Children’s Memory for Stressful Events

Exploring the Role of Discrete Emotions

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Scientists and practitioners have long been interested in understanding how children remember emotionally significant, stressful personal experiences. This interest has been motivated by theoretical questions concerning the links between emotion and cognition in development and the nature of children’s emerging event memories. Interest also has been motivated by applied questions concerning children’s memory for traumatic experiences, the development of trauma-related disorders, and children’s eyewitness capabilities (see Chapter 8). Indeed, numerous studies have examined children’s memory for a range of stressful events (for reviews see Alexander, Quas, & Goodman, 2002; Fivush & Sales, 2004). Despite this extensive body of literature, few studies have focused on the nature of children’s emotional experience during a to-be-remembered event. Instead, studies have largely considered how global indices of distress or arousal relate to children’s memory. Yet there are several reasons why the specific emotions that arise during an event may affect the extent and
content of children’s later memory. In the present chapter, we outline these reasons and, in doing so, highlight the need for a new line of research that directly examines the relations between discrete emotions and children’s memory for personal experiences.

Our chapter is organized as follows: First, we briefly review studies that have investigated children’s memory for emotional, primarily stressful, events. Because several comprehensive reviews of this literature already exist (see Chapter 4; Fivush, 1998; Fivush & Sales, 2004; Howe, 1997; Howe, Cicchetti, & Toth, 2006; Howe, Toth, & Cicchetti, 2006; Ornstein, Manning, & Pelphrey, 1999; von Baeyer, Marche, Rocha, & Salmon, 2004), we focus here on the types of emotional events that have been studied and on the range of emotions children may have experienced during these events. Second, we discuss theoretical perspectives and empirical findings concerning the differing effects of discrete emotions on memory. To date, this research has primarily concerned adults’ processing of and memory for emotional information. Third, we describe similarities and differences between children’s and adults’ appraisals of stressful events. Fourth and finally, we present testable hypotheses concerning how children’s discrete emotional reactions to stressful events would likely affect their memories, and we review findings from the few studies that have considered how discrete emotions affect children’s memory. We conclude by offering recommendations for pursuing this new, exciting line of inquiry.

Of note, most research concerning emotion and memory in children has investigated how well they remember distressing experiences. As such, our chapter focuses primarily on negative emotions, such as fear, anger, and sadness, each of which may be experienced to various degrees during a stressful event. In the future, it will be necessary to expand this area of research to examine how different positive as well as negative emotions affect children’s memory for personal experiences. Also, in our review, we address how children’s emotions at the time of encoding relate to their later memory. Of course, emotional experiences are not static states, and individuals’ appraisals of situations, emotional responses, and adaptation to emotions continually change, often over extended periods following an event’s occurrence (for a review, see Ellsworth & Scherer, 2003). These changing appraisals can affect memory (Baker-Ward, Eaton, & Banks, 2005; Levine, Prohaska, Burgess, Rice, & Laulhere, 2001) and certainly should be considered in future research. Finally, a separate body of research concerning mood-congruency effects on memory also exists. Because this
research has not focused on the effects of discrete emotions on the content of children’s memory, we will not discuss this topic in depth here. Instead, our review serves as a critical starting point from which we hope a larger body of research concerning discrete emotions and memory across development will emerge.

Children’s Memory for Stressful Events

Studies concerning children’s memory for stressful events can be heuristically divided into two general categories based on the type of event being remembered. One set of studies has focused on children’s memory for naturally occurring stressful events (see Chapter 6), and the other concerns children’s memory for mildly arousing laboratory-based experiences. Across both types of studies, however, the central question has been the same: does stress help or hurt children’s memory? Unfortunately, findings have not revealed a consistent pattern. Several studies have reported positive associations between stress and memory, both for naturally occurring stressors and arousing laboratory events (e.g., Alexander, Goodman, Schaaf, et al., 2002; Goodman, Hirschman, Hepps, & Rudy, 1991; Quas, Carrick, Alkon, Goldstein, & Boyce, 2006), but others have reported either no direct associations (e.g., Vaandermaas, Hess, & Baker-Ward, 1993) or negative associations (e.g., Bugental, Blue, Cortez, Fleck, & Rodriguez, 1992; Merritt, Ornstein, & Spicker, 1994; Quas, Bauer, & Boyce, 2004). What may be more useful than a simple description of the varying patterns of findings is an overview of the different types of to-be-remembered events that have been studied and a description of the range of possible emotions children may have experienced during these events. Insofar as children’s emotional experiences vary, so may the content of their memories.

Naturalistic studies have capitalized on stressful events outside of the experimenters’ control to which children have been exposed (e.g., Goodman, Quas, Batterman–Faunce, Riddlesberger, & Kuhn, 1997; Peterson, 1999). For instance, Fivush and colleagues assessed 3- to 4-year-old children’s memory for Hurricane Andrew, a devastating hurricane that hit the Florida coast in the early 1990s (Fivush, Hazzard, Sales, Sarfati, & Brown, 2003; Fivush, Sales, Goldberg, Bahrick, & Parker, 2004). Children’s proximity to the hurricane was related to the amount of damage to families’ homes and to the amount of family displacement and disruption. Therefore,
proximity was used as an index of children’s stress during the hurricane to
define high-, moderate-, and low-stress exposure groups. When children’s
memory was tested a few months after the hurricane, children in the
moderate-stress group reported the most information, whereas children
in the high- and low-stress groups reported less. When children’s memory
was examined 6 years afterward, children in the high-stress group again
provided less information than children in the moderate-stress group, but
only in free recall. With additional follow-up prompts, however, the high-
stress children provided as much information as did the other children.
Thus, even children in the high-stress group remembered the event after
the long delay, but they were either unwilling or unable to describe their
memories in detail without considerable prompting by the interviewer.

