Description Questionnaire (EDQ1). The EDQ1 consisted of eight events evenly balanced between pleasant (e.g., being accepted into your top-choice graduate school) and unpleasant (e.g., having your house burn down) events. For each event, subjects had to provide a detailed description of that event. Subjects returned 4-6 weeks later

and completed the second part of the EDQ. The free-response descriptions were coded for content along five informational styles variables: emotional content, focus on feelings, informativeness, personalizing, and generalizing. They reported that the descriptive information generated by the high AI subjects contained significantly more references to emotional arousal, more focus on feelings, and more overgeneralization compared to subjects low in AI. The authors argued that their findings were consistent with the notion that specific cognitive processing could be associated with dispositional affect intensity. In addition, the authors concluded that people's informational style is stable over time and across situations.

HYPOTHESES

The present study examined the effect of emotional arousal and focus of attention on subjects' memory for a witnessed event. The intent of the study was to explore why witnesses exposed to highly emotional events can sometimes provide a very accurate description of the event and, while at other times, their memory is impaired. A second goal was to examine the effect of emotion on witness suggestibility.

Although emotional arousal can increase retention of the memory for the event (e.g., by increasing the release of adrenaline; Cahill, et al., 1994), one key variable that may moderate its effect on memory accuracy is the focus of attention at the time of encoding. For instance, when attention is focused on the perceptual and physical details of the event (although note that sometimes this attention might be focused on the arousing elements of the event more than on more peripheral elements), memory will generally be accurate relative to a neutral event. In contrast, when emotional events lead people to focus their attention elsewhere (e.g., one's thoughts or feelings about the arousing situation), then one would expect less accurate and detailed memories. This relatively poorer memory may also make emotionally aroused subjects more suggestible when exposed to post-event information.

In the present study, the goal was to investigate, in the context of the eyewitness suggestibility paradigm, the effect of emotional arousal and attentional focus. Subjects watched either an emotional or a neutral event in a series of slides while focusing their attention either on perceptual detail, on their own thoughts or feelings (self-focus), or on details of their own choice (i.e., the no-focus control condition). After the slide presentation, subjects answered questions about the event that contained some misleading information. Finally, subjects completed a source memory test.

The primary measure of interest was the tendency of subjects to misremember witnessing the suggested items in the event, although performance on event (slide) items was also of interest. To the extent that exposing subjects to an emotional rather than to a neutral type of event leads to greater arousal, this type of manipulation should lead to an increase in accurate memory for event details and also an increase in misattributions to witnessed event. *The first hypothesis* was that subjects in the emotional condition would show enhanced memory for the witnessed event compared to those subjects in the neutral condition, particularly for the second phase that contained the arousing stimuli (Burke, Heuer, & Reisberg, 1992; Cahill & McGaugh, 1995; Heuer & Reisberg, 1990; Laney, Campbell, Heuer, & Reisberg, 2004). *The second hypothesis* was that subjects in the emotional condition would show increased susceptibility to post event misinformation compared to those subjects in the neutral condition (Porter, Spencer, & Birt, 2003).

In this study, subjects focused on different aspects of the witnessed event (perceptual detail, self-focus, and no-focus). Because it was expected that this manipulation would lead to differences in the type of characteristics encoded during the event, we expected that the types of information available at retrieval would vary (e.g., Johnson, et al., 1996). These differences were likely to increase or decrease subjects' ability to accurately attribute test items to their appropriate source. For example, it was expected that the self-focus subjects would focus on their own thoughts and feelings at the expense of encoding perceptual details about the event. Conversely, perceptual detail subjects would focus on the perceptual details (e.g., shape, color, location, etc.) of elements of the event. Further, these perceptual details were precisely the type of details that would help subjects distinguish between their memories of event items and memories of items they encountered in the questions. Thus *the third*

hypothesis was that this differential focus at encoding would make self-focus subjects' less able to accurately remember information from the slides, less able to reject misinformation introduced during the questionnaire, and more likely to attribute suggestions to the witnessed event. It was also expected that perceptual focus subjects, because of the relatively greater perceptual detail available to them at retrieval, would to be less likely to misattribute suggested items to the event than either of the other two conditions. In addition to the main effect of type of focus it was also expected that there would be an interaction of event type and focus type. Specifically, it was expected that self-focus subjects who viewed the emotional slide sequence should show the poorest event memory and the greatest suggestibility. This hypothesis was based on the supposition that the emotional stimuli would lead self focus subjects to think about emotional aspects of the slides more than when they view neutral stimuli, which should interfere with encoding or rehearsal of perceptual details.

Although it is clear that memory is affected by emotional arousal, the role of individual differences in moderating this process is not as clear. Thus, a secondary goal of this study was to assess the potential role of responsiveness to emotional stimuli. Specifically, the possible relationship between the personality dimension of affect intensity and eyewitness performance was explored. The short Affect Intensity Measure (Geuens, & DePelsmacker, 2002) is a 20-item questionnaire (see Appendix A) that was used to assess the characteristic intensity with which individuals experience their emotions, regardless of the direction. Individuals high on AI experience their emotions quite strongly and are emotionally reactive and variable. Individuals low on AI experience their emotions mildly and with only minor fluctuations. *The fourth hypothesis* was that high AI subjects would show poorer memory for event items and be more suggestible than low AI subjects. This prediction was based on

