Child Development, March/April 2004, Volume 75, Number 2, Pages 542–561

"If It Happened, I Would Remember It": Strategic Use of Event Memorability in the Rejection of False Autobiographical Events

Simona Ghetti and Kristen Weede Alexander

The present research investigated the link between perceived event memorability and false-event rejection. In 2 studies, event salience, plausibility, and recency were manipulated. Study 1 showed that high-salience events elicited higher memorability ratings than low-salience events for 5-, 7-, 9-year-olds and adults. Plausibility and recency affected only 9-year-olds' and adults' judgments. Study 2 demonstrated that younger versus older children and adults were less likely to reject false events, and that older children and adults were more likely to reject false events based on salience than were younger children. High-recency false events were more likely to be rejected than low-recency false events. Consistent with prediction, recency moderated the effect of salience. The development of metamemorial awareness and rejection strategies is discussed.

In recent years, many researchers and professionals have become interested in the reliability of children's and adults' memory. Numerous studies have replicated the finding that postevent misleading information may distort children's memory of details of an event (e.g., Ceci, Ross, & Toglia, 1987; Dent & Stephenson, 1979; Goodman, 1984; Goodman & Aman, 1990; Leichtman & Ceci, 1995; Poole & White, 1991; for reviews, see Bruck & Ceci, 1999; Ceci & Bruck, 1993), and that sizable percentages of children and adults may at times create memories for entirely false events (Ceci, Huffman, Smith, & Loftus, 1994; Hyman, Husband, & Billings, 1995; Loftus & Pickrell, 1995).

In contrast to the deluge of research on factors enabling false-memory formation, relatively few studies have concerned children's and adults' ability to reject false events (Brainerd & Reyna, 2002; Ghetti, 2003; Koriat, Goldsmith, Schneider, & Nakash-Dura, 2001). That is, the mechanisms, automatic and controlled, specifically devoted to the rejection of event occurrences have only recently become an object of scientific investigation. Brainerd and Reyna (2002), for example, studied the development of a mechanism termed *recollection rejection* within the fuzzy-trace theory framework. This mechanism allows for the suppression of false reports regarding events that did not occur but are gist consistent with events that did. For example, in a recognition memory test, when a distracter that is gist consistent with a studied item is presented, individuals may access the verbatim trace of the studied item. This results in the comparison of the two representations and the acceptance of the representation of the true event as an accurate memory and the rejection of the other representation as a nonoccurrence. Of importance, this mechanism is conceived as automatic, thus requiring little cognitive control. Consistent with the relatively low level of cognitive demand necessary to implement recollection rejection, Brainerd and Reyna reported that although recollection rejection increases its efficiency in middle childhood, it is clearly observed even in young children.

The development of the ability to reject false memories based on controlled processes has also been outlined. For example, Koriat et al. (2001) showed that the memory performance of children aged 7 to 12 improved when participants: (a) were instructed to withhold information when they did not feel it was accurate or (b) received monetary compensation for accurate responding and experienced monetary loss for inaccurate responding. Furthermore, the authors showed that the advantage was greater for older versus younger children. Koriat et al. concluded that controlled processes, such as

Simona Ghetti, Research Institute on Judicial Systems, National Research Council, Bologna, Italy, and University of California, Davis; Kristen Weede Alexander, California State University, Sacramento.

The present research is based on work supported by the National Science Foundation under Grant 0004369. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors do not necessarily reflect the views of the National Science Foundation. We are grateful to Robin Edelstein, Gail Goodman, and Kristin Lagattuta for their valuable comments on earlier versions of this manuscript.

Correspondence concerning this article should be addressed to Simona Ghetti, Research Institute on Judicial Systems, National Research Council (IRSIG-CNR), Via Zamboni, 26, 40126, Bologna, Italy, or Department of Psychology, University of California, Davis, One Shields Avenue, Davis, CA 95616. Electronic mail may be sent to ghetti@irsig.cnr.it or sghetti@ucdavis.edu.

strategies informed by metacognition, play a crucial role in enhancing the accuracy of individuals' memory.

Relevant to the present research, in the adult literature a handful of researchers proposed that adults rely on strategies based on expected memorability to infer event nonoccurrence (e.g., Brown, Lewis, & Monk, 1977; Dodson & Schacter, 2001; Ghetti, 2003; Guttentag & Carroll, 1998; Strack & Bless, 1994). The overarching goal of the present study was to investigate developmental differences in the strategic use of perceived event memorability for the rejection of false events. To provide a background on memorability-based strategies, studies examining adults' use of such strategies are briefly reviewed in the following section. Next, the developmental literature relevant for the present research is discussed.

Event Memorability and Rejection of Nonoccurrences

Although recent studies indicate that children and adults may come to believe having experienced entirely false events (Ceci et al., 1994; Hyman et al., 1995; Loftus & Pickrell, 1995), the success with which an event may be implanted in memory may depend on several factors. For example, Pezdek, Finger, and Hodge (1997) argued that event plausibility plays an important role in false-memory formation. Participants in their study were interviewed about being lost in a shopping mall and receiving a rectal enema (Pezdek et al., 1997, Experiment 2). As in previous false-memory research (Loftus & Pickrell, 1995), interviewers assumed that these events were true, presented brief descriptions of them, and asked participants to report what they remembered. Results revealed that the lost-in-the-shopping-mall episode was more likely to be assented to than was the receiving-a-rectal-enema episode.

Pezdek et al. (1997) explained this finding as a function of differences in perceived plausibility of the two events. Specifically, it was argued that rejection of the implausible event was possibly due to the use of two different (but not mutually exclusive) inferential processes. The first, referred to as the *lack of knowledge inference* (Gentner & Collins, 1981), is based on lack of relevant script knowledge (i.e., semantic memory). Specifically, when asked about the implausible event, individuals may have failed to retrieve any script-relevant information. Such a failure would lead to the decision that the event did not occur. If, when asked about having received an enema, participants realized that they did not know what an enema was, or had no knowledge about how and why one is administered, they may have inferred that they never received one. Because individuals possess vast script knowledge about a variety of life events, only a minority of decisions may benefit from implementing the lack of knowledge inference.

Of importance for the present research, however, Pezdek et al. (1997) also alluded to a second potential inferential process, one based on lack of episodic memory. Participants may have inferred that the false implausible event did not occur because if it happened they would expect to remember it, implying that implausible events are generally deemed more memorable than plausible events. Although Pezdek et al. did not explicitly describe such an inferential process, other researchers have highlighted the importance of perceived event memorability for the rejection of nonoccurrences (e.g., Brown et al., 1977; Guttentag & Carroll, 1998; Strack & Bless, 1994).

Strack and Bless (1994) proposed that individuals implement two memorability-based strategies to infer whether they experienced an event. Before describing such strategies, we highlight that according to Strack and Bless, memorability (i.e., subjective expectation about the memory representation that should be available if the event was actually experienced) is due to event-specific features that may affect individuals' expectations (e.g., event salience) and not due to contextual information (e.g., conditions under which the memory was acquired).

First, the metacognitive strategy leads to confident rejection of an event experience when two conditions are met: (a) individuals evaluate an event as memorable and (b) they fail to retrieve any memory of the event. Because the event should be remembered, but the memory search yields no result, individuals conclude that the event did not occur, regardless of the context in which the event is said to occur.

Second, the presuppositional strategy leads to false-event endorsement when individuals experience lack of memory for a nonmemorable event. Because individuals do not consider the absence of a clear recollection of a nonmemorable event as diagnostic of its nonoccurrence, they may attribute failure to retrieve the nonmemorable event to forgetting, thus inferring that the event actually happened but was forgotten. Moreover, according to Strack and Bless (1994), this inference should be particularly likely when the nonmemorable event was allegedly encoded under conditions detrimental to later retention, or when retrieval is attempted under conditions that may promote assent (e.g., suggestion by respectable sources that the event occurred). Thus, when an event is evaluated as nonmemorable, con-

textual information plays a role in the decision to reject false-event occurrence.

Recent studies further investigated Strack and Bless's (1994) proposal (Ghetti, 2003; Rotello, 1999). For example, participants in a recognition memory test were less likely to correctly reject low-salience (i.e., low-memorability) distractors than high-salience (i.e., high-memorability) distractors (Ghetti, 2003, Experiment 1), confirming the use of the metacognitive strategy. Furthermore, when participants were biased to believe that high-forgetting rates had been observed with other participants, they became even more likely to endorse low-salience distractors than when they did not receive any biasing information (Ghetti, 2003, Experiment 1). This latter result with low-salience distractors is consistent with the use of the presuppositional strategy. Of importance, the rejection of high-salience distracters did not vary according to whether participants received biasing information at retrieval. Thus, the effect of salience was magnified in the bias condition. To the extent that events are attributed high memorability, contextual information may not influence individuals' decisions about event occurrences, consistent with Strack and Bless.

Memorability-based rejection strategies as described by Strack and Bless (1994) entail two crucial abilities: the ability to assess events for their expected memorability and the ability to use memorability assessments as a basis for inferences to support rejection of nonoccurrences. These abilities may require sophisticated mental processes that develop with age and therefore may not be available to young children. In the next sections, the literature on children's metamemorial awareness of memorability and their use of memory strategies are examined to provide justification for the hypotheses tested in our research.

Children's Metamemorial Awareness of Event Memorability

Traditional research on metamemory development has shown that even young children display some metamnemonic competence. For example, most young children (4-year-olds) appear to have a general understanding that to remember or forget, one must have first acquired a memory (Kreutzer, Leonard, & Flavell, 1975; Lyon & Flavell, 1993, 1994; Wellman & Johnson, 1979) and that the probability of forgetting increases as the retention interval becomes longer (Lyon & Flavell, 1993). Furthermore, most kindergartners (about 80%) are aware that remembering in the presence of a loud noise is more difficult than remembering in a quiet environment (Wellman, 1977).