Other researchers have studied children’s memory for medical expe-
riences, including emergency room visits (Peterson, 1999; Peterson &
Parsons, 2005; Peterson & Whalen, 2001) and prescheduled procedures
(Alexander, Goodman, et al., 2002; Chen, Wang, Chen, & Liu, 2002;
Merritt et al., 1994; Quas et al., 1999). Many of these events are distressing
and painful, and some are highly standardized, providing researchers with
objective information about what actually occurred, to which children’s
reports can be compared for accuracy (Goodman, Quas, Batterman-
Faunce, Riddlesberger, & Kuhn, 1994; Salmon, Price, & Pereira, 2002).
Several teams of researchers, for instance, have studied children’s memory
for a scheduled radiological procedure involving urethral catheteriza-
tion. The procedure, which is designed to identify a potentially serious
kidney problem, requires that children be awake while their bladder is
filled with a contrast medium. Afterward, children void while X-rays
are taken. Children’s memory for the procedure has been assessed im-
imediately afterward (Merritt et al., 1994), several weeks later (Goodman
et al., 1997; Merritt et al., 1994), and several years later (Quas et al., 1999).
Merritt et al. (1994) found that medical staffs’ ratings of child distress
were negatively related to children’s memory. Similarly, Quas et al. (1999)
found that being more upset during the procedure, according to parental
report, was associated with decreases in the amount of information chil-
dren provided in free recall. However, Quas et al. (1999) also found that
being more upset before the procedure was associated with increases in
the number of correct responses to closed-ended, misleading questions.
Thus, although the same stressful to-be-remembered event was examined
across studies, the associations between child distress and memory varied,
precluding clear patterns from being identified regarding the precise relations between stress and memory.

In contrast to the highly charged emotional events studied in naturalistic contexts, to-be-remembered events studied in laboratory contexts are typically mildly distressing events that children have either witnessed or experienced, such as brief fire-alarm incidents or negatively valenced video clips or pictures (Bugental et al., 1992; Quas et al., 2006). Because laboratory events can be controlled, objective records are nearly always available, and children can be randomly assigned to high- and low-stress conditions, allowing researchers to draw causal conclusions about the effects of mild distress or arousal on children’s memory—conclusions not possible with naturalistic, correlational studies. Using this approach, Bugental et al. (1992) found that increases in 5-year-olds’ heart rate while watching a video clip of a child visiting the doctor were associated with poorer memory (no relations between heart rate and memory were observed in older children, however). Yet, the opposite pattern was reported by Quas and Lench (in press). Arousal while watching a fear-eliciting video clip of four boys on a bridge as a train approaches was positively related to children’s later memory. Thus, even in laboratory studies, findings continue to be mixed. Moreover, the extent to which findings from laboratory studies generalize to naturalistic contexts remains unknown.

As this brief review indicates, findings concerning the relations between stress and memory vary considerably. Stress often appears to inhibit children’s performance when asked to recall stressful events, but this poor performance may be due to an unwillingness to talk about the events rather than poor memory per se. When direct questions are asked, stress often appears to enhance performance, although only in some studies. Of greater relevance to the present review, and another potentially important source of variation in studies’ results, is the range of types of to-be-remembered events that have been investigated. Although all of the events have been labeled as stressful or arousing, children likely experienced one of several different emotions. For instance, during a hurricane, if children and their families are prepared and safe, children may not experience fear or distress. Instead, children may feel sad, but only later, upon returning to find devastation and significant changes to their lives (Fivush et al., 2004; Sales, Fivush, Parker, & Bahrick, 2002). During a medical procedure, some children may feel angry with the medical staff or their parents
for inflicting pain. Others may feel frightened because they do not know what is happening or how to protect themselves. Still other children may be confused regarding why something designed to help them is painful. These emotions involve different appraisals and motivations and have different behavioral and physiological correlates. Further, children’s ability to cope with these emotions changes over the course of development. Each of these factors has implications for the content, and possibly the accuracy, of children’s later memory (Goodman et al., 1991).