the findings of previous research that individuals high on AI were likely to focus on their emotional reactions to the stimuli, while those low in AI were less likely to do so. Similar to the effect of attentional focus, it was expected that AI would affect the degree to which subjects would encode the perceptual details that were essential for discriminating between event and suggested items. These differences in the completeness of the memory for the witnessed event could make those individuals high on AI more likely to accept suggested items in the questionnaire and later attribute suggested items to the slides. Thus, this would also predict that the effect would be most pronounced in self-focus Ss who viewed the emotional arousal slide sequence. Thus, it was expected that there would be an interaction between event type, focus type and AI dimension. Specifically low AIM subjects in the perceptual focus condition who viewed the neutral slides should show best memory for event and be less suggestible than the other conditions, and high AIM subjects in the self-focus condition who viewed the emotional slides should show the worst event memory and highest suggestibility. However, I note that his prediction of a three-way interaction is somewhat speculative as high AI subjects might already show high levels of self-focused encoding even without instructions to focus on their emotions (Thus, predicting two-way interactions between event type and AIM, and between event type and focus type).

MATERIALS AND METHODS

Participants

Subjects (Ss) were two hundred sixty undergraduate students at Louisiana State University recruited from psychology classes, and who received course credit for their participation in the experiment. Ss were randomly assigned to one of the six experimental conditions: control/neutral (n = 44), perceptual/neutral (n = 43), self/neutral (n = 42), control/emotional (n = 43), perceptual/emotional (n = 43), and self/emotional (n = 45).

Design

This study used a 2X2X3X3 factorial design, with type of presentation (arousal and neutral), affect intensity (high and low), and type of focus (perceptual, self, and control) as between-subjects variables, and slide phase (1,2, and 3) as a within-subjects variable.

Materials

The materials that were used for the present study were originally developed by Heuer & Reisberg (1990) and expanded by Cahill & McGaugh (1995) and consisted of a neutral or an emotional story presented during a sequence of slides. The neutral story is rather boring and uneventful and tells the story of a woman and her son who visit the boy's father at the hospital where he works. On the way to the hospital they witness a relatively routine aspect of a disaster drill of a simulated accident. The boy stays with his father and the mother goes to pick-up her younger son from the preschool. The emotional story tells a different story while the same images are presented. On the way to the hospital to visit the father, the boy is the victim of a very serious car accident in which his feet are severed. He is rushed to the hospital, where a team of specialized surgeons reattaches his feet. The boy stays in the hospital (attended by the father) and the distraught mother leaves to pick up her son from the

preschool.

Each version of the story—neutral and emotional—consisted of same sequence of 11 slides and a different narrative accompanied each. The narrative, which was recorded by a male voice, was the crucial aspect of manipulation. The same pictures which were described in the neutral version as relatively routine aspects of a disaster drill watched by the boy are described in the arousal version as an attempt to save the boy's life. Specifically, a picture of badly scarred legs is described in the neutral version as merely an actor made up to appear injured for the disaster drill, but in the arousal version is described as the boy after his feet have been reattached by surgeons. The narration accompanying the first four slides was identical in both stories and highly similar for the last three slides. The narration differed between the two versions mainly during the middle five slides (see Appendix B).

For the purpose of our study we tailored the presentation mode (i.e., slide sequence) in order to accommodate the focus type manipulation that required that Ss pay attention to different aspects of the event. As a result, each slide accompanied by its appropriate narrative (i.e., neutral and emotional story) was presented for approximately 20 seconds. The end of narration for each slide was followed by 5 seconds of silence, during which the slide remained in view. An additional 11 slides were interspersed between the original 11 slides in order to accommodate the focus manipulation. For the two focus conditions (perceptual and the self-focus) these slides contained a rating scale and were presented for approximatively 5 seconds. In the no-focus control condition, these slides remained blank for the same amount of time.

The post-event questionnaire consisted of 20 questions about the slides sequence. The questionnaire contained questions about specific aspects (i.e., forensically relevant aspects of each slide such as perceptual and physical descriptions of objects and people) of each of the

11 slides. Some of the statements contained misleading items that had not been in the slides. These items supplemented rather than contradicted what Ss had seen (as in Zaragoza & Lane, 1994) in the slides and the items were not the direct object of the questions. For example, for the suggestion "Mother and son waited patiently at the light to cross the street." The Ss were asked, "In the fourth slide, they are standing at the edge of the walkway waiting for the red light to change. Was the mother holding the boy's hand?" Across the experiment there were a total of 12 critical statements: *a ramp, a microscope, the light, framed picture, running shoe, ambulance, red sock, bloody bandages, basketball, bench, tissue, older men.* There were four versions of the questionnaire, two for the emotional story and two for neutral story, and each version six critical items functioned as never presented control items (i.e., they did not appear until the final test), and six critical items functioned as suggested items. Each of the two slide series was subdivided into three phases according to the plot of the story: first phase—slides before the arousal manipulation was introduced, second phase—slides where the arousal manipulation took place, and third phase—slides following the manipulation. Two misleading items were suggested for each of the three parts of the slide sequence. An equal number of Ss in both neutral and emotional conditions received each version.

The source memory test consisted of 24 test statements administered on a computer. Six of the statements were suggested only in the post-event questionnaire, 6 statements were critical items that had never been suggested (control items), 6 statements concerned items that were only depicted in the slides, and 6 statements concerned items that were both in the slides and in the questionnaire. For each item type (e.g., slide-only), 1/3 of the items were from the 1st third of the sequence, 1/3 of the items were from the 2nd third of the sequence, and 1/3 were from the last third of the sequence.