Nonetheless, young children's metamemory may be limited and rudimentary in other domains (Kreutzer et al., 1975). Relevant to the present research, important age differences have been found in the understanding that some events may be more memorable than others. For example, only 30% of kindergartners and 50% of first graders correctly determined that a word-pair list composed of opposites (e.g., hard–easy) is more memorable that a word-pair list composed of random pairs (e.g., Mary–walk). In contrast, virtually all of the third graders and fifth graders understood that if items match on some meaningful dimension, they can be remembered more easily (Kreutzer et al., 1975; see also Moynahan, 1973). When asked to predict the number of items remembered in a later test, kindergartners overestimated such a number (e.g., Pressley, Levin, Ghatala, & Ahmad, 1987; Worden & Sladewski-Awig, 1982), and only a small minority (13%) was able to attribute performance predictions to item characteristics (e.g., preference, familiarity, salience). Rather, most young children were either unable to provide any reason for their optimistic prediction or justified their prediction as naturally resulting from their own memory ability (e.g., ''I have great memory''; Worden & Sladewski-Awig, 1982).

The reasons some metamneumonic abilities are acquired earlier than others are not fully understood. Nevertheless, there is a consensus that metamemory, like other forms of knowledge, results from individuals' attempt to represent and understand the world (Howe & O'Sullivan, 1990; O'Sullivan & Howe, 1995; Wellman, 1988). Thus, it is possible that young children possess some metamemory skills because of the frequent exposure to the effect of certain factors on memory. For example, the early notion that noise during acquisition has a negative impact on memory may derive from the recurrent observation of the detrimental effects of noise on memory and on information processing more generally (e.g., it may be difficult to follow a conversation in a noisy environment; Wellman, 1977). In contrast, young children may not have as many opportunities as older children to reflect on the factors contributing to event memorability (i.e., familiarity, preference).

Remarkably, however, there is a paucity of research on children's ability to recognize explicitly that more salient events (i.e., noticeable, standing out on some dimension) are more memorable than less salient events. Although previous research has

shown that, until the elementary school years, children may not be able to discern explicitly among intrinsic characteristics that make one event more memorable than another (Kreutzer et al., 1975; Worden & Sladewski-Awig, 1982), children have never been asked to rate the memorability of meaningful life events. Yet, in their daily lives, children encounter events that vary in salience, and even young children experience better memory for events that are bizarre (Emmerich & Ackerman, 1979), noticeable (Howe, Courage, Vernescu, & Hunt, 2000), and personally relevant (i.e., personally experienced as opposed to only observed; Rudy & Goodman, 1991; Tobey & Goodman, 1992). Thus, it is possible that even young children (5-year-olds) may have explicit metamemorial awareness that more salient events are more memorable than less salient events. Because the goal of the present research was a developmental investigation of the link between perceived event memorability and rejection of false events, children were asked to rate the memorability of life events that were varied on salience.

Another dimension that was deemed crucial to memorability is plausibility (Pezdek & Hodge, 1999). Thus, the effect of plausibility on event memorability was also investigated in the present study. It should be noted that, although different, salience and plausibility might be related. Events may be attributed different levels of salience for various reasons. Although some of such reasons are likely idiosyncratic to each individual, assessments of salience may be based on common factors such as events' frequency of occurrence, adherence to a script, and emotional content. Plausibility is arguably an additional important factor. To the extent that implausible events are not expected to occur, and when they do occur they may violate individuals' expectations, individuals may consider implausible events more salient than plausible events, thus resulting in increased levels of perceived memorability for implausible versus plausible events. As evident in later descriptions of the present research, events were selected such that the independent contribution of salience and plausibility could be examined.

Finally, events were varied according to recency. Children at times show awareness at early ages that length of retention interval affects memory (e.g., Lyon & Flavell, 1993; MacNamara, Baker, & Olson, 1976; Wellman & Johnson, 1979). For example, Lyon and Flavell (1993) required 3- and 4-year-olds to judge which of two dolls, one exposed to a short retention interval and one to a long interval, would remember or forget. Results indicated that by 4 years of age, most participants understood that forgetting would be more likely to occur after a long versus short retention interval. Although this study suggests early understanding of the effect of retention interval on memory, other studies provided a different picture (Howe, O'Sullivan, & Marche, 1992; O'Sullivan, Howe, & Marche, 1996).

For example, Howe et al. (1992) asked 6- and 8-year-olds to predict the number of items they would forget after 1 or 7 days. Whereas most 8-year-olds correctly estimated that forgetting would increase with a longer retention interval, no 6-year-olds did so. Furthermore, O' Sullivan et al. (1996, Experiment 2) examined the effect of retention interval (i.e., long vs. short) and centrality of event actions (i.e., central vs. peripheral) in preschoolers, first graders, and third graders. They found that although children across age groups were more likely to expect better memory for central actions, no evidence was found that participants of any age would expect to forget more peripheral details in the long-retention condition, as predicted. Thus, it was of interest to examine whether participants in the present study would attribute higher memorability ratings to more recent than to less recent events.

Strategy Development

Developmental psychologists commonly interpret the finding that age differences in memory performance are magnified in recall tasks compared with recognition tasks as evidence that young children's performance suffers when memory tasks require reliance on memory strategies (e.g., Bjorklund & Coyle, 1995; Cox, Ornstein, Naus, Maxfield, & Zimler, 1989; Keniston & Flavell, 1979; Schneider & Bjorklund, 1998). For example, older children are better than younger children at organizing and elaborating information during the acquisition phase, and at conducting memory searches to recall information systematically at the time of retrieval (Bjorklund & Douglas, 1997). In general, strategies, particularly those involving the ability to conduct appropriate memory searches during retrieval, are fully available for spontaneous use only during the late elementary school years (Schneider & Bjorklund, 1998).

An examination of the literature reveals that memory-strategy development is generally studied to understand how children learn to remember (Bjorklund & Douglas, 1997). In contrast, little research has been conducted on children's use of strategies to make inferences about the occurrence of an event after failing to retrieve information about that event. An exception is a study conducted by

Ackerman and Emmerich (1978) to document the use of an exclusion strategy in a forced-choice recognition task. The authors had 3- to 4-year-olds and 6- to 7-year-olds learn pictorial paired associates. Children's memory was later tested by showing the first member of the pair and asking participants to select the second from four alternatives. Of particular interest was the situation in which none of the four alternatives was correct because they included three studied pictures (i.e., previously presented, but not in combination with the one presented as the first member of the pair) and one completely new picture. Results revealed that under these conditions, 6- to 7-year-olds were more likely than 3- to 4-year-olds to select mistakenly the completely new picture. According to Ackerman and Emmerich, children used an exclusion strategy: Children were able to exclude three of the four alternatives because they remembered having originally studied them paired with other pictures. This resulted in the selection of the completely new picture. Thus, children may have inferred that they may have been exposed to the new pair but forgot it. Although this study set the stage for the systematic study of children's reliance on inferences when memory fails, until recently no research had directly addressed the issue of how children infer that an event never happened.

Pezdek and Hodge (1999), however, contributed to this literature by replicating with children their finding with adults that low-plausibility false events (i.e., receiving an enema) are less likely to be falsely assented to than high-plausibility false events (i.e., getting lost in a mall). The authors argued that children, like adults, were able to use their lack of memory for the low-plausibility event to infer that the event did not happen. It should be noted, however, that the children in Pezdek and Hodge's study were either 5- to 7-year-olds or 9- to 12-year-olds (and the authors used a dichotomized age variable for their data analysis). Given that traditional studies of children's memory strategies suggest there are important differences between 5- and 7-year-olds' use of strategies (Bjorklund & Douglas, 1997; Schneider & Bjorklund, 1998), it is likely that differences within each age group existed in the inferences used to reject false events.

Furthermore, receiving an enema and getting lost in a mall may differ in other important ways, which may affect the probability that participants would assent to these events' occurrence. For example, children and adults report being less willing to discuss an experience involving receiving an enema than one entailing getting lost in a mall (Ghetti & Goodman, 2001). Also, implausible events may be more salient (i.e., noticeable) than plausible events. It is thus important to consider these additional factors in the same design. Moreover, although the plausibility hypothesis is reasonable, because Pezdek and Hodge (1999) did not have any direct evidence for the psychological processes responsible for the differences in false assents between events (i.e., lack of memory), further investigation is needed.

In a developmental extension of Strack and Bless's (1994) study described earlier, Ghetti (2003, Experiment 2) investigated age differences in the use of memorability-based rejection strategies. In this study, child participants aged 5, 7, and 9 years, and adults viewed 5 drawings depicting members of one semantic category (e.g., four-legged animals) and 35 drawings depicting members of another semantic category (e.g., objects). The two types of stimuli were intermixed at study. Salience was operationally defined as the frequency of occurrence of members of a semantic category. Thus, in the previous example, objects were the low-salience (i.e., low-memorability) items and four-legged animals were the high-salience (i.e., high-memorability) items. Participants' memory was tested with a recognition task including high-salience studied items and distracters (e.g., nonstudied four-legged animals), and low-salience studied items and distracters (e.g., nonstudied objects).

A correct rejection pattern consistent with the development of memorability-based strategies was found. Nine-year-olds and adults were more likely to reject high-salience than low-salience distractors, suggesting reliance on the metacognitive strategy. Additionally, when 9-year-olds and adults studied the material in the presence of a loud noise (and were told at encoding that noise negatively affects memory) and were biased at retrieval to expect high-forgetting rates, rejection of high-salience distractors remained unvaried (consistent with the use of the metacognitive strategy), whereas that of low-salience distractors further diminished (consistent with the use of the presuppositional strategy). Thus, the effect of event salience was magnified when contextual information (i.e., noise at encoding and biasing information at retrieval) suggested that forgetting might have occurred.