**Appraisals, Discrete Emotions, and Memory in Adults**

Although little research has examined the potentially differing effects of discrete emotions on children’s memories, these effects have begun to receive attention in theory and research on adults. Therefore, we now turn to a review of the adult literature to set the stage for generating hypotheses about how discrete emotions may affect children’s memory for stressful events. In adults, studies have examined the links between emotion and memory, both when emotions are construed as general arousal and when discrete emotions are considered. A key finding has been that arousal enhances memory for central or emotionally salient information at the expense of peripheral details (e.g., Adolphs, Denburg, & Tranel, 2001; Berntsen, 2002; Burke, Heuer, & Reisberg, 1992; Cahill, Gorski, & Le, 2003; Safer, Christianson, Autry, & Osterlund, 1998; for a review see Reisberg & Heuer, 2004). For instance, in one early study, Christianson and Loftus (1987) presented participants with one of two matched slide sequences depicting either an emotional event (a boy hit by a car) or a neutral event (a boy walking beside a car). All participants wrote down the central feature of each slide. Participants who viewed the emotional slide sequence were better able to recall the central features than participants who viewed the neutral sequence, but they were less able to recognize details that allowed them to pinpoint the particular slides they had seen. Based on appraisal theories of emotion, Levine and Pizarro (2004) argued that the type of information an individual considers to be central should vary depending on his or her discrete emotional state, and hence the content of the individual’s memory should vary. Thus, we next review the different appraisal processes associated with discrete emotions followed by empirical findings concerning the effects of discrete emotions on memory in adults.
Discrete Emotions and Appraisal Processes

According to appraisal theories, emotions such as happiness, fear, anger, and sadness are elicited by different interpretations of events and are associated with different physiological responses, motivational states, and problem-solving strategies. These characteristics of emotional experiences should influence the type of information people deem to be important or central and, therefore, the type of information they attend to and remember. Thus discrete emotions may serve as a powerful organizing force, not just for behavior but for perception and memory as well (Dalgleish, 2004; Frijda, 1986; Lerner & Keltner, 2000; Oatley & Johnson-Laird, 1987; Roseman, Wiest, & Swartz, 1994; Stein & Levine, 1987).

In general, appraisal theories hold that people continually evaluate the relevance of incoming information for their goals, with ongoing events being appraised along several dimensions that designate the events’ relevance to those goals. Emotions are experienced when people perceive that a goal has been attained or obstructed and it becomes necessary for them to revise prior beliefs and construct new plans. The specific emotion experienced depends on the result of this appraisal process. Thus, when a potentially stressful event occurs, the extent to which people experience fear versus anger versus sadness, or some combination thereof, depends not only on objective features of the event but also on whether people feel personally threatened, whether the outcome is certain or uncertain, and whether they believe they have the resources available to overcome obstacles to their goals (e.g., Ellsworth & Scherer, 2003; Frijda, 1986; Levine, 1995, 1996; Roseman, Antoniou, & Jose, 1996; Smith & Lazarus, 1993; Stein & Levine, 1989; Stein, Trabasso, & Liwag, 2000; Weiner, 1985).

Moreover, once evoked, emotions are thought to direct subsequent cognitions, behaviors, and responses in a manner that is functional—that is, relevant for responding to the type of situation that evokes the emotion (Arnold, 1960; Lazarus, 1991; Lerner & Gonzalez, 2005; Lerner & Keltner, 2001; Oatley & Johnson-Laird, 1987; Scherer, 1998; Shaver, Schwartz, Kirson, & O’Connor, 1987; Stein & Levine, 1987). Thus appraisals, motivations, behaviors, and even physiological responses would be expected to vary depending on the discrete emotion elicited.

For example, happiness is elicited when people appraise events as conducive to the attainment of their goals. Happiness has been found to exert a variety of cognitive and behavioral effects that Fredrickson (1998)
has characterized as “broaden-and-build” tendencies. That is, happiness promotes expansive thoughts and actions, such as affiliation, play, exploration, creative thinking, and the use of broad sources of information when making decisions.

Fear, in contrast, is elicited by the perception that goals are at risk and that one lacks control over the situation (e.g., Lerner & Gonzalez, 2005; Lerner & Keltner, 2001). Once elicited, fear motivates thoughts and behaviors directed toward avoiding the threat. Individuals must evaluate the situational information to assess the immediacy and severity of the threat, and identify methods of escaping or reducing the threat (e.g., whether “fight” or “flight” is the appropriate response or whether the assistance of another is needed). Consistent with this motivation, fear appraisals are often associated with increased physiological responses (e.g., Hamm, Cuthbert, Globisch, & Vaitl, 1997; Lerner, Gonzalez, Dahl, Hariri, & Taylor, 2005; Levenson, 1994, 1999). Thus, for example, fear-induced activation of the sympathetic nervous system leads to enhanced cardiovascular tone, increased blood flow to the skeletal muscles, and elevated blood glucose levels, all of which prepare an individual for the immediate action that may be necessary to avoid a threat (e.g., Christie & Friedman, 2004; Gray, 1994). To determine what action is necessary, people who are frightened would be expected to selectively attend to, encode, and retrieve information concerning the perceived threat and means of avoiding it.