The Short Affect Intensity Measure (Geuens & DePelsmacker, 2002) is a 20-item questionnaire that assesses the characteristic strength or intensity with which an individual typically experiences his or her emotions.

Procedure

Subjects were tested in groups of up to six. Upon arrival in the lab, Ss were told that they would participate in a memory experiment. Ss were next informed that they would be watching a set of slides, and that some of the slides would be pleasant, some unpleasant, and some neutral. Further, they were told that the slide presentation should be viewed as a film and that their continuous attention would be necessary and vital for the accurate assessment of their memory for the presented material. In addition, Ss were informed that the best performance on the subsequent test would be awarded with a $25. Those more general instructions were followed by instructions that were specific to focus condition. Ss received the instructions according to the type of attention focus group (i.e., perceptual condition, self-focus condition, or control) to which they were assigned. Ss assigned to the perceptual detail condition were instructed as follows: "I would like you to pay attention to the events in the slide sequence, to the order in which they occur, and to any physical and perceptual details depicted in the slides." Self-focus participants were told: "I would like you to pay attention to your emotional reactions, to your own thoughts you have in reaction to the events depicted in the slides." The Ss assigned to the control condition were instructed: "I would like you to pay attention to the events depicted in the slides."

After the presentation of each slide, perceptual focus participants saw on the computer screen a slide containing short instructions that asked them to think back to the details they saw in the previous slide, and to rate the complexity of the details on a 1-5 scale with 1

representing not complex at all, and 5 meaning very complex. Self-focus participants saw on the computer screen a slide that asked them to think back to the feelings and emotions they experienced while watching the previous slide, and to rate their emotional reactions to it on a 1-5 scale with 1 meaning no emotion at all and 5 meaning very emotional. Ss assigned to the control condition did not make any ratings. The rating slides were presented to the Ss for 5 seconds and they had to make their responses by pressing the appropriate key as directed in the instructions.

After viewing the slide sequence, Ss worked on the post-event questionnaire (this task was self-paced). After finishing the questionnaire, Ss worked on a word puzzle filler task until 15 minutes had elapsed.

Instructions for the source memory test were similar to those used in Zaragoza & Lane (1994). Ss were informed that for each of the 24 statements they would see they would have to indicate the correct source of the information. For each statement they had 4 possible sources to choose from: Slides Only, Questionnaire Only, Both the Slides and the Questionnaire, and Neither the Slides nor the Questionnaire. The test was self-paced.

Following completion of the source memory test, Ss took the short Affect Intensity Measure. Ss were given 10 minutes to complete the AIM and they received the following instructions: "*The following questions refer to emotional reactions to typical life-events. Please indicate how YOU react to these events by placing a number from the following scale in the blank space preceding each item. Please base your answers on how YOU react, not on how you think others react or how you think a person should react*." The Ss used a 6-point response format, with each point anchored to a brief phrase describing affective reactions of varying intensity, with 1 meaning "I never feel like that" and 6 meaning "I always feel like

that." Lastly, Ss completed the demographic questionnaire together with a post-experiment questionnaire and they were fully debriefed about the purpose of the study.

RESULTS

Both absolute and conditionalized measures of source memory are reported. All analyses were conducted with an alpha level of .05. The proportions of accurate responses (i.e., slides–only, questions-only, and control) are provided in Table 1, and source misattribution errors (i.e., suggested items attributed to slides and control items attributed to slides) are provided in Table 2.

TABLE 1: Proportion of Accurate Responses on the Source Test by Focus and Event Type

Item Type	Neutral Event			Emotional Event		
	C	P	S	C	P	S
Slides Only	.45 (.03)	.47 (.03)	.46 (.03)	.44 (.03)	.48 (.03)	.46 (.03)
Questions Only	.28 (.03)	.16 (.03)	.24 (.03)	.25 (.03)	.26 (.03)	.25 (.03)
Control Only	.64 (.03)	.67 (.03)	.63 (.03)	.64 (.03)	.65 (.03)	.68 (.03)
Both Only	.64 (.03)	.65 (.04)	.65 (.04)	.64 (.04)	.67 (.04)	.71 (.03)

Note. Standard errors are provided in parentheses.

The data were first analyzed using a mixed model ANOVA, with type of event (emotional/neutral) and type of focus (perceptual, self and control) as between-subjects factors, and phase of the slides (1-3) as a within-subject factor run separately for each item type (slides only, questionnaire only items, and control items). The analyses are reported separately by item type below. To simplify reporting, I note that there were no main effects of focus type, nor were there any significant interactions involving this variable. Thus, subjects were equally accurate (or inaccurate) regardless of the type of focus they adopted at encoding. Thus subsequent analyses report data collapsed across this factor.

TABLE 2: Proportion of Inaccurate Responses on the Source Test by Focus and Event Type

Item Type	Neutral Event			Emotional Event		
	C	P	S	C	P	S
Suggestions to Slides	.43 (.04)	.50 (.04)	.46 (.04)	.52 (.04)	.52 (.04)	.50 (.04)
Controls to Slides	.32 (.03)	.38 (.03)	.36 (.03)	.32 (.03)	.31 (.03)	.29 (.03)

Note. Standard errors are provided in parentheses.

Slide Items

These analyses focused on accurate attribution of items seen in the slides. The analysis revealed a main effect of phase (F (2,508) = 11.09, p < .05, η_p^2= .04), and a marginally significant interaction of phase by type of event (F (2,508) = 2.96, p = .052, η_p^2= .01, See Figure 1). All other results revealed no significant differences (All Fs < 1.71, n.s.).