In contrast, 5-year-olds were not more likely to reject high-salience than low-salience distractors. Moreover, 7-year-old children behaved as if they were in a transition phase: They were more likely to correctly reject high-salience versus low-salience distractors, depending on the conditions under which the information was encoded. When information was encoded under standard conditions,

the effect of salience was detected. However, when information was encoded in the presence of a loud noise (and participants were informed that noise negatively affects memory), the effect of salience was no longer evident in 7-year-olds. These results suggest a developmental progression from the time children do not use memorability-based strategies at all, through a time when children may at times use rejection strategies although not consistently, to a time when children's performance is comparable to adults'. Further examination of this developmental progression was of interest for the present study for two reasons. First, consistent with previous research, high and low item salience (i.e., memorability) were operationally defined in terms of frequency of occurrence in Ghetti's (2003) experiment. Thus, memorability ratings were not elicited directly from children. It was therefore deemed important to extend that finding by establishing whether the developmental pattern uncovered by Ghetti was replicable when memorability ratings were in fact elicited from participants and was used to make predictions about rejections of false events.

Second, it was of interest to establish whether it was possible to observe a developmental progression in memorability-based rejection of false autobiographical events given that autobiographical events were used in previous developmental research proposing a role for inferences based on memory in the rejection of false events (Pezdek & Hodge, 1999).

The Present Research

As previously argued, two conditions must be met to decide whether an event is forgotten or never occurred based on expected memorability: One must have knowledge of the variables affecting remembering and forgetting, and the ability to use that information to support decision making. Thus, young children may be unable to use a memorability-based rejection strategy because they fail to appreciate different memorability levels across events. Alternatively, young children may be aware that some events are more memorable than others but fail to use that information strategically to support false-event rejection.

Two studies were therefore conducted. In Study 1, memorability ratings about a set of eight life events were elicited from participants. In Study 2, a new group of participants was involved in a study using the lost-in-the-mall paradigm with the same eight events used in Study 1 (Loftus & Pickrell, 1995; Pezdek & Hodge, 1999). The memorability ratings gathered in Study 1 were used to make predictions about the probability that participants in Study 2 would reject the occurrence of false events.

Study 1

The goal of Study 1 was twofold. First, Study 1 was intended to examine children's ability to assess event memorability. Specifically, whether memorability ratings of 5-, 7-, and 9-year-old children and undergraduate students were affected by plausibility, salience, and recency was of interest. Second, this study was aimed at obtaining an empirical basis for advancing predictions about the probability that the occurrence of different false events would be rejected. As previously illustrated, Pezdek and colleagues (Pezdek et al., 1997; Pezdek & Hodge, 1999) contrasted two events (i.e., being lost in a mall and receiving a rectal enema), which intuitively varied in plausibility and memorability, but there was no direct evidence concerning the relation between participants' rejection of false events and event memorability.

Several hypotheses were advanced. First, consistent with Pezdek and Hodge's (1999) proposal, high-plausibility events were expected to be rated as less memorable than low-plausibility events. Second, high-salience events were expected to receive higher memorability scores than low-salience events. Third, events described as more recent were expected to receive higher memorability scores than less recent events. Finally, because previous research has at times found limits in preschoolers' and kindergartners' metamemorial awareness of event characteristics that may increase perceived memorability, interactions between age and plausibility, and between age and salience were also viable predictions. Because of age-related limitations in metamemory skills, the hypothesized effects of event plausibility and salience on memorability may be absent (or reduced) in 5-year-olds and emerge clearly only in older participants.

Method

Design

This study conformed to a 4 (age group: 5-, 7-, and 9-year-olds, and undergraduates) $\times$ 2 (recency: high recency vs. low recency) $\times$ 2 (plausibility: high vs. low) $\times$ 2 (salience: high vs. low) mixed-design. Age and recency were varied between participants, whereas plausibility and salience were varied within participants.

Participants

Memory ratings were obtained from 72 children, divided equally among three age groups (5-year-olds, $M = 67.40$ months, *range* = 62 to 71; 7-year-olds, $M = 88.70$ months, *range* = 85 to 94; and 9-year-olds, $M = 114$ months, *range* = 109 to 119), and 24 undergraduate students ($M = 21.5$ years, *range* = 18 to 26). An equal number of males and females were represented in each cell of the study. Approximately 79% were European American, 11% were Asian, 5% were Hispanic, 3% were African American, and 2% were Native American. Participants were primarily from a middle-class background. Children and their families were recruited through newspaper advertisements and were compensated with a prize and $5. Undergraduate students were recruited from a psychology course and received course credit for participation.

Materials

Event stories: Pilot testing. Eight event stories were selected on the basis of the ratings of plausibility and salience obtained from pilot participants. Forty undergraduate ($M = 19.9$ years, *range* = 18 to 27) students read 14 event stories (presented one at a time) described as if each happened to them (e.g., ''Once you took a trip to the Grand Canyon with your family. You drove through the desert, which you thought was very cool. But what you really liked was that the Grand Canyon was so deep. You kept saying that it was so deep.''). Following each story presentation, participants were asked to rate the event's plausibility and salience. For each event, plausibility ratings were elicited as follows: ''Some events would be very unlikely to happen in the real world, whereas others could happen in anyone's life. On a scale from 1 to 10, being 1 = very unlikely, very implausible, and 10 = very likely, very plausible, how plausible do you think this event is?'' Also, for each event, salience ratings were elicited as follows: ''Some events are very salient and noticeable. Thus, they stand out compared to other life events. On a scale from 1 to 10, being 1 = not salient at all, not noticeable at all, and 10 = very salient, very noticeable, how salient do you think this event is?''

Preliminary analyses indicated that the following eight events were those best suited to evaluate the independent effect of salience and plausibility on memorability ratings. There were two high-plausibility/high-salience events: going to the Grand Canyon (plausibility, $M = 7.93$, $SD = 1.82$; salience, $M = 7.30$, $SD = 1.20$) and wearing a bandage after getting hurt on an eye (plausibility, $M = 7.93$, $SD = 2.09$; salience, $M = 7.60$, $SD = 1.32$). There were two high-plausibility/low-salience events: taking a summer craft class (plausibility, $M = 8.33$, $SD = 1.23$; salience, $M = 5.23$, $SD = 1.73$) and putting a seed up one's own nose (plausibility, $M = 7.48$, $SD = 1.93$; salience, $M = 5.35$, $SD = 1.78$). There were two low-plausibility/high-salience events: meeting one's favorite famous person (plausibility, $M = 3.33$, $SD = 2.00$; salience, $M = 8.23$, $SD = 2.03$) and being attacked by a big black bird (plausibility, $M = 3.55$, $SD = 2.15$; salience, $M = 7.75$, $SD = 2.07$). Finally, there were two low-plausibility/low-salience events: receiving a live tarantula as a birthday present (plausibility, $M = 4.40$, $SD = 2.03$; salience, $M = 6.35$, $SD = 1.87$) and receiving an enema (plausibility, $M = 4.17$, $SD = 2.17$; salience, $M = 5.42$, $SD = 2.00$).

The appropriateness of this set of events for use in the present study was verified with 2 one-way within-participants ANOVAs in which the type of event was entered as the independent variable (i.e., eight levels corresponding to the eight preselected events), and plausibility and salience ratings were respectively entered as dependent measures. Results revealed that each event that was considered of high plausibility received plausibility scores that were significantly higher than those received by each event that was considered of low plausibility ($ps < .05$) but were not significantly different in plausibility from the other events considered of high plausibility. The same was true for each of the low-plausibility events. Similarly, each event that was considered of high salience received salience scores that were significantly higher than each event that was considered of low salience ($ps < .05$) but were not significantly different in salience from the other events considered of high salience. The same was true for each of the low-salience events. It is evident that for these events, event salience did not vary according to plausibility level.

Other events initially included in pilot testing (e.g., being lost in a mall, being in a car accident) were excluded because of their plausibility or salience ratings. For example, the being-lost-in-a-mall event obtained average plausibility ratings equal to 8.8 ($SD = 2.01$) and average salience ratings equal to 6.32 ($SD = 2.52$). Although the plausibility ratings were such that this event could be included among those of high plausibility, the salience ratings precluded inclusion: Salience ratings did not significantly differ from either those of the high-salience or those of the low-salience events selected.

Event stories: The present study. Descriptions of the eight events selected included information about the

time the event allegedly happened. Thus, event recency was systematically varied. In the low-recency condition, participants rated event memorability for an event that allegedly happened when they were 3 years of age. Three years of age was chosen to reflect a time in early childhood for participants of all age groups, but nevertheless a time for which individuals may retrieve some memory, thus preventing floor effects. In contrast, in the high-recency condition, adjustments in the alleged time of occurrence were necessary because participants belonged to different age groups. All child participants in the high-recency condition, regardless of age, were told to rate memorability while imagining that the events happened 1 year earlier (i.e., age 4 for 5-year-olds, age 6 for 7-year-olds, and age 8 for 9-year-olds). It was believed that child participants would consider this event as relatively close in time. Because the events were selected to be childhood experiences, undergraduate students were told to evaluate the memorability of the events as if they had occurred at age 8. This age for adults was chosen because: (a) it is clearly a middle-childhood age as opposed to early childhood as is 3 years of age and (b) it was the same age used for 9-year-olds, thus allowing for direct comparisons of memorability ratings.

In the following paragraphs some of the events are shown. The first example was classified as a high-recency/high-plausibility/low-salience event: ''When you were 8, you and your parents thought that it was a good idea to take a summer craft class to learn how to make things out of wood. One of the teachers helped you make a little toy out of wood.''

The second example was classified as low-recency/low-plausibility/high-salience event: ''When you were 3, you were walking down the street with your mom, when a big black bird attacked you: It landed on your head and scratched you a little. At first it was really scary, but it did not look too bad afterwards.''

Memorability Rating Scale (MRS). Memorability was operationally defined as the participants' ratings of the likelihood and ease of remembering the event after a delay. To make a 6-point scale accessible to all participants, especially young children, a board containing six pictures representing six memorability levels was provided to all participants. Each picture showed a face with a thought bubble. Even children younger than those involved in the present study have been found to understand thought bubbles (Wellman, Hollander, & Schult, 1996). The bubble in the first picture (i.e., value equal to 1) was completely empty and was described to participants as indicating ''I would remember nothing because I would probably forget this event.'' The bubble in the last picture (i.e., value equal to 6) was filled of colorful details and was described to participants as indicating ''I would remember it perfectly because I would never forget this event.'' Four intermediate pictures depicting bubbles with increasing levels of detail were also provided (i.e., values equal to 2, 3, 4, and 5, respectively) and described to participants.