Anger is elicited when people perceive that a goal is obstructed but also believe that they may be capable of overcoming that obstruction (Lerner & Tiedens, 2006; Levine, 1996). In contrast to fear, anger is not consistently associated with increased physiological arousal. For instance, although some studies show a positive association between anger and arousal (e.g., increased heart rate; Labouvie-Vief, Lumley, Jain, & Heinz, 2003), others find no significant associations (e.g., Porter, Stone, & Schwartz, 1999), or even negative associations (e.g., Carroll, Smith, Sheffield, Shipley, & Marmot, 1997; Smith & Houston, 1987). In addition, some researchers have found lower levels of cortisol and cardiovascular responses when anger is induced than when fear is induced (Lerner et al., 2005). The behavioral tendencies associated with anger are more clear-cut. Unlike fear, which is regarded as an avoidance emotion, anger is viewed as an approach emotion, because it motivates an individual to actively engage in a situation to eliminate perceived obstacles and reinstate goals (e.g., Gray, 1990). Thus angry people would be expected to selectively encode and retrieve
information concerning goals and the agents or causes responsible for obstructing the goals. This focus on goals and the causes of failure serves an important function. People are most likely to construct effective plans to reinstate goals if they understand who or what caused the situation that they are trying to change.

A third negative emotion, sadness, is elicited when people appraise goal failure as irrevocable. When a goal cannot be reinstated, its failure affects all of the goals, beliefs, and plans associated with it. Further, with irrevocable loss, no action is necessary, leading to Gray’s (1990, 1994) designation of sadness as an inhibition emotion or one that leads to a reduced likelihood of behavior. As such, sadness is not typically associated with increased physiological activation (Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005), and a few studies have reported reduced autonomic, somatic, and electrodermal activity following the induction of sadness (e.g., Deichert, Flack, & Craig, 2005; Etzel, Johnsen, Dickerson, Tranel, & Adolphs, 2006). With regard to attention, for the sad person, information concerning the risks and potential causes of failure (central information for the fearful or angry person, respectively) would be irrelevant or peripheral, whereas understanding the outcomes and consequences of failure would be centrally important. Of note, although sadness may ultimately be followed by plans to substitute more attainable goals, in the midst of the emotional episode, the withdrawal and passivity commonly associated with sadness may reflect the difficult mental work of coming to terms with the need to revise prior goals and expectations (Levine, 1996). Thus, to effectively understand the outcomes associated with failed goals when feeling sad, people would be expected to attend to and focus on the losses that result from the goal failure.

Of course, fear, anger, and sadness are not the only emotions that a person may experience during a potentially stressful event. Yet, as the brief description above suggests, even across these three emotions that share a common negative valence, individuals’ appraisals and motivations vary substantially. This variability likely affects the aspects of events to which individuals attend and, accordingly, what they remember about those events afterward. That is, in the service of responding to the circumstances that lead to their elicitation, discrete emotions should cause people to focus on and to search for information relevant to their current motivations. Thus the types of information that are of central importance, as opposed to peripheral details, should differ depending upon a
person’s specific emotional state (Lench & Levine, 2005; Levine & Bluck, 2004; Levine & Burgess, 1997; Levine & Pizarro, 2004; Levine, Pizarro, & Laney, 2006). Moreover, because the activation of one goal can inhibit the accessibility of alternative goals (Shah, Friedman, & Kruglanski, 2002), information peripheral to the motivational state of the discrete emotion being experienced may become less accessible.

**Discrete Emotions and Memory**

A growing body of research supports the view that discrete emotions have distinct effects on memory. Research on both adults and children suggests, for instance, that positive memories encompass a broad range of information whereas negative memories focus on specific information relevant to preventing (fear), reversing (anger), or adjusting to (sadness) goal failure. As one example, Berntsen (2002) had independent judges code the content of adults’ most negative and positive autobiographical memories for central and peripheral information. Negative memories focused primarily on central information, as would be predicted by arousal-based models, but positive memories did not. Instead, positive memories tended to include a wide range of information. Other studies have shown that negative memories are less error-prone than positive memories. For example, Kensinger and Schacter (2006) had Boston Red Sox and New York Yankees fans recall the Sox’s win in the American League playoff in October 2004 after 6 days and again approximately 6 months later. Although the fans of the winning Red Sox were more confident of their memories, the Yankees fans recalled details related to the game more accurately than did Red Sox fans (also see Levine & Bluck, 2004).

Turning to discrete negative emotional states and memory, several investigators have found that fearful people display enhanced memory for threat-related information and poorer memory for threat-irrelevant details. For example, Wessel and Merckelbach (1998) investigated the effects of fear on memory in a sample of spider-phobics. Phobic and low-fear control participants were shown a bulletin board to which central (pictures of spiders) and peripheral (pictures of babies and pens) stimuli were attached. Not only did the spider-phobics display an increase in physiological markers of fear when viewing the display, but when asked to recall the display, spider-phobics showed enhanced memory for the central, threatening information (i.e., the spider pictures) and impaired memory
for peripheral, nonthreatening information (i.e., baby and pen pictures). A positive association between fear and memory for threatening stimuli also has been noted by investigators assessing the accuracy and completeness of eyewitness testimony. For instance, “weapon focus” refers to witnesses’ tendency to focus on and remember the weapon used to commit a crime, often at the expense of memory for other, possibly more peripheral, information (e.g., Kramer, Buckhout, & Eugenio, 1990; Loftus, Loftus, & Messo, 1987; Steblay, 1992).