In order to explore the interaction, we compared neutral and emotional event conditions at each phase. The only significant comparison was for phase 2 (F (1,259) = 3.72, p < .05, η_p^2= .01; all other Fs < 1.59, n.s.). Specifically, subjects in emotional event condition were more likely to correctly attribute slide items to slides on the source test (M = .55) than those in the neutral event condition (M = .47) in the *arousal phase* of the slide sequence.

Next, item recognition for slide items was computed (i.e., Attribution of slides to the slides + misattribution to questions + attributions to both sources). The analysis revealed only a main effect of phase (F (2,516) = 34.95, p < .05, η_p^2= .12), and a significant interaction of phase by type of event (F (2,516) = 3.81, p < .05, η_p^2= .02). In order to explore the

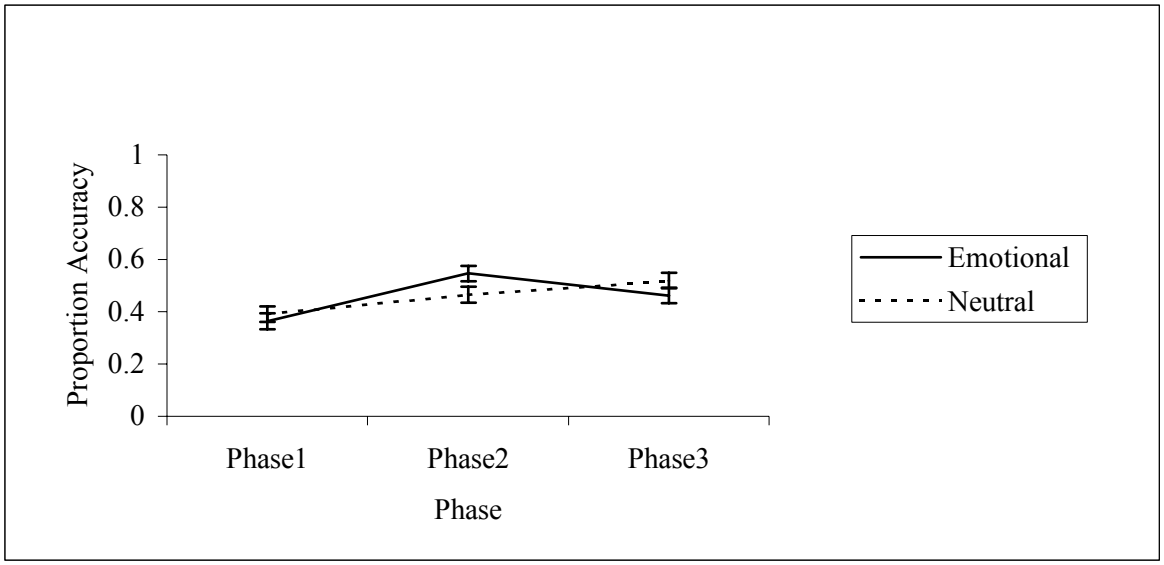

FIGURE 1. Average Proportion of Slide Items Correctly Attributed to Slides by Event Type and Phase of Presentation.

interaction, we compared neutral and emotional event conditions at each phase. The only significant comparison was for phase 3 (F (1,259) = 4.80, $p < .05$; for phase 2, M = .57 and .51 for emotional and neutral, respectively, F (1,258) = 2.42, $p = .12$; for phase 1, $F < 1$). Specifically, subjects in emotional event condition were less likely to recognize slide items ($M = .61$) than those in the neutral event condition ($M = .70$) in the 3rd phase of the slide sequence. Because potential recognition differences may affect the interpretation of source attribution, a conditionalized measure of source memory was computed. Specifically, the proportion of recognized slide items that were correctly attributed to the slides was examined. Analyses revealed that there was a main effect of phase (F (2,246) = 18.01, $p < .05$, $\eta_p^2 = .13$). Conditionalized accurate attributions to slides were significantly lower in the 3rd phase (M = .74) than in the 1st (M = .92) and 2nd (M = .95) phases (which did not differ from each other). Unlike the unconditionalized analysis reported above, there was no significant phase by type of event interaction ($F < 1$). However, it should be noted that performance was near ceiling in the first two phases, thus it may have been difficult to detect differences, particularly in the critical 2nd phase. Given the above analyses, it appears that the arousal manipulation decreased item recognition more than it decreased a bias to accurately attribute items to the slides.

Suggested Items

The suggestibility of Ss (i.e., the likelihood they claim to have seen in the slides items which were only suggested in the questionnaire) was next examined. The mixed factorial ANOVA revealed a main effect of Phase (F (2,508) = 99.06, $p < .05$, $\eta_p^2 = .28$, See Figure 2). Subjects misattributed more suggested items to the slides in the 1st and 3rd phases (M = .60 for both) than in the 2nd phase (M = .27). In addition, there was a trend toward a main effect of

event type (M = .47 and .42 for Emotion and Neutral conditions, respectively, F (1,258) = 2.67, p = .10, η_p^2= .01). No other interaction reached significance (All Fs < 1.52, n.s.).

