

If at First You Don't Remember, Try, Try Again: The Role of Initial Encoding in Children's False Reports

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To examine the extent to which differences in the initial encoding of information affect preschoolers' vulnerability to suggestion, 4 groups of 4-year-olds ($N = 54$) individually participated in a simulated shopping event in which they were asked to purchase 6 items from a specially constructed grocery store. Half the children had only 1 opportunity to purchase the list of items, whereas the remaining half returned to the store on multiple occasions until they correctly purchased all 6 items on 2 consecutive trials. Following the shopping event, the children were interviewed in either a neutral or suggestive manner on 3 occasions over a 3-week period. The suggestive interviews contained strongly worded suggestions that certain items had been purchased, when in fact they had not been on the list. One week later, all the children were questioned by a new interviewer. Compared with the children in the other 3 groups, those in the 1-trial suggestive group were more likely to spontaneously report suggested items during the final interview, demonstrating that poor versus strong initial encoding heightens proneness to postevent suggestions.

Research on young children's suggestibility has revealed a number of interviewing practices that can seriously hinder reporting accuracy, such as repeating misinformation across interviews (Bruck, Ceci, Francouer, & Barr, 1995), providing selective reinforcement (Bruck, Ceci, & Hembrooke, 1997), creating an atmosphere of accusation (Lepore & SESCO, 1994), and aggrandizing the power differential between the interviewer and the child (Tobey & Goodman, 1992). This body of work has made it apparent that accuracy largely depends on the interviewer's interrogation style, such that one can have greater confidence in the accuracy of statements elicited in a neutral context than those made only after suggestive interviews (e.g.,

Ceci, Bruck, & Battin, 2000). Admittedly, however, the effects of interviewer behavior are not as straightforward as one might wish. For example, even in studies with robust suggestibility effects, some children invariably resist even repeated and aggressive attempts to convince them that a false event occurred. In other investigations, some children quickly incorporate erroneous suggestions into their accounts, even after only a single mildly leading interview. Thus, it remains difficult, if not impossible, to predict with certainty whether a particular child is as prone, more prone, or less prone to suggestion than others on average. Given such variability in performance, it is important that researchers learn more about factors that contribute to individual variability in susceptibility to suggestion.

One important source of variation in children's vulnerability to suggestive questioning concerns individual differences in the initial encoding of information in the memory system. A consideration of the role of encoding and the establishment of representations in memory is relevant to discussions of accuracy because successful encoding is an essential first step to accurate recall. Simply put, a child cannot accurately retrieve and report a memory of an event unless it was adequately encoded and stored in memory in the first place. However, not all aspects of an experience make it into memory. Because the cognitive system has a limited capacity to handle incoming information, some information is attended to and registered in memory, whereas other information essentially goes unnoticed (Broadbent, 1958; Hagen & Hale, 1973). Thus, simple exposure to an event is not sufficient to ensure complete encoding and hence accurate remembering. This point is particularly relevant to discussions of young children's memory abilities, because young children often fail to encode those aspects of an event that adults consider to be important (e.g., Mandler, 1990) and acquire less from comparable exposure to an event than older individuals (Bender, Wallsten, & Ornstein, 1996). With these issues in mind, this study was designed to examine the degree to which differences in the initial encoding of information affect young children's proneness to subsequent suggestive interviews. This work was motivated by basic questions about the operation of memory and applied issues surrounding children's abilities to provide testimony in legal settings.

Research on the development of memory demonstrates that a range of factors influence the encoding of information and the generation of an underlying representation. A number of internal variables, such as the ability to adapt attention to the requirements of a situation, prior knowledge about an event, and the level of stress experienced, can affect what gets into memory and the cohesiveness of the resulting representation. Similarly, a variety of external events, such as the number of repetitions of the event and the duration of exposure, can influence the integrity of the representation (see, e.g., Kail, 1990; Schneider & Pressley, 1997). For example, it is well known that existing knowledge shapes perception and interpretation, and consequently the resulting representation (Bjorklund, 1985; Chi & Ceci, 1987). Likewise, stress experienced as an event is occurring can affect the deployment of attention and thus influence what gets in to memory.