In another line of work, evidence indicates that chronically fearful individuals evince attentional and memory biases consistent with this discrete emotional state. Clinically anxious people have been found to exhibit hypersensitivity to threat-related information. Mathews and Klug (1993), for instance, used an emotional Stroop paradigm to assess color-naming latencies (a sign of greater attention) for positive and negative threat-related words, for positive and negative words unrelated to threat, and for neutral words. Participants included patients with a variety of anxiety disorders and controls. Anxious patients took longer to name the colors of both positive and negative threat-related words (but not positive or negative words unrelated to threat) than to name the colors of neutral words. Selective retrieval of threatening information also has been found (though less consistently) in studies using implicit memory measures (for reviews see MacLeod & Mathews, 2004; Mineka, Rafaeli, & Yovel, 2003). For example, Mathews, Richards, and Eysenck (1989) had clinically anxious people and controls listen to and write down homophones (words that sound alike but have different meanings and spellings). One of the homophones had a threatening meaning, and the other had a neutral meaning (e.g., die and dye). Anxious participants were more likely than controls to write down the threatening meaning upon hearing the word, suggesting that threatening information may be more accessible in memory for these people.

In contrast, people in a sad or depressed mood asked to recall autobiographical events tend to focus not on sources of threat but on negative outcomes such as personal losses and defeats. For example, Lyubomirsky, Caldwell, and Nolen-Hoeksema (1998) found that moderately sad or depressed people recalled more negative autobiographical events associated with loss (e.g., failing a test, losing a girlfriend, their parents’ divorce) than did nondepressed people. Moreover, although depression and post-traumatic stress disorder (PTSD) are both characterized by the presence
of intrusive memories, the content of the intrusive information for these two disorders differs. Consistent with the differing motivations associated with sadness and fear, depression is characterized by rumination on past negative outcomes and their consequences for the self, whereas PTSD is characterized by intrusive memories related to past threats to safety (e.g., Lyubomirsky et al., 1998; Reynolds & Brewin, 1999; Watkins & Teasdale, 2001).

Levine and Burgess (1997) conducted a study to test more directly the predictions derived from appraisal theories concerning the effects of discrete emotions on memory. The researchers contrasted discrete emotions in the same study to see if each emotion would lead to enhanced memory for particular kinds of information. Emotions were evoked in undergraduates by randomly assigning grades of A or D on a surprise quiz. Immediately afterward, students participated in what they believed to be an unrelated study during which they heard and later recalled a narrative. Finally, they rated how happy, angry, and sad they had felt when they received their quiz grade. Participants who received the A (and obviously reported being happy) demonstrated enhanced memory for the narrative as a whole. In contrast, participants who reported feeling primarily sad or primarily angry (all of whom received the D) tended to recall specific types of information. As predicted, those who reported feeling sad about their grade recalled significantly more information concerning event outcomes in the narrative than did participants who reported feeling angry about their grade. The latter individuals showed a nonsignificant tendency to recall more information about the protagonist’s goals than did sad participants. Finally, a significant positive correlation was found between the intensity of anger reported and the amount of information that participants recalled about the goals of the lead character in the narrative.

Summary

Further research is clearly needed to identify the mechanisms underlying the effects of discrete emotions on memory, but the findings reported above support the view that discrete emotions evoke “appraisal tendencies” (Lerner & Keltner, 2000) as well as “action tendencies” (Frijda, 1986) that influence the processing, encoding, and retrieval of information in ways that are consistent with the differing functions of discrete emotions. Overall, negative emotions promote a focus on central information in
the service of responding to potential goal failure. However, as argued by Levine and Pizarro (2004), the types of information deemed central appear to vary depending on the discrete negative emotion elicited. People tend to focus on and remember information about losses when sad, risks when fearful, and goal frustration and blame when angry. Next, we turn to the question of whether similar patterns emerge in children.

**Appraisals, Discrete Emotions, and Memory in Children**

To draw inferences from findings in the adult literature and make predictions about how discrete emotions affect children’s memory, it is first necessary to establish that children experience the same range of discrete emotions as do adults and that children and adults are capable of similar appraisals in response to the same situations. It is also important, however, to acknowledge limitations in children’s processing capacity, coping, and attentional resources. These limitations may have implications for differences between children and adults in their attention to, and memory for, stressful experiences.

**Discrete Emotions, Appraisal Processes, and Emotion Regulation**

Research on the development of emotional experience and understanding in childhood suggests considerable similarity between children’s and adults’ appraisals of events, although some key differences are also noteworthy. Regarding appraisal similarity, research shows continuity across development in the basic types of appraisals that elicit discrete emotions. For instance, in the first year of life, infants display facial expressions of happiness in response to success at instrumental attempts to attain a goal, anger when goals are obstructed, fear when danger is threatened (e.g., fear of heights), and sadness at losses (Alessandri, Sullivan, & Lewis, 1990; Campos, Bertenthal, & Kermoian, 1992; Lewis, Sullivan, Ramsay, & Alessandri, 1992; Sroufe & Waters, 1977; Stenberg, Campos, & Emde, 1983; for reviews see Lewis, 2000; Witherington, Campos, & Hertenstein, 2001).