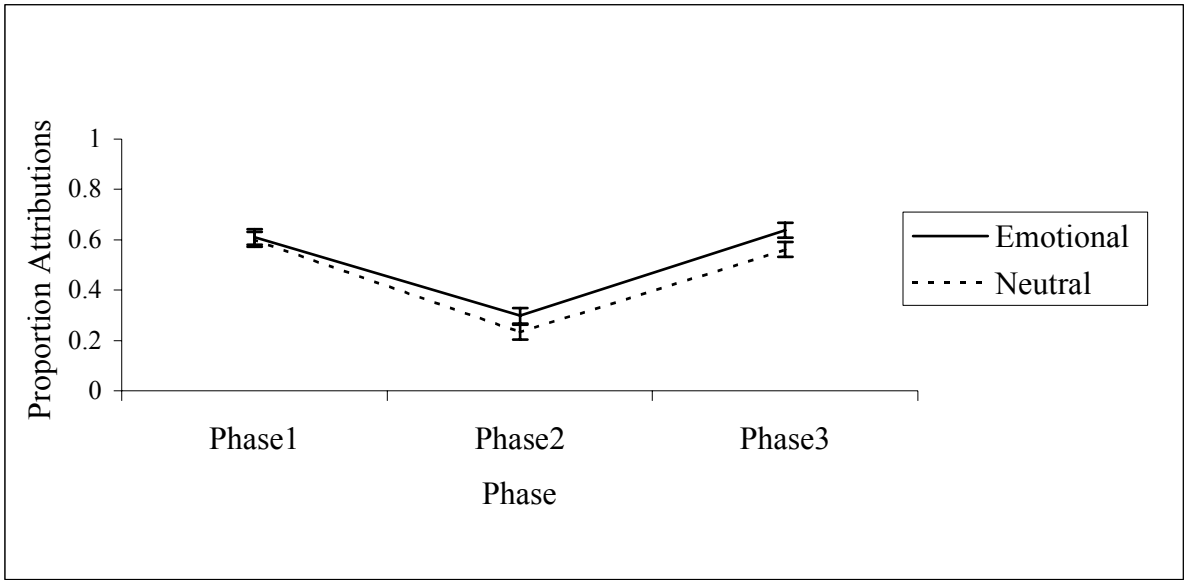

FIGURE 2. Average Proportion of Suggested Items Misattributed to Slides by Event Type and Phase of Presentation.

Next, item recognition for suggested items was computed (i.e., Attribution of suggested items to the slides + misattribution to questions + attributions to both sources). The analysis revealed a main effect of phase (F (2,508) = 159.89, p < .05, η_p^2= .38), a main effect of event type (M = .77 and .69, F (1,254) = 12.19, p < .05, η_p^2= .05), and a significant interaction of phase by type of event (F (2,508) = 4.78, p < .05, η_p^2= .02). In order to explore the interaction, neutral and emotional event conditions were compared at each phase. Subjects who viewed the emotional event were more likely to recognize suggested items than neutral conditions subjects in the 1st (M = .82 and .74) 2nd (M = .57 and .41) phases, but not the third phase (M = .92 for both).

Because of item recognition differences, a conditionalized measure of source memory for suggestions was computed. Analyses revealed that there was a main effect of phase (F (2,354) = 21.80, p < .05, η_p^2= .11). Conditionalized inaccurate attributions to slides were

significantly higher in the 1st phase (M = .78), significantly lower in the 3rd phase (M = .65) and significantly lowest in the 2nd phase (M = .54). There was no significant phase by type of event interaction (F < 2.36, n.s.). Thus the impact of emotion on suggestibility appears primarily a function of increased item recognition rather than increased tendency to attribute suggested items to the event.

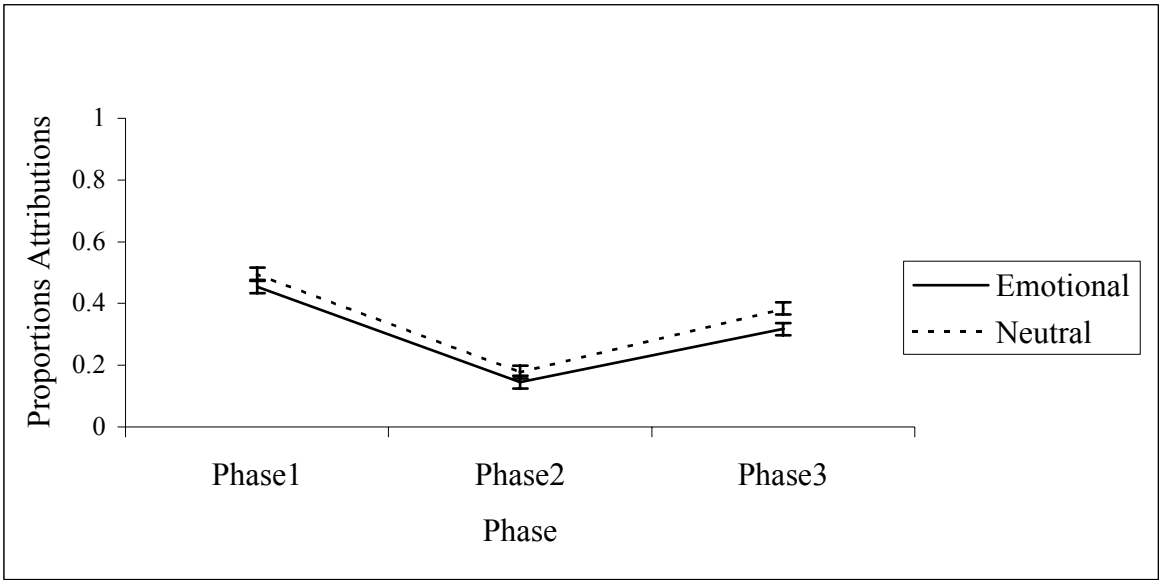

FIGURE 3. Average Proportion of Control Items Misattributed to Slides by Event and Phase of Presentation.