Given that accurate remembering is largely dependent on successful encoding, some of the problems associated with suggestive questioning may reflect failures to adequately encode and represent experienced events in memory in the first place. The role of encoding-time processes in vulnerability to suggestive questioning comes from a theoretical position that suggestibility occurs as a function of the integrity, or strength, of the original memory, with weak representations being especially susceptible to suggestion (Brainerd & Reyna, 1988; Howe & Brainerd, 1989). Here, memory strength refers to the degree to which the elements composing an underlying representation are integrated. Thus, representations that are strongly encoded and coherently organized in memory are expected to be more resistant to suggestive influences than information that is poorly encoded and represented in a fragmented manner (or when there is no memory at all for the original information).

Expanding on existing hypotheses regarding the mechanisms underlying suggestibility effects, we find several reasons to suspect that poorly encoded representation might heighten susceptibility to suggestion. First, if suggested information alters or overwrites memory for the original event (Loftus & Loftus, 1980) then this blending of new and old information may occur as a function of the integration of the initial representation, with memory impairment more likely when the features making up a representation are loosely integrated than when they are tightly bundled (Brainerd, Reyna, Howe, & Kingma, 1990). Second, if suggested information is encoded as a separate representation and coexists in memory with the original representation (Christiaansen & Ochalek, 1983) then suggestibility effects may be more likely when the original event is poorly encoded and becomes difficult to access in storage. When this happens, the suggested information may be more readily retrieved than the original information and hence mistakenly reported. Third, suggestibility effects may result from difficulties in discriminating between the experiential sources of original versus suggested information (Lindsay & Johnson, 1989), with the risk of source errors highest when poor encoding of the original event inhibits access to source information. Finally, in contrast to these three cognitive mechanisms, suggestibility may be the result of the deliberate reporting of suggestions (McCloskey & Zaragoza, 1985), with pressures to report suggestions greatest in situations where memory for the original event is weak. In such cases, individuals may be inclined to incorporate suggestions into their reports simply because no strong, competing representation of the original event challenges the suggestions. Although the circumstances associated with genuine cognitive confusions versus deliberate reporting of suggestions are not yet well defined, existing evidence suggests that both types of mechanism play a role in producing suggestibility effects (Ceci & Bruck, 1993, 1995).

Regarding empirical support for a link between encoding-time processes and suggestibility, a number of studies have provided evidence that variations in initial encoding are associated with children's vulnerability to misinformation. For

example, studies by King and Yuille (1987) and Warren, Hulse-Trotter, and Tubbs (1991) have shown that children are more likely to acquiesce to suggestions related to story details that they failed to recall (poor encoding) than those that were recalled (strong encoding) earlier in a free narrative. Others have provided support by manipulating the number of presentations of the to-be-remembered information and thereby varying the extent of initial encoding (Connolly & Lindsay, 2001; Holliday, Douglas, & Hayes, 1999; Howe, 1991; Marche, 1999; Marche & Howe, 1995; Pezdek & Roe, 1995; Powell, Roberts, Ceci, & Hembrooke, 1999). In general, these investigations have shown that children are more likely to report erroneous postevent suggestions when they are exposed to the original information once versus multiple times and presumably have experienced poorer encoding. Further, Lindberg (1991) demonstrated that children are less suggestible in domains in which they are knowledgeable, compared to areas in which they are less well acquainted.

An important consistent finding in this literature is that poor initial encoding promotes suggestibility effects even when memory for the original event has not been distorted or replaced by misinformation (Howe, 1991; Marche, 1999; Marche & Howe, 1995). For example, Marche and Howe exposed preschoolers to a narrated slide sequence. Half the children received a single slide presentation (poor encoding), whereas the remaining half received repeated presentations until they achieved a criterion of perfect recall of the material on two consecutive memory tests (strong encoding). After a 3-week delay, some of the children received correct information concerning details of the slide sequence, whereas others received misleading information. Four weeks later, the children who were presented with the slides once versus multiple times were more likely to report misinformation. However, exposure to misinformation did not affect memory for the details of the original slides, thus supporting the claim that memory impairment is not a necessary condition for the heightened suggestibility proneness of poorly versus strongly encoded memories. Indeed, this finding has much forensic relevance because although poor initial encoding heightens the risk of false reporting, the original information, albeit weakly represented in memory, may still be open to recovery by way of supports and cues for remembering (e.g., the provision of focused questions).