Moreover, by the age of 3, children explain emotions in terms of whether goals have been attained or obstructed (Stein & Levine, 1989), and by the age of 5, children distinguish anger from sadness based in part on whether they believe that goal reinstatement is possible or not (Levine,
Investigations of children’s perceptions of provocation have shown that by 6 years of age, elementary school children have learned that other people may act with deliberately hostile intentions (Gifford-Smith & Rabiner, 2004). This understanding leads to an increase in aggressive responding when children perceive that another has harmed them intentionally, showing an increased focus on the agents and goals of anger-eliciting situations (Rule & Ferguson, 1986; Dodge et al., 2003). To some extent, the apparent similarity between children’s and adults’ understanding of emotional situations and appraisals is promoted by parents. For example, Fivush (1991) found that mothers tend to focus on agents (retribution) and goals (repairing relationship damage) when talking to their children about anger.

Levine and colleagues directly compared children’s and adults’ appraisals of, and memories for, several emotional events (Levine, Stein, & Liwag, 1999). Parents of 2- to 6-year-olds recalled recent events that had made their child feel happy, sad, fearful, and angry. The children were then asked to describe those events and how the events had made them feel. Children remembered virtually all of the events their parents had described. Moreover, children’s reported emotions often matched the emotions their parents had observed, with matches occurring most often for events that parents described as having elicited happiness or sadness, less often for fear, and least often for anger. Parents and children reported different emotional reactions most often when they focused on different goals or different temporal parts of the emotional episode. For example, a parent recalled her child’s initial feelings of anger at being thwarted in his desire to bring a favorite toy to school. The child, focusing on the eventual outcome of being without his favorite toy, recalled having felt sad. Notably, however, when asked to recall familiar events of personal importance, even the youngest children were capable of generating a coherent account that included their goals or desires and how events impacted those goals (see also Izard, Levinson, Ackerman, Kogos, & Blumberg, 1998).

Despite these marked similarities, children’s and adults’ appraisals differ in complexity. Young children’s appraisals of emotional situations tend to be less complex than the appraisals of older children and adults (see Stein & Levine, 1999, for a review; Bartsch & Wellman, 1995; Case, 1992; Harris, 1989). In particular, preschool children show limited understanding that people can feel emotional ambivalence and that individuals can experience two emotions concurrently (e.g., feeling sad about a pet’s death and at the
same time happiness that the pet’s suffering has ended; Harris, 1989; Harter & Buddin, 1987). This limitation is most pronounced for emotions that vary in valence. Harter and Whitesell (1989) investigated children’s understanding of the co-occurrence of multiple emotions within a single situation and found that children were not able to adequately coordinate dimensions of the emotional experience with opposing valence (e.g., one positive and one negative emotion) until they were about 10 years old. Younger children were not able to attend effectively to multiple facets of a situation. Instead, their attention was largely directed toward a single, emotionally relevant aspect of the event, and this aspect thus was central in guiding their appraisal. Of note, Stein et al. (2000) have argued that young children’s appraisals are simpler than those of older children, but even young children—for instance, in the later preschool and early school-age years—have some appreciation of the experience of opposing emotions (e.g., feeling both good and bad about a single person or situation). However, the authors point out that this understanding is limited to feelings that occur consecutively, not extending to those that happen at the same time. For example, children can claim that they like someone while focusing on one salient goal (e.g., “I like her when she plays with me”) and claim that they dislike that same person when they focus on a different goal (e.g., “I don’t like her because she took my candy”). Nonetheless, evidence is consistent in highlighting a more limited appraisal process on the part of children relative to adults that focuses on single dimensions of an experience.

Another difference between children and adults that may affect children’s memory concerns their more limited attentional and emotion regulation capabilities. Considerable developmental change occurs in children’s capacity to engage in effective emotion regulation (for reviews see Aldwin, 1994; Campos, Frankel, & Camras, 2004; Compas, Connor-Smith, Saltzman, & Thomsen, 2001; Saarni, Campos, Camras, & Witherington, 2006; Skinner & Wellborn, 1994). For example, although during infancy children self-soothe (e.g., non-nutritive sucking) when faced with mild physiological distress (Kopp, 1989), children lack the skills required to deliberately regulate their own emotional responses to psychological distress through at least the early preschool years. They often rely on others, typically parents, to help them regulate their arousal (Miller, Klieweer, Hepworth, & Sandler, 1994; Valiente, Fabes, Eisenberg, & Spinrad, 2004). Indeed, parents, teachers, and older siblings typically intervene to assist distressed children by acting to change the distressing situation or, when this is not possible, by helping
them redirect their attention to reduce arousal, providing further explanations to increase their understanding, physically comforting them, or modeling other coping behaviors that may reduce distress (e.g., Lopez & Little, 1996). Several studies have shown that supportive parenting is associated with improved coping abilities in young children (Eisenberg et al., 2001; Hardy, Power, & Jaedicke, 1993; Valiente et al., 2004), and parents often talk to children about distressing events, such as Hurricane Andrew, in ways that help children make sense of the events and their feelings (Fivush & Sales, 2004).