Control Items

Next, subjects' misattribution of control items to the event (i.e., those items never presented in the slide sequence or questionnaire and seen only in the source test). The mixed factorial ANOVA showed a main effect of phase (F (2,508) = 77.84, p < .05, η_p^2= .24). Subjects were most likely to misattribute control items from the 1st phase (M = .47), next most likely to misattribute control items from the 3rd phase (M = .35) and least likely to do so for phase 2 (M = .16). There was also a significant effect of event type (F (1,254) = 4.34, p < 05, η_p^2= .02), with the neutral condition subjects attributing more control items to the slides (M = .35) than emotional condition subjects (M = .31) see Table 3.

Suggestibility Effect

Lastly, the suggestibility effect was examined. Specifically, the misattribution of suggested items versus control items was compared. The utility of this measure is that it allows one to explore the impact of a variable on the processing of postevent suggestions relative to its impact on never-presented (but schema-consistent) control items. For each participant, the proportion of control items misattributed to the slides was subtracted from the proportion of suggested items misattributed to the slides (data was collapsed across phases). A one-way ANOVA showed that the suggestibility effect for emotional event condition was significantly larger (M= .21) than the effect for neutral event condition (M= .11, F (1,260) = 7.91, p < 05, η_p^2= .03). Thus, subjects who viewed the emotional event were more suggestible than subjects who viewed the neutral event. Table 3 summarizes the major findings regarding the impact of emotion on event memory.

TABLE 3: Proportion of Overall Accurate and Inaccurate Attributions to Item Types by Event Type.

Item Type	Neutral Event	Emotional Event	p=
Slides Accuracy	.46 (.02)	.46 (.02)	.94
Suggestions to Slides	.46 (.02)	.51 (.02)	.10
Control to Slides	.35 (.02)	.30 (.02)	.04
Suggestibility Effect	.11 (.00)	.21 (.00)	.01

Note. Standard errors are provided in parentheses.

Individual Differences in Affect Intensity

In order to examine the possible relationship between the personality dimension of affect intensity and Ss' memory for the witnessed event, a subjective emotional response rating for AIM was created. The scoring procedure for AIM (as recommended in Larsen & Diener, 1987; Guens & DePelsmacker, 2002) involves rekeying the reversed items (see Appendix: A, Factor 3) and averaging responses across the 20 items. A 2 X 3 ANOVA with type of event (neutral and emotional) and focus type (control, perceptual, and self focus) as

TABLE 4: Proportion of Items Attributed to the Event by Focus and Median Split AIM Scores for Neutral Event.

Item Type	Neutral Event											
	Low AIM						High AIM					
	N	C	N	P	N	S	N	C	N	P	N	S
Slides Only	24	.47 (.04)	24	.49 (.04)	21	.46 (.04)	20	.42 (.05)	19	.47 (.05)	21	.45 (.04)
Suggestions	24	.43 (.05)	24	.53 (.05)	21	.52 (.05)	20	.43 (.06)	19	.47 (.06)	21	.41 (.05)
Errors	24	.35 (.04)	24	.40 (.04)	21	.33 (.04)	20	.28 (.04)	19	.36 (.04)	21	.38 (.04)

Note. Standard errors are provided in parentheses.

between variables was used to analyze for possible differences in AIM scores. The results revealed no significant differences between conditions (All Fs < 2.16, n.s); the overall AIM mean was 3.66.

Next, a high and low AI factor was created by using a median split. A 2X2X3X3 factorial design, with type of presentation (arousal and neutral), affect intensity (high and low), and type of focus (perceptual, self, and control) as between-subjects variables, and slide phase (1,2, and 3) as within-subjects variable was run separately for each item type (slides only, questionnaire only, both slides and questionnaire or control items). The proportions of items attributed to the slides for the neutral and emotional event are provided in Table 4 and 5. The level of AIM score had no significant impact on any dependent measures. Finally, the correlations between AIM scores and attributions to the event for each item type were computed separately for event type. None of the correlations were significant. Thus, regardless of type of analysis, affect intensity (as measured by AIM) does not appear to have an impact on event memory.

TABLE 5: Proportion of Items Attributed to the Event by Focus and Median Split AIM Scores for Emotional Event. (Standard errors are provided in parentheses.)

Item Type	Emotional Event											
	Low AIM						High AIM					
	N	C	N	P	N	S	N	C	N	P	N	S
Slides Only	25	.47 (.04)	22	.47 (.04)	23	.48 (.04)	18	.42 (.05)	21	.46 (.04)	22	.43 (.04)
Suggestions	25	.53 (.05)	22	.47 (.05)	23	.46 (.05)	18	.51 (.06)	21	.58 (.05)	22	.54 (.05)
Errors	25	.29 (.04)	22	.31 (.04)	23	.27 (.04)	18	.36 (.04)	21	.31 (.04)	22	.30 (.04)