Procedure

Participants came to the laboratory on one occasion for participation. Before the beginning of the session, participants were given detailed instructions about how to use the MRS. Practice trials on material irrelevant to the study were given. During these trials, participants received feedback on their use of MRS. Next, the real task was introduced. Participants were told to pretend that the events happened to them at the age corresponding to the recency condition to which they were assigned. Participants in the low-recency condition were told that the events happened when they were 3 years old, that is, when they were little children, and that thus they may not expect to remember very much. They were then asked to do their best to assess the events' memorability. Participants in the high-recency condition were told to pretend that the events happened when they were 4 (or 6, or 8), that is, when they were no longer little children, and that thus they may expect to remember quite a bit. They were then asked to do their best to assess the events' memorability.

Participants were then read each event description one at a time in random order. Each participant was asked to assess the memorability of the eight life events described earlier. After having heard the description of the event, they were invited to use the MRS to rate the event memorability (i.e., ''If this happened to you when you were 3 [i.e., low-recency condition], how much would you remember about it?''). After providing memorability ratings, participants in Study 1 were also asked to rate how willing they would be to talk about the event on a 4-point-scale (1 = I would never want to talk about this, 2 = I would want to talk about this sometimes, 3 = I would want to talk about this often, and 4 = I would want to talk about this all the time). The analyses of the answers to these questions are reported here. However, the relevance of this information is discussed later. This procedure lasted approximately 30 min.

Results

Preliminary analyses indicated that there were no differences in performance by gender. Thus, data

were collapsed across genders for further analyses. A 4 (age group) × (recency of occurrence) × 2 (salience) × 2 (plausibility) mixed ANOVA was conducted. Memorability ratings were entered as the dependent measure. Only statistically significant results are reported here unless nonsignificant results contrast our hypotheses.

Mean memorability ratings by age group, salience, and plausibility are reported in Table 1. A significant age effect was found, $F(3, 88) = 7.62$, $p < .001$, $\eta^2 = .21$; 5-year-olds, $M = 3.63$; 7-year-olds, $M = 4.52$; 9-year-olds, $M = 4.90$; undergraduates, $M = 3.88$. Although Bonferroni planned comparisons revealed that this main effect was due to the fact that ratings by 5-year-olds and by undergraduates were significantly lower than ratings by 9-year-olds, there was a trend such that an increase of memorability was observed as the age of child participants increased.

A significant main effect of salience was also found, $F(1, 88) = 42.91$, $p < .001$, $\eta^2 = .33$, such that high-salience events were rated as more memorable than low-salience events ($M = 4.55$ and $M = 3.92$, respectively). Thus, irrespective of event plausibility, participants of all ages recognized that high-salience events are more memorable than low-salience events.

Furthermore, a significant main effect of event plausibility was found, $F(1, 88) = 7.11$, $p < .01$, $\eta^2 = .08$, such that low-plausibility events were rated as more memorable ($M = 4.35$) than high-plausibility events ($M = 4.12$). The effect of plausibility, however, was qualified by a significant interaction among age, recency, and plausibility, $F(3, 88) = 3.91$, $p < .05$, $\eta^2 = .12$ (Table 2).

To interpret this interaction, analyses were conducted separately for each age group. When the effect of plausibility and recency were examined in 5-year-olds, a significant interaction between the two variables emerged, $F(1, 22) = 6.97$, $p < .05$, $\eta^2 = .24$, such that the effect of plausibility was significant in the high-recency condition (low plausibility, $M = 3.78$; high plausibility, $M = 3.08$), $F(1, 11) = 12.00$, $p < .01$, $\eta^2 = .52$, but not in the low-recency condition (low plausibility, $M = 3.71$; high plausibility, $M = 3.96$), $F(1, 11) = .70$, $p = .42$, $\eta^2 = .06$. The main effect of recency was not statistically significant, $F(1, 22) = .52$, $p = .48$, $\eta^2 = .02$. The only indication of a trend for a recency effect was observed with high-plausibility events. High-plausibility events described as more recent were assessed as less memorable ($M = 3.08$) than those described as less recent ($M = 3.96$), $F(1, 22) = 2.01$, $p = .17$, $\eta^2 = .08$. The direction of this trend, however, is contrary to prediction.

When the effects of plausibility and recency were examined in 7-year-olds, the interaction between the two variables approached statistical significance, $F(1, 22) = 3.24$, $p = .08$, $\eta^2 = .13$, such that different from 5-year-olds, the effect of plausibility approached statistical significance when the event was described as less recent, but in the direction opposite to prediction (low plausibility, $M = 4.08$; high plausibility, $M = 4.85$), $F(1, 11) = 3.74$, $p = .08$, $\eta^2 = .24$. In contrast, no significant effect of event plausibility was observed when the event was described as more recent (low plausibility, $M = 4.63$; high plausibility, $M = 4.56$), $F(1, 11) = .07$, $p = .80$, $\eta^2 = .01$). The effect of recency was not statistically significant, $F(1, 22) = .14$, $p = .72$, $\eta^2 = .01$, and did not vary based on plausibility as it did with 5-year-olds.

Different from younger children, the effects of plausibility and recency observed in 9-year-olds were consistent with prediction. Low-plausibility events were rated as significantly more memorable

Table 1
Study 1: Mean Memorability Ratings (Standard Deviations) for Events by Event Salience, Event Plausibility, and Age Group

	Salience			
	Low		High	
	Plausibility		Plausibility	
Participants' age	Low	High	Low	High
5-year-olds	3.15 (1.86)	3.40 (1.64)	4.34 (1.49)	3.65 (1.73)
7-year-olds	3.96 (1.60)	4.58 (1.44)	4.71 (1.10)	4.83 (1.11)
9-year-olds	4.75 (1.04)	4.44 (1.22)	5.33 (0.67)	5.08 (0.91)
Adults	3.94 (1.18)	3.15 (1.16)	4.63 (1.02)	3.79 (1.22)

Table 2
Study 1: Mean Memorability Ratings (Standard Deviations) for Events by Event Recency, Event Plausibility, and Age Group

	Recency			
	Less recent		More recent	
	Plausibility		Plausibility	
Participants' age	Low	High	Low	High
5-year-olds	3.71 (1.24)	3.96 (1.18)	3.78 (1.47)	3.08 (1.79)
7-year-olds	4.04 (1.55)	4.85 (0.83)	4.63 (0.83)	4.85 (0.94)
9-year-olds	4.85 (0.96)	4.38 (1.04)	5.23 (0.50)	5.17 (0.64)
Adults	4.04 (0.89)	3.17 (0.97)	4.52 (0.94)	3.77 (1.16)

($M = 5.04$) than high-plausibility events ($M = 4.77$), $F(1, 22) = .4.87$, $p < .05$, $\eta^2 = .18$. In addition, the effect of recency was marginally significant, $F(1, 22) = 3.52$, $p = .07$, $\eta^2 = .14$, such that more recent events were rated as more memorable ($M = 5.20$) than less recent events ($M = 4.61$).

Similarly, with adults low-plausibility events were rated as significantly more memorable ($M = 4.48$) than high-plausibility events ($M = 3.47$), $F(1, 22) = 35.08$, $p < .01$, $\eta^2 = .62$. The effect of recency was not statistically significant but was in the predicted direction, $F(1, 22) = 1.98$, $p = .17$, $\eta^2 = .08$: More recent events appeared to be rated as more memorable ($M = 4.15$) than less recent events ($M = 3.60$).

One final result that is worth mentioning is the interaction between salience and plausibility, $F(1, 88) = 3.68$, $p = .06$, $\eta^2 = .04$. Consistent with the effects of salience and plausibility reported earlier, the effect of salience was detected for both high-plausibility events (high salience, $M = 4.24$; low salience, $M = 3.89$) and low-plausibility events (high salience, $M = 4.75$; low salience, $M = 3.95$). However, the low-plausibility/high-salience events were assigned memorability scores that were significantly higher than those assigned to high-plausibility/high-salience events ($p < .05$).

Overall, results from Study 1 suggest that plausibility may not be the only factor potentially contributing to inferences about event nonoccurrence, as shown by the effect of salience on perceived memorability. Also, the effect of salience seems to emerge earlier than that of plausibility. Finally, the main effect of recency failed to emerge as a significant factor affecting judgments of memorability but appeared to affect judgments in older children and adults.

Discussion

The results of this study demonstrate that children as young as 5 years are capable of generating meaningful assessments of event memorability. With older children and adults, 5-year-olds are sensitive to event salience and expect to remember noticeable events better than unnoticeable events. It is possible that children gain this notion by observing the reliable advantage that everyone, including young children, experience in memory performance for salient versus nonsalient events (e.g., Emmerich & Ackerman, 1979; Howe et al., 2000). This result can be considered a piece of indirect evidence that children and adults hold similar notions of salience, at least with respect to memorability expectations for the events used here. Although the effect of salience was uncovered across age groups, 5-year-olds rated the events as less memorable than did older children. This result is not consistent with the typical finding that younger children tend to be more optimistic regarding their memory performance than older children (e.g., Pressley et al., 1987; Schneider & Bjorklund, 1998). However, younger children's overestimation is typically found with the performance-prediction paradigm, which requires that children indicate the number of to-be-remembered stimuli they expect to remember before the study phase (for a review, see Schneider & Pressley, 1997). It is possible that a short story provides a context that may enhance children's ability to gauge expected memorability. Younger children may have been facilitated when the event to be assessed for memorability was meaningful to them and when it was presented in the form of a short narrative.

Furthermore, undergraduate ratings were similar to 5-year-olds' and significantly lower than 9-year-olds' ratings. Recall that undergraduate students, like 9-year-olds, were asked to pretend that the events either happened when they were 3 or when they were 8 years of age. Thus, undergraduates may have considered that these events are placed at times in the past for which they do not have very detailed memories available, thus resulting in reduced memorability ratings.