Despite the basic and applied importance of prior investigations demonstrating an encoding-suggestibility link, a number of key forensically relevant questions remain unaddressed. One concern is that existing studies have not examined the role of initial encoding following suggestibility manipulations that resemble the repeated and coercive questioning that some children involved in the legal system undergo. To date, work on encoding-time processes in suggestibility has focused exclusively on the effects of mildly leading statements or questions during a single postevent session. For example, after viewing a slide sequence that showed a character named Cyndi eating an egg, the children in Marche's (1999) study were

asked a question that provided misinformation in a subtle manner about what the girl had eaten: "After Cyndi ate her cereal . . . , what did she look at on the wall?" In contrast, many children caught up in legal cases are exposed to more intense forms of report contamination involving explicit suggestions during repeated interviews (for examples, see Ceci & Bruck, 1995; Ceci & Friedman, 2001; Garven, Wood, Malpass, & Shaw, 1998). For example, analyses of professional interviews in cases involving allegations of sexual abuse have shown that police and social service officials at times have used highly suggestive techniques in attempts to elicit disclosures of abuse from young witnesses (see, e.g., Lamb, Hershkowitz, Sternberg, Boat, & Everson, 1996; Lamb, Hershkowitz, Sternberg, Esplin, et al., 1996; Sternberg et al., 1996; Warren, Woodall, Hunt, & Perry, 1996). In response to such findings, a number of recent investigations have focused on the effects of multiple, aggressively suggestive interviews on children's reporting accuracy (e.g., Ceci, Crotteau-Huffman, Smith, & Loftus, 1994; Leichtman & Ceci, 1995). This work has provided ample evidence that highly biased interviews are more likely to lead to large reporting errors than the types of mild suggestion used by Marche and others. It is important to extend existing work by determining whether initial encoding remains an important factor in reporting accuracy following multiple, explicitly suggestive interviews, or whether powerful, repeated suggestions wash out the protective effects of strongly encoded initial representations.

This study also explores how encoding and the establishment of representations affect the production of intrusions of suggested information. *Intrusions* are defined as the spontaneous recall of nonexperienced information in response to open-ended, or only very general, prompts by the interviewer (e.g., Ornstein et al., 1998). Spontaneous recall is particularly important in forensic situations, both because of its obvious significance during discovery and because triers of fact view it as having greater credibility than information reported in response to specific prompts (Wehrspann, Steinhauer, & Klajner-Diamond, 1987).¹ Moreover, work that has demonstrated that elicited, or cued, recall tends to yield more errors than spontaneous recall, even under neutral interviewing conditions, is also relevant to this issue. For example, Ornstein and his colleagues have found that even though children as young as 3 years of age were able to provide reasonably accurate, albeit limited, spontaneous accounts of a recent physical examination (Baker-Ward, Gordon, Ornstein, Larus, & Clubb, 1993), their recall in response to yes-no questions (Gordon & Follmer, 1994) and recognition cues (Geddie, Myers, & Ornstein, 1994) was not significantly different from chance. Despite the forensic importance of children's spontaneous reports, as well as the difficulties associated with young children's performance on elicited recall questions, research to date on encod-

¹For example, in *State v. Michaels* (1994), the court held that "the absence of spontaneous recall" was one of the factors relevant to a determination that the interviews of child witnesses had been tainted by biased questioning.

ing-time processes and suggestibility has focused exclusively on elicited recall. Most investigators have measured suggestibility by relying on children's responses to specific questions (typically one-word answers; e.g., Howe, 1991; Marche, 1999; Marche & Howe, 1995) or recognition procedures (e.g., Holliday et al., 1999; Pezdek & Roe, 1995). An examination is needed of the effects of differences in the initial encoding of information on the production of spontaneous intrusions of suggested information.