DISCUSSION

In summary, the results of this study demonstrate that exposing subjects to an emotional event can have important consequences on memory for the event and misattribution errors (i.e., suggestibility). Specifically, the emotional manipulation appeared to enhance accurate source attributions of items from the second (arousal) phase of the slides to the witnessed event. Thus, there is some support for the first hypothesis. In addition, this study provides some empirical support that exposure to an emotional event increases overall suggestibility. First, there was a trend toward greater suggestibility for those phases subsequent to the arousal manipulation (i.e., phases 2 & 3). Thus, there is some evidence that subjects in the emotional condition more often misattributed the suggested items to the event than those in the neutral condition (hypothesis two). However, for control items this pattern was reversed, as subjects in emotional condition were significantly less likely to misattribute never-presented control items to the event than neutral conditions subjects. Further, the magnitude of the suggestibility effect (misattributions of suggested vs controls) was significantly larger when subjects had seen the emotional event than when they had viewed the neutral event. Thus, the overall pattern of findings suggest that emotional arousal may make the witnessed event more memorable while at the same time making subjects more vulnerable to misleading post-event information. The results clearly failed to support the third hypothesis; that differential focus at encoding would make self focus subjects' less able to accurately remember information from the slides, less able to reject misinformation introduced during the questionnaire, and more likely to attribute suggestions to the witnessed event than perceptual focus participants. Lastly, the fourth hypothesis of the study also failed to receive support. High AI subjects and low AI subjects showed similar performance on event and

suggested items. The implications of the present study's findings together with possible explanations are discussed below.

The finding that enhanced recognition for slides for the emotional compared to neutral subjects in the phase two of the witnessed event can only be attributed to the arousal manipulation. Participants viewed exactly the same series of slides and the only difference between the conditions was the nature of the accompanying narrative. This finding is important because the present study replicates the recognition findings reported by Burke, Heuer, & Reisberg (1992) and Cahill and McGaugh (1995) thus, these results join that of previous researchers in suggesting emotional arousal can increase event memory.

Although there was an increase in event memory as a function of emotional arousal (albeit, only for the 2nd phase), there was also an increase in suggestibility in all phases. This finding is important because the present study replicates the suggestibility findings reported by Porter, Spencer, & Birt (2003) and thus these results join that of previous researchers in suggesting emotional arousal can increase suggestibility.

There are three possible explanations for this impact, and they parallel the theories offered for the impact of emotion on memory discussed in the introduction (e.g., Burke, et al., 1992; Cahill & McGaugh, 1995). First, the *attentional narrowing* mechanism proposed by Burke, Heuer, & Reisberg (1992) claims that emotional arousal promotes better memory for the central elements of the event and poorer memory for those peripheral aspects of the event. According to the view, emotional arousal could have increased event memory *and* suggestibility if event details were relatively more central and suggested items relatively more peripheral. When reading the suggested items in the post-event questionnaire, arousal subjects would be more likely to incorporate them into their memory of the event because the

items are less likely to conflict with their memory of peripheral event items than for neutral subjects. Thus, emotional subjects would show poorer *discrepancy detection* during the post-event questionnaire (Tousignant et al., 1986). Although the present study did not manipulate the central and peripheral aspects of the witnessed events, a comparison between the present study slide items and those of Cahill & McGaugh (1995) shows that the present study's slide items could be considered relatively peripheral. For example, in the critical second phase, the slide items referred to a lamp above the operating table and the mother had her hands in her pockets. Although the suggested items were often peripheral (e.g., bloody bandages on the operating table), others were relatively central (an ambulance at the scene of the accident). Thus, this account of the results seems unlikely.

An alternative explanation comes from Cahill & McGaugh (1995), together with SMF (Johnson et al, 1993). Cahill & McGaugh's biochemical theory argues that emotional arousal leads to enhanced activation of the amygdala at encoding, and thus better retention of information encountered during the arousing situation. According to SMF view, different sources of information have, on average, different phenomenal characteristics associated with them. For the present study the SMF would presume that emotion Ss' memories of the event are more likely to be remembered more vividly, and to include more perceptual detail (e.g., the color, shape, and sound associated with it) and contextual detail (e.g., place in the slide sequence where it occurred) than the memories of neutral Ss. In such a situation, one might expect that emotion subjects would be less suggestible than neutral subjects because they might be able to more easily detect discrepancies between the questionnaire and the event ("There was no microscope in that slide."). However, the increased vividness of their event memory representations might have led to differences in the way the questionnaire items were

processed. Specifically, emotion Ss might have been able to reinstate clearer (or more vivid) images of the event while reading the suggestions in the questionnaire, and thus were more likely to incorporate suggestions into their memory of the event (similar to how imagery of post-event suggestions increases source misattributions, e.g., Zaragoza, et al., 1996). According to SMF, at retrieval people judge the activated qualities of a given memory against their knowledge of event characteristics. Thus, one way that source attribution errors can occur is when an activated memory trace has characteristics that are typical of an alternate source (e.g., when memories of imagined items contain much visual or contextual detail). Thus, by virtue of the type of processing deployed during the questionnaire, the characteristics of suggested items would have been more "event-like" than memories of neutral condition subjects, increasing the misattributions of the items to the slides. Note, that the findings suggest that the impact of emotion arousal was limited to the processing of post-event items as emotion subjects were actually significantly less likely to misattribute never-presented items.

The second explanation noted above has difficulty explaining the fact that although event memory was enhanced for the 2nd phase only, subjects showed enhanced suggestibility for all three phases. Thus, I propose a third explanation that I term the *persistent arousal* hypothesis. According to this view, the emotional arousal introduced during the slides during phase two persisted into the third phase and subsequently into the processing of the post-event questionnaire. Because of this, emotional event subjects had better item memory for the suggested items, but poor source memory. Keep in mind that the questions refer back to the event and contain primarily accurate information about the event. Thus, even if subjects can remember reading the items, this information does not allow them to discriminate items seen

in the slides from unseen items. In this paradigm, subjects can attribute suggested items to both the slides and the questions, and indeed this was a common error.