If individuals reject false autobiographical events based on strategies informed by subjective assessments of event memorability, it will be particularly interesting to compare the behavior of 9-year-olds and undergraduate in rejecting false events. Because 9-year-olds assigned higher memorability ratings to events than did adults, if higher memorability ratings are associated with higher rejection rates, 9-year-olds, in principle, could be more likely than adults to correctly reject false events.

The effect of salience across age also is an important finding because it creates an appropriate context to test fully the metacognitive strategy hypothesis (Strack & Bless, 1994). As discussed earlier, the memorability-based rejection strategy described by Strack and Bless (1994) entails two crucial abilities: the ability to evaluate event memorability and the ability to use memorability assessments as a basis for inferences to support rejection of nonoccurrences. Thus, if false-event rejection was not affected by event salience for young children, one would be justified to conclude that young children fail to implement the metacognitive strategy not because of a lack of metamemorial knowledge about event memorability but rather because they lack the ability to integrate such knowledge into decision making.

Consistent with the proposal that false implausible events are more likely to be rejected because they are more memorable than false plausible events (Pezdek & Hodge, 1999), an effect of plausibility was uncovered but was qualified by an interaction between age and recency. Only 9-year-olds' and adults' memorability ratings reflected a main effect of event plausibility, whereas younger participants' ratings did not. Thus, it appears as if, at least for the events used in the present study, the effect of event salience on memorability ratings was more extended and emerged earlier than that of plausibility.

With respect to the relation between plausibility and salience, it is worth noting that the interaction effect between salience and plausibility approached statistical significance. Thus, it was observed that high-salience/low-plausibility events were rated as more memorable than high-salience/high-plausibility events. However, memorability assessments to low-salience events were not qualified by event plausibility. Thus, if individuals reject false events based on event memorability, a significant interaction between salience and plausibility should also be detected in the results of Study 2. That is, individuals should be least likely to assent to the occurrence of high-salience/low-plausibility false events. Study 2, therefore, offers the opportunity to observe the independent and interactive effects of plausibility and salience.

Before turning to Study 2, the absence of a main effect of recency on memorability ratings deserves comment. That passage of time is detrimental to memory is one of the first metamneumonic notions acquired by young children (e.g., Lyon & Flavell, 1993). Thus, failing to detect a reliable effect in 5- and 7-year-olds is surprising. It is possible that when the to-be-assessed events are life-event scenarios, participants' attention becomes more focused on the central actions of the events and less focused on information transcending the event per se, such as recency information. Future research should investigate whether other variables describing the circumstances in which an event occurred (e.g., personally experienced events vs. observed events; events observed for a brief time vs. events observed for a long time) become secondary to event salience when individuals engage in rating the memorability of life events.

Nevertheless, the effect of length of retention interval in young ages failed to emerge in other studies on expectations of forgetting and remembering (e.g., Howe et al., 1992; O'Sullivan et al., 1996). It has thus been proposed that there exist important developments between ages 4 and 8 in children's beliefs about the effects of recency of acquisition on later retention (O'Sullivan et al., 1996). If this is the case, at least 9-year-olds' and adults' responses should show the effects of recency in the present study. Although there was a trend, the recency effect failed to reach conventional levels of statistical significance.

Given that adults undoubtedly perceive their memory for events that occurred in early childhood to be different in quality and quantity from events that occurred in middle childhood (e.g., Bruce, Dolan, & Phillips-Grant, 2000), lack of a significant effect of recency in adults seems to suggest that when rating scenarios about life events, individuals may pay closer attention to event-specific features than to contextual information such as event recency. We should acknowledge, however, that undergraduates may also have considered that all the events examined here were placed far enough in the past to result in a compression of the difference between high and low recency.

Even so, to the extent that recency information is factored in the decision of nonoccurrence based on the subjective memorability assessments of more or less recent events, we hypothesized that the effect of recency on false-memory rejection should emerge in 9-year-olds and adults. Because older children and adults have been found in other research to be fully aware of the impact of length of retention interval on memory, and 9-year-olds and adults in this study showed a tendency to rate high-recency events as more memorable than low-recency events, the rejection of more recent events is expected to be more likely than that of less recent events. It should be added that consistent with Ghetti's (2003, Experiment 2) findings, contextual information (i.e., expectation of forgetting) magnifies the effect of salience in older children and adults; thus, recency should interact with event salience in older children and adults such that the effect of event salience should be more evident in the low-recency than in the high-recency condition.

Study 2

Whereas Study 1 provided information on the effects of age, event salience, event plausibility, and event recency on memorability ratings, Study 2 was aimed at examining the effects of the same variables on child and adult participants' rejection of false events. As discussed earlier, little research has been conducted on children's use of strategies to reject false events (but see Koriat et al., 2001).

The present study sheds light on children's use of strategies to reject false events. Participants were interviewed about eight autobiographical events. Participants actually experienced only four of these events. Questions about true events were included to prevent participants from gauging the real goals of the study. However, only participants' responses regarding the false events were of interest for the present study.

Several hypotheses were tested, in consideration of Study 1 findings. First, younger versus older children were expected to be less likely to correctly reject false events. This prediction is consistent with the literature on false-memory formation (e.g., Ceci et al., 1994). Second, a significant interaction between age and event salience was expected. Older children and adults were expected to be more likely to reject the occurrence of high-salience false events, whereas the effect of salience was not expected in 5-year-olds (and possibly 7-year-olds) because younger children may be less skilled than older children and adults at implementing memorability-based strategies. This prediction is consistent with Ghetti's (2003) findings discussed earlier. Results of that experiment illustrated not only that the effect of salience was not evident in 5-year-olds' correct rejections but also that the effect of salience was limited in 7-year-olds. That is, 7-year-olds showed the effect of salience only when items were learned under favorable conditions. Older children and adults were expected to be more likely to confidently reject high-salience false events than low-salience false events.

An interaction effect between age and plausibility may be expected. Recall that 5- and 7-year-olds in Study 1 did not evaluate low-plausibility events as more memorable than high-plausibility events, whereas 9-year-olds and adults did, demonstrating that plausibility affects memorability relatively late. Thus, if memorability-based strategies are used, only older children and adults could rely on plausibility to support their decisions about event occurrence.

Finally, although the effect of event recency on memorability did not emerge in Study 1, it was still of interest to examine whether event recency would affect false-memory rejection in Study 2 for two reasons. First, in Ghetti (2003, Experiment 2), the effect of salience was more evident when individuals were led to believe that they would have encountered high forgetting rates. This information led older children and adults to infer that they had forgotten low-salience distractors (thus further increasing false alarm rates), but it did not interfere with rejection of high-salience distracters. In the present study, the effect of salience in older children and adults should be more evident in the low-recency versus high-recency condition. Second, establishing whether recency is factored in false-event rejections may provide valuable information as to the type of processes supporting such rejections. If recency affects rejections even though individuals do not seem to consider it when rating memorability, one should then consider the possibility that individuals may implement rejection processes that do not require deliberate control.

Method

Design

Study 2 conformed to a 4 (age group: 5-, 7-, and 9-year-olds, and undergraduates) $\times$ 2 (recency: high recency vs. low recency) $\times$ 2 (plausibility: high plausibility vs. low plausibility) $\times$ 2 (salience: high salience vs. low salience) mixed design. As in Study 1, age group and recency were varied between participants, whereas plausibility and salience were varied within participants.

Participants

A new group of 120 children, divided equally among three age groups (5-year-olds, $M = 65.63$ months, *range* = 60 to 71; 7-year-olds, $M = 88.20$ months, *range* = 84 to 96; and 9-year-olds, $M = 113.03$ months, *range* = 108 to 120), and 40 undergraduates ($M = 19.64$ years, *range* = 18 to 22) participated in the study. An equal number of males and females were represented in each condition. Approximately 76% of the participants were European American, 16% were Asian, 5% were Hispanic, 3% were African American, and 2% were Native American. Children and their families were recruited through newspaper advertisements and were compensated with a prize and $10. Undergraduate students were recruited from a psychology course and received course credit for participation.

Materials

Event stories. The eight event stories evaluated for memorability in Study 1 were used in the present study. The events were divided into four pairs for the present study. Two pairs included high-plausibility events and two pairs included low-plausibility events. Within each pair, one event was higher in salience than the other. The selected pairs were the following: (a) going to the Grand Canyon and taking a summer craft class, (b) wearing a bandage after

getting hurt on a eye and putting a seed up one's own nose, (c) meeting one's favorite famous person and receiving a live tarantula as a birthday present, and (d) being attacked by a bird and receiving an enema. Pairs (a) and (b) were considered high-plausibility events, whereas pairs (c) and (d) were considered low-plausibility events.

As described in the Procedure section of Study 1, participants rated their willingness to talk about the events assessed for memorability. This factor is relevant to false reports because individuals may experience different levels of motivation to fabricate different stories. To the extent that one is more reluctant to talk about an event, one may be more likely to reject the occurrence of such an event. We were able to verify that perceived memorability and willingness to talk about an event were not systematically associated. Within each event pair described previously, the two events either did not differ in rated willingness to be talked about, or if they did, the direction of the difference was against the predictions tested in the present study, making the study more conservative.

Participants were either interviewed about pairs (a) and (d) or pairs (b) and (c) so they would not be questioned only about events of negative valence. The assignment to one or the other set was counterbalanced. However, if participants had experienced the events to which they were assigned, they were switched to the other set. Participants were not only interviewed about four false events but also about four true events. The order of presentation of the eight true and false events was random.

True events were included to maintain participants' interest, feelings of competence, and motivation. True events were also included to prevent participants from gauging the real goals of the study, thus ensuring credibility to the alleged goal of the research (i.e., memory for childhood events). Although we attempted to include true events that were comparable to false events across individuals, true events did not vary systematically in plausibility and salience, as did false events. For example, by definition, high-plausibility events were more likely to have been truly experienced by participants (and thus included in the interview) than low-plausibility events. Recency of true events, however, was varied systematically between participants. Participants in the low-recency condition were interviewed about true events that happened when they were 3 years of age. Participants in the high-recency condition were interviewed about events that happened 1 year earlier (for child participants) or when they were 8 (for adults).