The goal of our research is to extend existing work by investigating two forensically relevant factors that heretofore have not been examined in experiments of encoding-time processes and suggestibility, namely, the influence of aggressively suggestive interviews and an assessment of children's spontaneous intrusions of suggested information. To examine these issues, 4-year-old children individually participated in a staged shopping event in which they were asked to go to a pretend grocery store to purchase six items needed to bake cookies. Four-year-olds were studied because of the difficulties associated with eliciting spontaneous recall from children younger than 4 years of age (see, e.g., Ornstein, Baker-Ward, Gordon, & Merritt, 1997; Principe, Ornstein, Baker-Ward, & Gordon, 2000). To explore the effects of differences in initial encoding, half the children went to the store once and thus had only one opportunity to purchase all six items, whereas the remaining half returned to the store on multiple occasions until they correctly purchased all six items on two consecutive trials. The children in both experimental conditions were questioned about the details of their purchases on three occasions spread out over a 3-week period. Half the children in each group were questioned in a suggestive manner, and the remaining half received neutral interviews. Embedded in the suggestive interviews were strongly worded misleading questions that implied that the interviewee had purchased three specific items that in fact were not included on the original list. To assess the consequences of initial encoding differences and suggestive questioning, all the children received a fourth interview by a new examiner 4 weeks after the shopping event.

METHOD

Participants

Fifty-four 4-year-old children (M age = 4 years 7 months; range = 48–60 months) participated in the experiment. There were 29 girls and 25 boys in the sample. The children were recruited from preschools and day care centers in Chapel Hill and Raleigh, North Carolina. Approximately 95% of the children were White and came from middle-income families, reflecting the population of these child care centers.

Design

The children were randomly assigned to one of four conditions: one of two conditions that differed in the extent of initial encoding (one-trial encoding vs. criterion encoding), and within each of these were one of two conditions that differed in terms of the type of intervening interviews (neutral vs. suggestive). The two neutral interview groups had 13 participants each, and the two suggestive interview groups had 14 participants each. The number of girls in each group varied between 6 and 7.

Procedure

The children were seen individually during five sessions. Each session took place in a separate room at their preschools or day care centers. The sessions were videotaped and were separated by an interval of approximately 1 week ($M = 7$ days, range = 4–10 days).

Initial encoding. At the first session, a female research assistant invited the child to go to the “grocery store” to buy some things needed to make cookies. Once the child agreed, the assistant read aloud a grocery list of six items (butter, chocolate chips, sugar, eggs, mixer, and bowl) in a standard free recall format, pausing 1 sec between each word. Two orders of the list were used; half the participants received one version of the list and half received the other version. Following the presentation of the list, the child was given play money and a miniature shopping cart and invited to purchase the grocery items from a specially constructed store on the other side of the room. In the store setting, a “grocer” sat behind a counter with a toy cash register. When the child reported as many items as could be remembered, the grocer used only very general prompts such as, “Is there anything else?” or “Is there one more thing that you can remember?” to elicit further recall. All the grocery items were hidden from the child’s view behind the store counter, and only those items that were requested were given to the child. The child then paid for the remembered groceries and took them back to the assistant.

Half the participants were randomly assigned to the one-trial encoding condition, and the remaining children were assigned to the criterion encoding condition. The one-trial participants had only one opportunity to purchase all six items from the grocery store, whereas the criterion participants repeated this study-recall sequence until they correctly purchased all six items on two consecutive trials. Specifically, for the children in the criterion encoding condition, during the second study trial the assistant reread only those items that were not purchased on the first trial, then asked the child to return to the grocery store to get those items not remembered on the first trip. The assistant continued this sequence until the child reported each grocery item, at least once, to the grocer. Once this occurred, the six

items were returned to the store and again hidden from the child's view. To begin the next trial, the assistant reread the entire grocery list. Criterion participants continued this sequence until all six items were correctly purchased on two consecutive trials.

At the completion of the shopping activity, the assistant took the groceries into the kitchen to "make" the cookies. To shorten the time required, the assistant returned with premade cookies warmed in a microwave oven. The child waited with the grocer, who engaged the child in play activities. When the assistant returned, the child was given two cookies.

Intervening interviews. Beginning approximately 1 week after the shopping event, the children in both experimental conditions were questioned about the details of their purchases on three occasions spread out over a 3-week period. Half the children in each group were questioned in a suggestive manner, and the remaining half received neutral interviews. A new condition-unaware experimenter conducted these interviews. Both the neutral and suggestive interviews followed a structured format and consisted of 12 questions.