One major hypothesis of this study was that type of attentional focus (perceptual and self-focus) would impact event memory and potentially susceptibility to misinformation. The results are clearly inconsistent with this hypothesis as the type of focus did not improve or negatively affect what people remembered for the event or the post-event questionnaire. There are several possible explanations. One possibility is that the focus manipulation at encoding was not strong enough. Recall that subjects rated each slide on the amount of perceptual or emotional response in the focus conditions following the slide presentation. Given that the ratings took place after subjects had encoded each slide, it is possible subjects were not thinking about visual detail or their own emotions until they were prompted to make their ratings. In other words, participants in the various focus conditions may have encoded the slides similarly. A second possible explanation is that because subjects knew that there was going to be a memory test at the end of the experiment, they devoted their full attention to encoding event details and thus subjects in the various conditions encoded information in similar ways. Finally, it could be that memory for the event (whether emotional or not) is simply very good with an immediate test and the impact of attentional focus manipulation is too small to be detected. This would suggest that perhaps the effect of attentional focus might be more pronounced with a delay.

Finally, a secondary goal of the present study was to explore the relationship between the personality dimension of affect intensity and eyewitness performance. The analyses revealed no relationship between high and low AIM subjects and their performance on the source memory test across all item types. One potential reason why AIM scores did not

predict performance in this experiment is that affect intensity primarily affects memories of personally relevant (autobiographical) events. In other words, the emotional story (although rated as emotional) did not elicit very high levels of affective response.

In conclusion, the results of the present study seem to conflict with the commonly held beliefs about the impact of emotion; that memories of highly emotional events are highly accurate and resistant to misinformation. Although, witnessing a slide sequence of an emotional event is clearly different from witnessing an actual emotional event, nonetheless the present research presents some empirical support that memory can be enhanced *and* impaired by emotion. In particular, the results of this study indicate that emotional arousal can increase the impact of post-event information. Therefore, one implication is that real-life eyewitnesses who experience highly emotionally arousing events may be even more susceptible to misleading post-event information provided by other witnesses, through questioning procedures, or by media accounts of the event.

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APPENDIX A

THE SHORT AFFECT INTENSITY SCALE

Directions: The following questions refer to emotional reactions to typical life-events. Please indicate how YOU react to these events by placing a number from the following scale in the blank space preceding each item. Please base your answers on how YOU react, not on how you think others react or how you think a person should react.

1 = I never feel like that

2 = I almost never feel like that

3 = I occasionally feel like that

4 = I usually feel like that

5 = I almost always feel like that

6 = I always feel like that

FACTOR 1: positive emotions

_____When I feel happy, it is a strong type of exuberance.

_____My happy moods are so strong that I feel like I'm in heaven.

_____If I complete a task I thought was impossible, I am ecstatic.

_____When I'm feeling well, it's easy for me to go from being in a good mood to being really joyful.

_____When I'm happy I feel like I'm bursting with joy.

_____When I'm happy I feel very energetic.

_____When things are going good I feel "on top of the world."

_____When I'm happy I bubble over with energy.

FACTOR 2: negative emotions

_____Sad movie deeply touch me.

_____When I talk in front of a group for the first time, my voice gets shaky and my heart races.

_____When I do something wrong, I have strong feelings of shame and guilt.

_____When I do feel anxiety, it is normally very strong.

_____When I feel guilty, this emotion is quite strong.

_____When I am nervous, I get shaky all over.

FACTOR 3: reversed positive emotions

_____When I'm happy, it's a feeling of being untroubled and content rather than being zestful and aroused (reversed).

_____When I succeed at something, my reaction is calm contentment (reversed).

_____When I know I have done something very well, I feel relaxed and content rather than excited and elated (reversed).

_____When I feel happiness, it is a quiet type of contentment (reversed).

_____I would characterize my happy moods as closer to contentment than to joy (reversed).

_____When I am happy the feeling is more like contentment and inner calm than one of exhilaration and excitement (reversed).

APPENDIX B

SLIDE PRESENTATION SENTENCES

(Cahill & McGaugh, 1995)

Slide	Neutral version	Arousal version
1	A mother and her son are leaving home in the morning.	A mother and her son are leaving home in the morning.
2	She is taking him to visit his father's work place.	She is taking him to visit his father's work place.
3	The father is a laboratory technician at Victory Memorial Hospital.	The father is a laboratory technician at Victory Memorial Hospital.
4	They check before crossing a busy road.	They check before crossing a busy road.
5	While walking along, the boy sees some wrecked cars in a junkyard, which he finds interesting.	While crossing a busy road the boy is caught in a terrible accident, which critically injures him.
6	At the hospital, the staff are preparing for a disaster practice drill, which the boy will watch.	At the hospital, the staff prepares the emergency room, to which the boy is rushed.
7	All morning long, a surgical team practiced the disaster drill procedures.	All morning long, a surgical team struggled to save the boy's life.
8	Make-up artists were able to create realistic-looking injuries on actors for the drill.	Specialized surgeons were able to re-attach the boy's severed feet.
9	After the drill, while the father watched the boy, the mother left to phone her other child's pre-school.	After the surgery, while the father stayed with the boy, the mother left to phone her other child's pre-school.
10	Running a little late, she phones the preschool to tell them she will soon pick up her child.	Feeling distraught, she phones the pre-school to tell them she will soon pick up her child.
11	Heading to pick her child, she hails a taxi at the number nine bus stops	Heading to pick her child, she hails a taxi at the number nine bus stops.

VITA

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