As children’s understanding of events becomes more complex, so do their appraisals, as well as the range and frequency of strategies they use to regulate their emotional responses (Altshuler & Ruble, 1989). Compas, Connor-Smith, and Jaser (2004) reported that children who were temperamentally better able to control their attentional processes (e.g., had greater capacity for effortful control of their attention) were more likely to utilize advanced cognitive coping strategies such as shifting attention and reappraising situations. The perception of an event’s controllability is one important aspect of this developing sophistication. With age, children are better able to distinguish between stressors that are uncontrollable and those that are controllable, and children begin to use different types of emotion regulation strategies in these two cases (Aldwin, 1994). Uncontrollable situations, which tend to evoke sadness or fear, are more likely to motivate strategies such as cognitive reframing or distraction than are controllable situations (Aldwin, 1994; Brenner & Salovey, 1997; Marriage & Cummins, 2004). For instance, Hodgins and Lander (1997) found that among 5- to 13-year-olds undergoing a venipuncture, older children reported using a greater number of strategies to cope with the venipuncture, and these strategies increasingly reflected cognitive efforts, such as shifting attention. Thus, with age, children are able to attend to more facets of an emotional event (Harter & Whitesell, 1989; Stein et al., 2000), use a broader range of emotion regulation strategies (e.g., using cognitive strategies when a situation is perceived to be uncontrollable; Marriage & Cummins, 2004), and tailor their strategy choice to the situation at hand (Aldwin, 1994).

Discrete Emotions and Memory in Children

The research reviewed above indicates that children’s emotional experience of events depends on how they appraise those events. The manner
in which children appraise a potentially stressful incident has implications for what they consider to be central versus irrelevant (peripheral) during the incident and hence what they are likely to remember. Children’s appraisals are similar to those of adults in many respects, but are less complex. Children also have more limited resources available to regulate their emotions when exposed to potential stressors. As a result, children are unlikely to have attentional resources available to monitor a broad range of information during an emotional experience and instead may direct their attention almost exclusively toward central information consistent with their appraisals. These ideas lay the foundation for our primary hypothesis concerning discrete emotions and memory in children. Specifically, we contend that effects of discrete emotions on memory will be stronger in children than in adults, with children primarily remembering information about a negative emotional experience that is consistent with their appraisals and goals to the exclusion of information not directly relevant to their appraisals and goals.

To date, this hypothesis has not been tested directly. In fact, only a paucity of scientific research has actually considered discrete emotions when investigating children’s memory, and none has systematically considered whether discrete emotions differentially affect children’s memory content. Nonetheless, a few studies have addressed the relation between emotional valence, or discrete emotions, and children’s memory. The findings are consistent with the notion that the nature of children’s emotional experience affects the types of information they attend to and recall.

In one investigation, Fivush et al (2003) compared 5- to 12-year-old children’s memories of positive experiences (e.g., family vacations and school trips) and of stressful negative experiences (e.g., interpersonal violence, serious illness, medical procedures). Memory content was coded with respect to mention of persons, places, objects, actions, descriptions, and internal states. Although the overall amount of information recalled was equivalent across positive and negative experiences, the negative memory reports were more coherent and included more information about children’s thoughts and emotions. Positive memories, in contrast, included a wide range of information about people, actions, and descriptions (also see Fivush & Sales, 2004). These findings are consistent with the research on adults showing that people experiencing positive emotions attend to, and remember, a broader range of information than do people experiencing negative emotions (e.g., Fredrickson, 1998).
In another study, Baker-Ward, Eaton, and Banks (2005) examined 10-year-old children’s memory for a soccer tournament in which they had participated. Although objectively all children had experienced the same event, the outcomes and children’s emotional reactions varied. That is, some children won, others lost. When children’s memory was tested shortly after the game, the overall amount of information recalled did not differ between those who had won versus those who had lost. However, children who won reported more details about the game itself, whereas children who lost reported more interpretive or evaluative details (e.g., why the game was lost). Thus, children’s emotional reactions to the outcome of the game appeared to differentially direct their recounting of the experience toward particular types of information. Of interest, Baker-Ward et al. (2005) commented that some of the children who lost the tournament reported feeling sad, whereas others reported being angry. The researchers did not examine whether the content of memory differed between these two groups of children. Because both of these groups lost but appraised the outcome differently, such an analysis would enable at least one test of whether and how children’s attention and potential memory may vary depending on the discrete emotion experienced.

Turning to discrete negative emotions, Rice, Levine, and Pizarro (in press) examined the effects of sadness, and of instructions to regulate sadness, on children’s memory for educational material. Seven- and 10-year-olds watched sad or neutral film clips. Those who watched the sad clips were then instructed either to emotionally disengage by suppressing their feelings and expression of sadness or to engage in problem solving concerning their feelings. A control group received no emotion-regulation instructions. Children then watched a neutral-toned, educational video and were later tested for their memory of the educational material. Finally, children who had watched the sad film clip were asked whether they had done anything to make themselves feel better while watching that film. Results indicated that children instructed to disengage from their feelings of sadness recalled more details concerning the educational video than did children receiving instructions directing their attention to the sad film (i.e., problem-solving instructions) or no emotion regulation instructions. In addition, children who reported having used a cognitive strategy to regulate their emotions during the sad film remembered more educational material than children who reported not having regulated emotion. Given that the content of the educational video was not relevant
to motivations or appraisals associated with sadness and loss, the poorer memory of sad children who were not instructed to emotionally disengage is not surprising and is consistent with the view that memory for information peripheral to an emotional state is reduced.