The neutral interview was made up entirely of yes–no questions. Half the questions in the neutral interview pertained to the six original items on the grocery list (e.g., "Did you buy some sugar?"), and the other half dealt with items that were not on the grocery list and were unrelated to baking cookies (e.g., "Did you buy a plant?"). The latter six items, referred to as *atypical items*, were plant, fish, shoes, baseball, bicycle, and broccoli. Given that preschool-age children have scripted knowledge of cookie-baking routines (Shapiro & Hudson, 1991) and are unlikely to falsely assent to yes–no questions about unusual or unlikely details (Baker-Ward et al., 1993; Ornstein et al., 1998; Pezdek & Hodge, 1999), the questions about atypical items were not expected to affect the accuracy of the children's accounts at the final interview. The primary purpose of the atypical questions was to control for the number of questions asked in the suggestive interviews. In addition, for any item reported as purchased at the grocery store, the children were asked to elaborate (e.g., "Tell me more about the sugar."). Two comparable protocols were developed that differed only in the order of questioning; the participant group was divided into two subgroups, and each half received a different version of the interview.

Like the neutral interview, the suggestive interview contained 6 yes–no questions about the original items. The remaining 6 questions referred to items that might be bought when baking cookies but that were not on the original list. Three of these questions were asked in a highly suggestive forced-choice format in which the question stem directly stated that certain items had been purchased, when in fact they were not included on the original list. These three items are referred to as the "typical: forced-choice items." The questions were asked as follows: "Remember when you bought a cookie cutter to cut the cookie dough into shapes? Did you

buy a cookie cutter shaped like a heart, or did you buy a cookie cutter shaped like a star?"; "Remember when you bought some frosting to put on top of the cookies? Did you buy fudge frosting, or did you buy peanut butter frosting?"; and "Remember when you bought some juice to drink with the cookies? Did you buy apple juice, or did you buy orange juice?" The first question ("Remember when you bought . . .") in each of the series was asked in a rhetorical manner that did not give the children the opportunity to respond. The format of these questions was modeled after those used in earlier studies demonstrating marked suggestibility effects in preschool children (e.g., Leichtman & Ceci, 1995). As such, the questions were expected to lead to subsequent intrusions of suggested items.

The remaining three questions in the suggestive interview were asked in the same yes–no format as the questions about atypical items in the neutral interview (e.g., "Did you buy some milk?").² The items asked about in these questions, referred to as "typical: yes–no items," were milk, spoon, and nuts. The questions about typical: yes–no items were not expected to hinder children's performance at the final interview because of the neutral (nonsuggestive) tone of these queries. In addition, the children were prompted to elaborate on any item that was reported (e.g., "Tell me more about the cookie cutter."). Four comparable protocols were developed that differed only in the order of questioning and the order of the options in the forced-choice questions. In each condition, the group was divided in four, and each subgroup received a different version of the interview.

Final interview. The final interview, experienced by all the children, was conducted approximately 4 weeks after the shopping event by a new condition-unaware interviewer. In this interview, the same questions were asked and the same procedures used to interrogate the children in all four experimental groups. After establishing rapport and orienting the children to the grocery shopping activity, the interview began with an open-ended question ("Tell me what happened the day that [assistant's name] asked you to buy some things at the grocery store."). After additional open-ended probing (e.g., "What else happened?" "What happened next?"), a less general open-ended question was asked (e.g., "What did you buy at the grocery store?"). Once open-ended recall was exhausted, original, atypical, typical: yes–no, and typical: forced-choice items not already reported were queried with yes–no probes (e.g., "Did you buy some sugar at the grocery store?"). For each item mentioned in response to an open-ended or yes–no probe, the children were asked to elaborate (e.g., "Tell me more about that."). Two orders of question-

²Only three of the questions about items that might be bought when baking cookies were asked in a highly suggestive, forced-choice manner. Pilot work indicated that if all the questions about these items were asked in a highly suggestive, forced-choice manner, then some of the children, especially those in the criterion learning group, would pick up on the questioning pattern—perhaps interpreting the task as game—and repudiate the suggestions.

ing were used; the participants were divided into two groups, and each half received a different version of the interview.

Coding of the Interviews

The data from the final interviews were coded directly from the videotape by condition-unaware raters. Both the particular items recalled and the level of specificity of the probes required to elicit the information were coded. An original item was scored as remembered at the open-ended level if it was nominated in response to an open-ended prompt (e.g., "Tell me what happened the day that [assistant's name] asked you to buy some things at the grocery store." "What did you buy at the grocery store?"). An original item was scored as recalled in response to a yes-no question if a child verified that it was included on the grocery list following a yes-no probe. Total recall scores were calculated by summing the number of original grocery items correctly reported in response to open-ended and yes-no questions.