Confidence Rating Board (CRB). This measure was used to help child participants evaluate their confidence and was a modification of Berch and Evans's (1973) procedure. Two photographs, corresponding in gender to the participant's gender, were available. One picture depicted a child with a confident facial expression and the other depicted a child with a doubtful facial expression. The two pictures were positioned at opposite ends of a board. Three dots were drawn between the two pictures. The dots denoted three levels of certainty (very confident, somewhat confident, not confident). Because confidence ratings were elicited after children had assented to or denied event occurrence, the use of the board generated a confidence scale ranging from 1 (*very confident that the event did not happen*) to 6 (*very confident that the event happened*). Ghetti, Qin, and Goodman (2002) successfully employed the CRB with 5- and 7-year-old children. For methodological consistency, adults were also asked to rate their confidence using the CRB.

Procedure

Participation involved one visit to the university laboratory. Before the visit, a research assistant contacted all participants' parents over the phone, explained the study to them, and interviewed them about a series of events that the participant may have experienced. According to the recency condition to which participants were assigned, parents were asked to report events their children experienced either when they were 3 years of age or 1 year before the interview (or at age 8 for adult participants). The goal of the parent interview was to gather information to construct the participant interview, to ensure that participants had never experienced the events to be included in the interview as false events, and to gather information about some events that the child did experience to be included as true events.

On arrival at the laboratory, participants were told that the study concerned the investigation of the amount of memory that individuals can recover about past events. Participants were then given a careful explanation and feedback on how to use the CRB (see Ghetti et al., 2002, for further details).

The memory interview then began. Participants in the low-recency condition were told that the events happened when they were 3 years old, that is, when they were little children. Participants were then told that because the events happened when they were little, they may not remember very much. In contrast, participants in the high-recency condition were told

that the events happened when they were 4 (or 6 or 8, that is, when they were no longer little children). Then, participants were told that because the events happened when they were no longer little children, they may remember quite a bit. All participants were then asked to try really hard to report as much as they remembered.

Participants were read one description at a time of true and false events, and they were asked to report what they remembered about the event. Each event was introduced by saying that one of the participants' parents had told the story. The description of the event followed. Each event was concluded with the sentence: "This is what your mom (or dad) remembers about it, what do you remember about it?" When participants appeared to be finished with their report about one specific event, confidence ratings about the accuracy of the report (or the rejection of the occurrence) were elicited using the CRB. The procedure was repeated for every event. Overall, the session lasted between 45 and 75 min. Children and adults were thoroughly debriefed at the end of the session.

Results

Preliminary analyses determined that there were no significant differences in performance by gender and false event for each level of salience and plausibility. For example, no significant difference was found in rejections between the two low-plausibility/high-salience having-met-a-famous-person and being-attacked-by-a-bird events. Data were therefore collapsed for further analyses. Two 4 (age group) × 2 (recency of occurrence) × 2 (salience) × 2 (plausibility) mixed ANOVAs were conducted. Mean proportion rejections and confidence ratings were entered as the dependent measures.

Proportion of Rejections of False-Event Occurrences

Rejections were coded either as 0, when participants assented to the false-event occurrence, or 1, when participants rejected the false-event occurrence. As expected, a significant age effect was found, $F(3, 152) = 8.54$, $p < .001$, $\eta^2 = .14$, (5-year-olds, $M = .51$; 7-year-olds, $M = .76$; 9-year-olds, $M = .77$; undergraduates, $M = .82$). Bonferroni planned comparisons revealed that 5-year-olds were significantly less likely to reject the occurrence of a false event than were the other three age groups, which did not significantly differ from each other. A main effect of recency was also found, $F(1, 152) = 19.54$, $p < .001$, $\eta^2 = .11$, such that across all of the age groups, false events that were allegedly experienced more recently were more likely to be rejected, $M = .82$, than those that were allegedly experienced when participants were 3 years old, $M = .61$.

No significant main or interaction effect of plausibility was found, Fs$(3, 152) < .48$, ps$ > .05$, ηs$^2 < .009$. In contrast, a significant main effect of salience was found, $F(1, 152) = 15.14$, $p < .001$, $\eta^2 = .09$, such that high-salience false events were more likely to be rejected ($M = .76$, $SD = .43$) than low-salience false events ($M = .66$, $SD = .48$). The predicted interaction effect between age and salience approached statistical significance, $F(3, 152) = 2.12$, $p = .10$, $\eta^2 = .04$. Of importance, a significant interaction among age, salience, and recency was found, $F(3, 152) = 2.99$, $p < .05$, $\eta^2 = .06$.

To interpret this interaction, analyses were conducted separately for each age group. The mean values for each age group and experimental condition are reported in Table 3. When 5-year-olds' rejections were analyzed, a significant interaction between salience and recency emerged, $F(1, 38) = 4.06$, $p = .05$, $\eta^2 = .10$: High-salience and low-salience false events were rejected at similar rates in the low-recency condition, but high-salience false events were more likely to be rejected than low-salience false events in the high-recency condition. For 7-year-olds, an interaction approaching statistical significance was found between salience and recency, $F(1, 38) = 3.34$, $p = .08$, $\eta^2 = .08$. Like 5-year-olds, whereas high-salience false events were not more likely to be rejected than low-salience false events in the low-recency condition (and there was in fact the opposite tendency), high-salience false events were more likely to be rejected than low-salience false events in the high-recency condition.

Table 3
Study 2: Mean Rejection Rates (Standard Deviations) for Events by Event Recency, Event Salience, and Age Group

	Recency			
	Less recent		More recent	
	Salience		Salience	
Participants' age	Low	High	Low	High
5-year-olds	47 (.49)	.47 (.49)	.52 (.51)	.75 (.44)
7-year-olds	.71 (.46)	.62 (.50)	.82 (.40)	.89 (.50)
9-year-olds	.62 (.45)	.72 (.46)	.75 (.46)	.97 (.11)
Adults	.60 (.50)	.81 (.38)	.89 (.31)	.95 (.22)

For 9-year-olds, significant effects of event salience and recency were observed, Fs(1, 38) > 5.19, ps < .05, ηs^2 > .14, such that high-salience false events were more likely to be rejected than low-salience false events, and high-recency events were more likely to be rejected than low-recency false events. Analogous results were also detected in adults, Fs(1, 38) > 9.01, ps < .01, ηs^2 > .19. In addition, for adults, the interaction between salience and recency closely approached statistical significance, $F(1, 38) = 3.65$, $p = .06$, $\eta^2 = .09$, such that the effect of event salience was more evident in the low-recency condition than in the high-recency condition. Thus, although higher memorability scores were assigned to high-salience events compared with low-salience events across age groups (Study 1), the effect of salience on false-event rejection changed considerably with respect to age.

Confidence Ratings About False Events

Although this rating scale ranging from 1 (*very confident that the event did not happen*) to 6 (*very confident that the event happened*) is redundant with the proportion of rejection measure presented previously, it also includes additional information about how confidently decisions about event occurrence were made. Thus, when this variable was subjected to analysis, results mainly mirrored those obtained when analyzing proportions of false-event rejections, that is, main effects of age, salience, and recency, and interaction effects among these three variables, Fs(3, 149) > 2.94, ps < .05, ηs^2 > .06. Nevertheless, additional information was also gathered.

A significant main effect of event plausibility was found, $F(1, 149) = 4.68$, $p < .05$, $\eta^2 = .03$, such that low-plausibility events were rejected more confidently ($M = 2.46$) than high-plausibility events ($M = 2.71$). It should be noted, however, that an interaction between age and plausibility approached statistical significance, $F(3, 149) = 2.38$, $p = .07$, $\eta^2 = .05$. For 5-, 7-, and 9-year-olds, the effect of plausibility was not statistically significant, Fs(1, 38) < 1.26, ps > .27, ηs^2 < .03. In contrast, low-plausibility events were rejected more confidently ($M = 1.76$) than high-plausibility events ($M = 2.45$) in adults, $F(1, 38) = 8.05$, $p < .01$, $\eta^2 = .19$. Thus, although correct rejection of low and high plausibility was equally likely, adults were more confident when rejecting low-plausibility events than when rejecting high-plausibility events.

Finally, the interaction between salience and plausibility approached statistical significance, $F(3, 149) = 3.70$, $p = .06$, $\eta^2 = .03$, such that low-plausibility/high-salience events were rejected most confidently ($M = 1.70$) compared with other event types (low plausibility/low salience, $M = 2.63$; high plausibility/high salience, $M = 2.25$; high plausibility/low salience, $M = 2.53$). Thus, although low-plausibility/high-salience events were not the most likely to be correctly rejected, participants felt most confident when they rejected them.

To ensure that the plausibility effects on confidence were actually due to low-plausibility events being rejected more confidently than high-plausibility events instead of high-plausibility events being accepted more confidently than low-plausibility events, confidence ratings (0 = not confident at all, 2 = very confident) were examined separately for rejections and acceptances. When confidence for rejections was analyzed, results largely mirrored those reported earlier. Of interest, a significant interaction between age and plausibility emerged, $F(3, 63) = 12.41$, $p < .01$, $\eta^2 = .37$. Whereas with the overall confidence measure only adults were significantly more confident when rejecting low-plausibility events, in this analysis this was also true for 9-year-olds (9-year-olds, low plausibility, $M = 1.75$, high plausibility, $M = .98$; adults, low plausibility, $M = 1.80$, high plausibility, $M = 1.23$), but the effect still did not emerge in 5- and 7-year-olds (5-year-olds, low plausibility, $M = .86$, high plausibility, $M = 1.30$; 7-year-olds, low plausibility, $M = 1.19$, high plausibility, $M = 1.21$). No significant main or interaction effect of plausibility emerged when the analyses were conducted with confidence ratings for acceptances.