In a study described briefly earlier, Quas and Lench (in press) assessed 5- and 6-year-olds’ memory for a fear-eliciting video clip and found that increases in children’s heart rate were positively related to the accuracy of their responses to closed-ended questions about the video. Virtually all of the questions about the video, which depicted four boys running on a bridge as a train approached, concerned central features of the event (e.g., how many boys were running, whether the train stopped, whether the boys saw the smoke from the approaching train). The finding that greater heart rate predicted better memory is thus consistent with the view that fear, induced as a result of observing the video, focused children’s attention on information in the video concerning the source of the threat and the characters’ strategy to escape the threat. Unfortunately, children’s memory was not tested for peripheral information. Thus, there is no way of knowing whether a negative correlation would have emerged between children’s heart rate during the video and their memory for information in the video that was unrelated to threat.

A final study, although not supportive of our hypothesis, remains noteworthy because the researchers in fact manipulated emotional state and tested children’s memory for emotional information, even though the emotional state elicited and the emotion associated with the to-be-remembered event did not match. Potts, Morse, Felleman, and Masters (1986) induced emotion in 7- to 9-year-olds by having them think of a time that they had felt happy, sad, or neutral. Either before or after the emotion induction, children listened to a story in which two protagonists had negative (e.g., being yelled at by a neighbor) or positive (e.g., receiving a cookie from a friend’s mother) experiences. Children’s memory for the story was tested via free and cued recall and recognition. Overall, children recalled more emotional than neutral material; however, the specific emotion induced did not affect the amount of story information remembered. The researchers did not assess whether the content of children’s memory varied based on the emotion induced, making it difficult to determine whether experiencing the particular emotion directed children’s attention toward specific story details and therefore affected their memory.
Conclusion

The topic we introduce in this chapter—how discrete emotions affect children’s memory—is ripe for systematic investigation. Based on several lines of research, we laid out a specific hypothesis, namely that children should remember information about a negative emotional experience that is consistent with their appraisals and goals to the relative exclusion of information not directly relevant to their appraisals and goals. Moreover, based on developmental limitations in children’s appraisal processes and coping relative to that of adults, the effects of discrete emotions should be more pronounced in children than adults.

Insofar as this hypothesis is to be tested, we see two key issues that must be addressed. First, investigators must strive to create a match between the discrete emotion elicited during a to-be-remembered event and the content of the information for which memory is assessed. Studies of adults have focused on memory for emotional information both in the lab and in real-world situations; however, many of these studies, especially those conducted in the lab, have focused on the effects of inducing emotions on memory for neutral information. Studies of stress and memory in children, in contrast, have involved testing children’s memory for the to-be-remembered event that actually had elicited the stress response in children. However, the specific or discrete emotion during the to-be-remembered event was not controlled. It is thus necessary to (a) identify events that target discrete emotional experiences and (b) test children’s memory for the specific aspects of those experiences that are theoretically central and peripheral to the discrete emotion the experiences elicited. Once these studies are undertaken in a more direct, rigorous manner, researchers can better identify how the content of children’s memory is affected by their specific experience of discrete negative emotions.

To have adequate control over the to-be-remembered events and specific questions asked during the memory interviews, the aforementioned types of issues are best addressed using laboratory events, which at most elicit mild levels of emotional arousal. Therefore, a second key issue in need of direct examination concerns the generalizability of laboratory to-be-remembered discrete emotional events to highly distressing real-world events that children at times encounter. In other words, of interest is how the discrete negative emotions experienced during highly traumatic experiences (like certain invasive medical procedures) affect children’s
memory. The more traumatic the event, the more likely it is that intense negative emotions will be elicited in children. However, studies focusing on children’s distress currently do not assess children’s own interpretations and reactions or the specific emotions children report experiencing. Gaining insight into children’s own reactions and interpretations may explain, first, how children’s general distress responses vary, and, second, when and how children’s responses relate to the content and accuracy of their memory.

In closing, for the field often heuristically labeled “children’s memory for stressful events” to continue to advance, it will be necessary to look beyond “distress” as a unitary construct and evaluate children’s understanding or appraisals of those events that elicit distress, along with children’s discrete emotional experiences and emotion regulation techniques. With age, children appraise situations and regulate their emotions in increasingly complex ways and become capable of attending to multiple dimensions of an event. We argue that younger children, with an appraisal process that is similar to but simpler than adults’, and with limited emotion-regulation strategies, are likely to focus narrowly on the aspect of a situation that is more central and emotionally relevant to them. Such an intense singular attentional focus should in turn lead to enhanced memory for the aspects of an event that have direct relevance to the child’s emotional state—memory for information about loss when feeling sad, agents and obstructed goals when feeling angry, and threats when feeling scared—at the expense of other, unrelated information. This possibility may well explain some of the variability in former studies, especially when a wide range of ages and events is included. Of importance, this possibility, if confirmed with continued empirical research, will further our understanding of the complex roles that emotions play across development in children’s memory.

References