The children could receive three possible scores for atypical, typical: yes-no, and typical: forced-choice items. An intrusion was scored if one of these items was spontaneously reported at the open-ended level of questioning. For example, an intrusion was coded if, when asked, "What did you buy at the grocery store?" a child reported purchasing juice when, in fact, juice was not among the items available for purchase. In contrast, yes-no questions concerning these items were scored as either "false alarms" or "correct rejections." A false alarm was coded if a child erroneously said *yes* to a yes-no question about an item that was not available at the store, whereas a correct rejection was scored if a child correctly said *no* to one of these probes.

Spontaneously recalled items (i.e., items that were reported at the open-ended level of questioning) were then coded in terms of the degree to which the children provided elaborative detail to describe them. To determine elaborative detail, the number of syntactic units (see Poole & White, 1991) provided about each spontaneously reported item was calculated. Syntactic units were tallied without regard for accuracy. A syntactic unit was considered to be any meaningful piece of information that had not been mentioned previously by either the interviewer or the child. Examples of syntactic units were words that described an actor (*I*), an action (*bought*), or a direct object (*frosting*). Syntactic units also included prepositional phrases (*on the cookies*) and qualifiers (*fudge frosting*). For each child, composite scores were calculated by summing over the values for the individual items and then dividing by the total number of items of each type that were reported. In this way, separate elaboration scores were computed for correct open-ended recall of original items and for spontaneous intrusions of atypical, typical: yes-no, and typical: forced-choice items.

Of the 54 interviews coded, approximately 20% ($n = 11$) were coded independently by two judges and checked for interrater reliability. The percentage

agreement across interviews was very high, averaging 98% (range = 94%–100%). Coding discrepancies were mainly oversights that were resolved through discussion.

RESULTS

Preliminary analyses indicated no differences in memory performance as a function of order of grocery list items, order of questioning, interviewer, grocer, child care center, age in months, or gender. Accordingly, the data were collapsed over these variables for subsequent analyses. The mean number of items correctly purchased during the shopping event was 2.48 ($SD = 1.09$, range = 1–4) for those in the one-trial encoding conditions, whereas the children in the criterion encoding conditions necessarily purchased all six grocery items. The children in the criterion encoding groups averaged 7.33 ($SD = 2.22$, range = 4–12) study-recall trials to learn the items on the grocery list to criterion.

The general analysis strategy was to examine the effects of the experimental manipulations on the accuracy of the children's reports at the final interview. In these analyses, the number of original, atypical, typical: yes–no, and typical: forced-choice items reported were averaged across the children in each of the four groups formed by combining the two encoding levels (one-trial encoding vs. criterion encoding) and the two types of intervening interviews (neutral questioning vs. suggestive questioning). Analyses of variance were used to examine the effects of the experimental manipulations on the children's reports of their purchases during the shopping event. In these analyses, extent of initial encoding and type of intervening interview were between-subject factors. Additional analyses focused on the degree to which these children provided elaborative detail about spontaneously reported items.

Reports of Original Information During the Final Interview

The children's recall of the original items during the final interview as a function of both level of recall (open-ended vs. yes–no) and experimental group is shown in Table 1. As expected, the children in the criterion encoding conditions showed higher total recall (i.e., open-ended plus yes–no) and higher open-ended recall compared to the children in the one-trial encoding conditions, $F_s(1, 50) \geq 39.92$, $ps < .001$. Inspection of Table 1 also indicates that the children in the neutral interview groups showed better total and open-ended recall than those in the suggestive interview groups, $F_s(1, 50) \geq 4.81$, $ps < .05$, which indicates that the provision of erroneous information interfered with the children's free recall of the original items. Although the children in the one-trial suggestive interview condition tended to have lower total and open-ended recall scores compared to the children in the

TABLE 1
 Mean Numbers of Original Items and Standard Deviations Reported at the
 Final Interview as a Function of Experimental Group and Level of Recall

<i>Experimental Group</i>	<i>Level of Recall</i>					
	<i>Open Ended</i>		<i>Yes-No</i>		<i>Total</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
One-trial neutral interview	2.7	1.0	2.0	1.7	4.7	1.0
One-trial suggestive interview	1.9	1.1	1.6	1.9	3.6	1.8
Criterion neutral interview	5.5	0.5	0.5	0.5	6.0	0.0
Criterion suggestive interview	5.1	1.0	0.7	1.1	5.9	0.4

Note. There were six original items: butter, chocolate chips, sugar, eggs, mixer, and bowl.

other three conditions, the Encoding Condition \times Interview Condition interactions were not statistically significant, indicating that exposure to suggestive questions was not more likely to impair memory for the original event when the original information was poorly versus strongly encoded.