Proportions of Rejections of True-Event Occurrences

Because the four true events had to be experienced by participants, such events could not be systematically varied on plausibility and salience. However, true events were varied on recency as parents provided information about events occurring either when their children were 3 (low recency) or 1 year earlier (or age 8 for adult participants). Thus, proportions of true-event rejections were entered in a 4 (age group) × 2 (recency) between-participants ANOVA. The effect of age was not statistically significant, $F(1, 148) = 1.13$, $p = .34$, $\eta^2 = .02$ (5-year-olds, $M = .13$; 7-year-olds, $M = .09$; 9-year-olds, $M = .07$; adults, $M = .09$). A significant effect of recency emerged, $F(1, 148) = 6.52$, $p = .01$, $\eta^2 = .04$, such that low-recency events were more likely to be erroneously rejected ($M = .13$) than high-recency events ($M = .06$).

Discussion

Consistent with the previous literature on memory distortion (e.g., Ackil & Zaragoza, 1998; Ceci et al., 1994; Lindsay, Johnson, & Kwon, 1991), younger children were less likely than older children and adults to reject the occurrence of false events, particularly when interviewed in a highly leading fashion as is the case with the paradigm employed in the present study. Although recency did not affect memorability assessments for younger children in Study 1, young children were better at rejecting false events described as more than less recent in Study 2. Finally, younger children did not rely on event salience to reject false events as consistently as did older children and adults: The effect of salience was only found for young children in the high-recency condition. In the low-recency condition, only older children and adults were more likely to reject high-salience than low-salience false events. Furthermore, the effect of salience was magnified in the low-recency condition for adult participants.

The contrast between the effects of recency and salience in young children's false-event rejection raises the question of whether the mechanism underlying rejection of recent events is the same as that underlying rejection of salient events. Although we do not believe that the possibility that memorability-based decisions underlie the effects of both recency and salience, if this were the case it would have at least two implications. First, although even young children may be capable of drawing inferences from lack of memory, they learn how to rely on different event-related factors (i.e., salience and recency) associated with retention at different times during childhood. Second, determining an event nonoccurrence does not entail a primary consideration of event-specific features (e. g., salience) over extrinsic features (e.g., event recency) as proposed by Strack and Bless (1994).

Although we currently do not have definitive evidence supporting this claim, we propose that the mechanisms supporting rejection based on recency versus salience are not the same. Based on the present findings, we argue that the effect of salience may be largely due to inferences based on the metamemorial awareness of event memorability, whereas the effect of recency may reflect the operation of less effortful processes. To explain the effect of recency, it is possible to draw from the extant literature suggesting that some psychological mechanisms supporting rejection of false events may not need deliberate strategic control and can be observed in young children (Brainerd & Reyna, 2002; Ghetti et al., 2002). Specifically, recollection rejection (Brainerd & Reyna, 2002) allows for the suppression of false memory because individuals are thought to compare automatically the memory representation resulting from direct experience of a studied item with that not resulting from direct experience but from, for example, a sense of familiarity for a nonstudied item. The comparison may result in the acceptance of the representation of the true event as an accurate memory and the rejection of the other representation as a nonoccurrence.

Thus, one can generally expect recollection rejection to operate when a high level of true memory is available for a certain event, allowing for the experience of a contrast between the memory for the true event and that for a false (but similar) event. In the present study, true events in the high-recency condition were more likely to be assented to than those in the low-recency condition. Ease of retrieval (and possibly amount of information retrieved about an event) of true events in the high-recency condition may have created that contrast between the mental representation resulting from a true memory and that from a false memory described by Brainerd and Reyna (2002). Such contrast may have provided valuable information even to young children as to the quality of memory that may be available when an event is experienced, thus facilitating rejection of high-recency versus low-recency false events. Note that Brainerd and Reyna discussed recollection rejection in the context of recognition memory tasks in which the distracters were semantically consistent with the studied items and that the contrast described earlier was initiated by the distracters functioning as a memory cue for the studied item. It is plausible, however, that the alleged time of occurrence (e.g., age 8) may constitute another psychological dimension (in addition to semantic similarity) in which individuals may experience contrast between true and false memories.

The effect of event salience is instead better explained according to the memorability-based strategies account. Young children in the present study only showed the effect of salience in the high-recency condition, suggesting that for young children to be more likely to reject high-salience than low-salience false events there needed to be favorable conditions (i.e., those generating high levels of true memory). Although this result suggests that young children may be at initial stages of strategy use, it is important to note that the reliance on memorability-based strategies should be, in principle, more likely under conditions of increased uncertainty, that is, under conditions in which experiencing lack of memory

per se may not be used as evidence that an event was not experienced.

In the low-recency condition, individuals may generally expect to remember very little. Thus, individuals may be particularly motivated to assess the inherent expected memorability of an autobiographical event and make the decision about the event occurrence based on such assessment. Under these conditions, young children fail to reject high-salience false events at higher rates than low-salience false events. In contrast, the effect of event salience is evident in the low-recency condition in older children and adults, suggesting that older children and adults can reject high-salience false events even when the events were allegedly experienced at a time for which the simple contrast between the mental representation resulting from a true memory and that from a false memory may not be as diagnostic of the event nonoccurrence as in the high-recency condition.

In the present study, the effect of event salience was particularly evident in the low-recency condition for adults. This result conceptually replicates the finding discussed earlier, that is, that the effect of salience may be magnified when individuals are informed that the false event was allegedly encoded and retrieved under conditions that do not favor retention (Ghetti, 2003, Experiment 2). Furthermore, this result suggests that memorability-based strategies may be implemented particularly under conditions of uncertainty. Ghetti found that the effect was magnified not only in adults but also in 9-year-olds as well. One could speculate that the reason for this discrepancy may lay in a developmental difference between 9-year-olds and adults in the susceptibility to social pressure. Nine-year-olds may possess similar skills to implement memorability-based strategies, but they may encounter more difficulty than adults in implementing such strategies when false autobiographical events are presented as true by the interviewer.

The findings regarding the effects of salience across age groups are important from a developmental perspective because they suggest that children may not be able to implement fully metacognitive strategies until relatively late in elementary school years, and that reliance on expectations based on event memorability may be a sophisticated mental operation. If young children are characterized by a deficiency in using memorability-based strategies, further research should be conducted to characterize such a deficiency. For example, can this deficiency be conceived as a production deficiency (Flavell, 1970)? That is, would children benefit from receiving specific instructions on how to use event memorability salience when making decisions about event occurrences? Some research indicates that children's performance may benefit from receiving information about memory suggestibility. Saywitz and Moan-Hardie (1994) found that second graders could profitably use metamneumonic knowledge related to memory distortion to resist suggestion. It would thus be of interest to establish whether young children could benefit from specific instructions aimed at emphasizing that some events are more memorable than others, and that if a memorable event is not remembered, one can reasonably assume that it did not happen even when such events are described as early childhood events, occurring in relatively distant past.

Finally, the effect of plausibility on correct rejection argued by Pezdek and colleagues (Pezdek et al, 1997; Pezdek & Hodge, 1999) was not found in the present study. When event salience was considered along with plausibility, the effect of plausibility on false-event rejection did not emerge. It is therefore possible that Pezdek and colleagues' findings were due to factors other than plausibility: One possibility is that their plausible and implausible events differed in perceived salience and that event salience mediated the relationship between plausibility and false-memory formation.

Plausibility, however, did significantly affect confidence, such that low-plausibility false events were rejected more confidently by adults than high-plausibility events. Also, low-plausibility/high-salience events were rejected more confidently than all other events across age groups. This indicates that event plausibility is involved in the decision processes leading to event rejection. The mechanism through which this occurs, however, may be different from what we proposed to explain the effect of salience.

Pezdek and Hodge (1999) argued that two inferential processes may explain the effect of plausibility on resistance to false-memory formation. Specifically, they described an inferential process based on lack of semantic memory and one based on lack of episodic memory. Thus, plausibility may exert a role in false-memory rejection by eliciting the inference based on lack of semantic memory (Gentner & Collins, 1981; Pezdek & Hodge, 1999). Future studies should examine whether plausibility is specifically linked to such an inference process and confirm whether its implementation specifically leads to plausibility-based differences in the confidence for rejected events rather than plausibility-based differences in rejection rates (when event salience is taken into account).

That plausibility may be responsible for inferences from lack of semantic memory is consistent with previous research. Mazzoni, Loftus, and Kirsch (2001) found that providing research participants with new information about the plausibility of initially implausible events (i.e., witnessing demonic possession and being threatened with kidnapping) significantly increased participants' confidence that such events may have happened.

Before concluding, we should point out a limitation of the present study. Each participant was interviewed about only a limited number of false events, as in previous research (e.g., Ceci et al., 1994; Loftus & Pickrell, 1995; Pezdek & Hodge, 1999). Thus, these findings should be replicated with other events that are systematically varied in salience and plausibility. It should be noted, however, that in studies employing the false-memory paradigm, a primary concern is preventing participants from becoming aware of the intent of the study. To maintain the integrity of such studies, researchers have limited the number of false events in the interview and included true events. Thus, to the extent that one is interested in examining rejection of false autobiographical events in the suggestible context created by this paradigm, the use of a limited number of events may be difficult to avoid.

Nonetheless, future research should replicate these findings with additional events and populations to ensure generalizability of these findings. Furthermore, there may well be other psychological dimensions relevant to event salience in addition to how noticeable an event is (i.e., our operational definition of salience). For example, the extent to which an event is emotional or self-relevant may lead to different degrees of perceived memorability, which in turn may influence decisions about event occurrences. This and other dimensions deserve further exploration.

Conclusion

The processes by which individuals determine whether they have experienced an event may be informed by beliefs and expectations, eliciting the use of inferential strategies. The role of metamemory for decisions about event occurrence has often been highlighted in the adult literature. Despite the importance of this area of inquiry in determining how children learn to make decisions about their past, the investigation of strategies that may support decisions about nonoccurrences is relatively neglected in the developmental literature. Overall, the present research yielded relevant information regarding how children and adults determine that some events did not occur. Thus, this study is a first step to shed light on mechanisms preventing individuals from forming false memories, potentially allowing them to be more resistant to false suggestions.