Reports of Items Not Included in the Grocery Event During the Final Interview

The next set of analyses were carried out to determine whether exposure to erroneous suggestions encouraged the children to incorporate this information into their reports of the grocery shopping event during the final interview and whether such reporting was influenced by the extent of initial encoding. That is, the question of interest here was not whether the suggested information impaired memory for the original event (i.e., the previous set of analyses) but whether exposure to suggestive interviews increased the reporting of erroneous information. Of particular interest in this set of analyses is the degree to which the four experimental groups differed in their reports of the three typical: forced-choice items.

Atypical items. As expected, intrusions and false alarms of atypical items (i.e., items asked about in a nonsuggestive, yes-no format during the neutral intervening interviews that were not on the grocery list and that are unrelated to baking cookies) at the final interview were almost nonexistent, occurring at a frequency too small for meaningful analysis. Note that only the children in the neutral interview groups were posed questions about these items during the interval between the shopping event and the final interview. There were no intrusions of atypical items, and the mean number of false alarms of atypical items did not exceed 0.2 in any of the four experimental groups, thus indicating that the neutral intervening in-

interviews were indeed neutral; that is, exposure to them did not substantially elevate false claims of atypical items.

Typical: yes–no items. The children's responses during the final interview to questions concerning the typical: yes–no items are shown in the first two columns of Table 2. Note that only the children in the suggestive interview groups were asked questions about these items during the delay interval before the final interview and that these questions were posed in a nonsuggestive, yes–no format. As can be seen in the first column, there were very few intrusions of these items, occurring at a frequency too small to evaluate statistically. As expected, rates of false alarms of typical: yes–no items did not differ as a function of interview condition, indicating that the yes–no queries about these items during the intervening interviews were not strong enough to affect the children's accounts at the final interview. However, the children in the criterion encoding groups evidenced lower rates of false alarms, $F(1, 50) = 10.49, p < .01$, than the one-trial encoding children, suggesting that strong initial encoding offered some protection against acquiescing to yes–no questions about items engendered by scripted knowledge of cookie-baking routines.

Typical: forced-choice items. The final two columns in Table 2 summarize the children's responses during the final interview to questions concerning the typical: forced-choice items. Note that only the children in the suggestive interview groups were queried about these items during the delay interval and that these questions were posed in a highly suggestive, forced-choice format. The analysis of intrusions revealed significant main effects for both encoding condition, $F(1, 50) = 45.70, p < .001$, and interview condition, $F(1, 50) = 45.70, p < .001$. Moreover, an

TABLE 2
Mean Numbers of Intrusions and False Alarms With Standard Deviations at the Final Interview of Typical: Yes–No Items and Typical: Forced-Choice Items

Experimental Group	Typical: Yes–No Items				Typical: Forced-Choice Items			
	Spontaneous Intrusions		False Alarms		Spontaneous Intrusion		False Alarms	
	M	SD	M	SD	M	SD	M	SD
One-trial neutral interview	0.0	0.0	0.9	1.3	0.0	0.0	1.2	1.1
One-trial suggestive interview	0.2	0.6	0.8	1.1	1.8	0.8	0.8	1.0
Criterion neutral interview	0.1	0.3	0.1	0.3	0.1	0.3	0.3	0.5
Criterion suggestive interview	0.1	0.3	0.1	0.3	0.2	0.6	0.2	0.5

Note. There were three typical: yes–no items: milk, spoon, and nuts; and three typical: forced-choice items: cookie cutter, frosting, and juice.

interaction between encoding condition and interview condition, $F(1, 50) = 33.58$, $p < .001$, indicated that the effects of suggestive interviewing differed as a function of the degree of initial encoding, with poor encoding resulting in elevated rates of spontaneous intrusions of typical: forced-choice items. In fact, intrusions of typical: forced-choice items occurred almost exclusively in the one-trial suggestive group, with the children in the other three groups making few, if any, spontaneous errors. Thus, these data provide original evidence that the combined effects of poor encoding and suggestive questioning may be especially detrimental, inflating the production of spontaneous errors.