References

Ackerman, B. P., & Emmerich, H. J. (1978). When recognition memory fails: The use of an elimination strategy by young children. *Developmental Psychology, 14*, 286–293.

Ackil, J. K., & Zaragoza, M. S. (1998). Memorial consequences of forced confabulation: Age differences in susceptibility to false memories. *Developmental Psychology, 34*, 1358–1372.

Berch, D. B., & Evans, R. C. (1973). Decision processes in children's recognition memory. *Journal of Experimental Child Psychology, 16*, 148–164.

Bjorklund, D. B., & Coyle, T. R. (1995). Utilization deficiencies in the development of memory strategies. In F. E. Weinert & W. Schneider (Eds.), *Memory performance and competencies* (pp. 161–180). Hillsdale, NJ: Erlbaum.

Bjorklund, D. F., & Douglas, R. N. (1997). The development of memory strategies. In N. Cowan (Ed.), *The development of memory in childhood* (pp. 201–246). Hove, England: Erlbaum.

Brainerd, C. J., & Reyna, V. F. (2002). Recollection rejection: How children edit their false memories. *Developmental Psychology, 38*, 156–172.

Brown, J., Lewis, V. J., & Monk, A. F. (1977). Memorability, word frequency, and negative recognition. *Quarterly Journal of Experimental Psychology, 29*, 461–473.

Bruce, D., Dolan, A., & Phillips-Grant, K. (2000). On the transition from childhood amnesia to the memories. *Psychological Science, 11*, 360–364.

Bruck, M., & Ceci, S. J. (1999). The suggestibility of children's memory. *Annual Review of Psychology, 50*, 419–439.

Ceci, S. J., & Bruck, M. (1993). Suggestibility of the child witness: A historical review and synthesis. *Psychological Bulletin, 113*, 403–439.

Ceci, S. J., Huffman, M. L. C., Smith, E., & Loftus, E. F. (1994). Repeatedly thinking about a non-event: Source misattributions among preschoolers. *Consciousness and Cognition, 3*, 388–407.

Ceci, S. J., Ross, D., & Toglia, M. (1987). Age differences in suggestibility: Psycholegal implications. *Journal of Experimental Psychology: General, 117*, 38–49.

Cox, B. D., Ornstein, P. A., Naus, M. J., Maxfield, D., & Zimler, J. (1989). Children's concurrent use of rehearsal and organizational strategies. *Developmental Psychology, 25*, 619–627.

Dent, H. R., & Stephenson, G. M. (1979). An experimental study of the effectiveness of different techniques of questioning child witnesses. *British Journal of Social and Clinical Psychology, 18*, 41–51.

Dodson, C. S., & Schacter, D. L. (2001). "If I had said it I would have remembered it": Reducing false memories with a distinctiveness heuristic. *Psychonomic Bulletin and Review, 8*, 155–161.

Emmerich, H. J., & Ackerman, B. P. (1979). A test of bizarre interaction as a factor in children's memory. *Journal of Genetic Psychology, 134*, 225–232.

Flavell, J. (1970). Developmental studies of mediated memory. In H. Reese & L. Lipsitt (Eds.), *Advances in child development and child behavior* (*Vol. 5*, pp. 181–211). New York: Academic Press.

Gentner, D., & Collins, A. (1981). Studies of inference from lack of knowledge. *Memory & Cognition*, *9*, 434–443.

Ghetti S. (2003). Memory for nonoccurrences: The role of metacognition. *Journal of Memory and Language*, *48*, 722–739.

Ghetti, S., & Goodman G, . S. (2001). Resisting distortion. *The Psychologist*, *14*, 592–595.

Ghetti, S., Qin, J. J., & Goodman, G. S. (2002). False memories in children and adults: Age, distinctiveness, and subjective experience. *Developmental Psychology, 38*, 705–718.

Goodman, G. S. (1984). Children's testimony in historical perspective. *Journal of Social Issues*, *40*, 9–31.

Goodman, G. S., & Aman, C. (1990). Children's use of anatomically detailed dolls to recount an event. *Child Development*, *61*, 1859–1871.

Guttentag, R., & Carroll, D. (1998). Memorability judgments for high- and low-frequency words. *Memory & Cognition*, *26*, 951–958.

Howe, M. L., Courage, M. L., Vernescu, R., & Hunt, M. (2000). Distinctiveness effects in children's long-term retention. *Developmental Psychology, 36*, 778–792.

Howe, M. L., & O'Sullivan, J. T. (1990). The development of strategic memory: Coordinating knowledge, metamemory, and resources. In D. Bjorklund (Ed.), *Children's strategies: Contemporary views of cognitive development* (pp. 129–155). Hillsdale, NJ: Erlbaum.

Howe, M. L., O'Sullivan, J. T., & Marche, T. A. (1992, April). *The development of children metaforgetting.* Paper presented at the annual meeting of the American Educational Research Association, San Francisco.

Hyman, I. E., Husband, T. H., & Billings, F. J. (1995). False memories of childhood experiences. *Applied Cognitive Psychology, 9*, 181–197.

Keniston, A. H., & Flavell, J. H. (1979). A developmental study of intelligent retrieval. *Child Development*, *50*, 1144–1152.

Koriat, A., Goldsmith, M., Schneider, W., & Nakash-Dura, M. (2001). The credibility of children's testimony: Can children control the accuracy of their memory reports? *Journal of Experimental Child Psychology, 79*, 405–437.

Kreutzer, M. A., Leonard, C., & Flavell, J. H. (1975). An interview study of children's knowledge about memory. *Monographs of the Society for Research in Child Development*, *40*(1 Serial No. 159), 1–60.

Leichtman, M. D., & Ceci, S. J. (1995). The effects of stereotypes and suggestions on preschoolers' reports. *Developmental Psychology, 31*, 568–578.

Lindsay, D. S., Johnson, M. K., & Kwon, P. (1991). Developmental changes in memory source monitoring. *Journal of Experimental Child Psychology, 52*, 297–318.

Loftus, E. F., & Pickrell, J. E. (1995). The formation of false memories. *Psychiatric Annals*, *25*, 720–725.

Lyon, T. D., & Flavell, J. H. (1993). Young children's understanding of forgetting over time. *Child Development*, *64*, 789–800.

Lyon, T. D., & Flavell, J. H. (1994). Young children's understanding of "remember" and "forget". *Child Development*, *65*, 1357–1371.

MacNamara, J., Baker, E., & Olson, C. L. (1976). Four-year-olds' understanding of pretend, forget, and know: Evidence for propositional operations. *Child Development*, *47*, 62–70.

Mazzoni, G., Loftus, E. F., & Kirsch, I. (2001). Changing beliefs about implausible autobiographical events: A little plausibility goes a long way. *Journal of Experimental Psychology: Applied*, *7*, 51–59.

Moynahan, E. D. (1973). The development of knowledge concerning the effect of categorization upon free recall. *Child Development*, *44*, 238–246.

O'Sullivan, J T., & Howe, M. L. (1995). Metamemory and memory construction. *Consciousness and Cognition*, *4*, 104–110.

O'Sullivan, J. T., Howe, M. L., & Marche, T. A. (1996). Children's beliefs about long-term retention. *Child Development*, *67*, 2989–3009.

Pezdek, K., Finger, K., & Hodge, D. (1997). Planting false childhood memories: The role of event plausibility. *Psychological Science*, *8*, 437–441.

Pezdek, K., & Hodge, D. (1999). Planting false memories in children: The role of event plausibility. *Child Development*, *70*, 887–895.

Poole, D. A., & White, L. T. (1991). Effects of question repetition on the eyewitness testimony of children and adults. *Developmental Psychology, 27*, 975–986.

Pressley, M., Levin, J. R., Ghatala, E. S., & Ahmad, M. (1987). Test monitoring in young grade school children. *Journal of Experimental Child Psychology, 43*, 96–111.

Rotello, C. M. (1999). Metacognition and memory for nonoccurrence. *Memory, 7*, 43–63.

Rudy, L., & Goodman, G. S. (1991). Effects of participation on children's reports: Implications for children's testimony. *Developmental Psychology, 27*, 527–538.

Saywitz, K. J., & Moan-Hardie, S. (1994). Reducing the potential for distortion of childhood memories. *Consciousness and Cognition*, *3*, 408–425.

Schneider, W., & Bjorklund, D. F. (1998). Memory. In W. Damon (Series Ed.) & D. Kuhn & R. S. Siegler (Vol. Eds.), *Handbook of child psychology: Vol. 2. Cognition, perception, and language* (5th ed., pp. 467–521). New York: Wiley.

Schneider, W., & Pressley, M. (1997). *Memory development between 2 and 20* (2nd ed.). Mahwah, NJ: Erlbaum.

Strack, F., & Bless, H. (1994). Memory for nonoccurrences: Metacognitive and presuppositional strategies. *Journal of Memory and Language*, *33*, 203–217.

Tobey, A. E., & Goodman, G. S. (1992). Children's eyewitness memory: Effects of participation and forensic context. *Child Abuse and Neglect*, *16*, 779–796.

Wellman, H. M. (1977). Tip of the tongue and feeling of knowing experiences: A developmental study of memory monitoring. *Child Development*, *48*, 13–21.

Wellman, H. M. (1988). The early development of memory strategies. In F. E. Weinert & M. Perlmutter (Eds.), *Memory development: Universal changes and individuals differences* (pp. 3–29). Hillsdale, NJ: Erlbaum.

Wellman, H. M., Hollander, M., & Schult, C. A. (1996). Young children's understanding of thought bubbles and of thoughts. *Child Development*, *67*, 768–788.

Wellman, H. M., & Johnson, C. N. (1979). Understanding of mental processes: A developmental study of "remember" and "forget". *Child Development*, *50*, 79–88.

Worden, P. E., & Sladewski-Awig, L. J. (1982). Children's awareness of memorability. *Journal of Educational Psychology*, *74*, 341–350.