To further explore the extent to which some of the children made spontaneous reporting errors, the subsets of children in each of the four experimental groups who made at least one intrusion of a typical: forced-choice item were identified. Illustrating the heightened suggestibility of the children in the one-trial suggestive group, 13 of the 14 children (93%) in this group spontaneously reported at least one typical: forced-choice item compared to only 2 of the 14 children (14%) in the criterion suggestive group. In addition, only 1 child in the two neutral interview conditions committed a spontaneous error related to a typical: forced-choice item. As expected, a chi-square analysis carried out to compare the frequency of children in each of the four groups who committed at least one intrusion confirmed that a significantly higher frequency of children in the one-trial suggestive group spontaneously reported at least one typical: forced-choice item relative to those in the other three conditions, $\chi^2(1, N = X) = 4.62$, $p < .05$.

Regarding the children's false alarm scores, the only significant effects obtained were due to encoding condition, $F(1, 50) = 12.46$, $p < .001$, with the children in the criterion groups showing lower rates of false alarms compared to those in the one-trial groups. Note, however, that the absence of a main effect and interaction involving interview condition was certain because those in the one-trial suggestive group evidenced a high rate of intrusions of typical: forced-choice items and consequently were asked substantially fewer (only slightly greater than one) yes–no questions regarding these items compared to the children in the other three groups.

Qualitative Examination of Elaboration During the Final Interview

To understand the extent to which the children's spontaneous accounts were accompanied by descriptive detail, the syntactic unit coding scheme described earlier was used to characterize the elaboration of original items that were recalled at the open-ended level of questioning. In addition, similar scores were constructed for spontaneous intrusions of atypical, typical: yes–no, and typical: forced-choice items. If a child did not spontaneously report a particular type of item, then no score was generated for that item type for that child. Thus, zero to four elaboration

scores were calculated for each item type for each child. The resulting average elaboration scores, accompanied by the sample sizes on which each mean is based, are presented in Table 3. Because of the variation in the number of participants contributing to the means in Table 3, with most of the children providing elaborative detail for original items but only a few for intruded items, group differences in elaboration are not evaluated statistically.

Turning first to the original items recalled correctly at the open-ended level, inspection of the left column of Table 3 indicates that the children's spontaneous reports of original items were accompanied by a good deal of detail, with some tendency for the criterion children to provide greater elaboration.

Turning next to the elaboration associated with the children's spontaneous intrusions of items not available in the grocery store, inspection of Table 3 reveals that the children who made intrusions of typical: forced-choice items produced surprisingly elaborate fabrications describing these items. To illustrate, consider the following excerpts: "I got a heart ... a cookie cutter ... and 'I love you' was on the front"; "I bought ... apple juice ... it cost 20 dollars."; "The girl put chocolate in my basket and she ... I put my finger in and she ... and she said 'David, don't eat that. That's for the cookies!'" ; "I buyed some yummy juice ... and dranked it and got some more and dranked it and got some more and dranked it and got some more." As these examples reveal, many of the children did not simply intrude suggested items but rather liberally embellished their fabrications with constructive details.

TABLE 3
Mean Numbers of Syntactic Units and Standard Deviations
Reported at the Final Interview

<i>Experimental Group</i>	<i>Item Type</i>			
	<i>Original</i>	<i>Atypical</i>	<i>Typical: Yes-No</i>	<i>Typical: Forced-Choice</i>
One-trial neutral interview				
<i>M (SD)</i>	5.7 (2.2)	0	0	0
<i>n</i>	13			
One-trial suggestive interview				
<i>M (SD)</i>	6.4 (2.4)	0	1.5 (0.7)	12.9 (8.0)
<i>n</i>	14		2	13
Criterion neutral interview				
<i>M (SD)</i>	7.4 (3.0)	0	2.0 (0.0)	2.0 (0.0)
<i>n</i>	13		1	1
Criterion suggestive interview				
<i>M (SD)</i>	7.7 (3.5)	0	1.0 (0.0)	7.0 (2.8)
<i>n</i>	14		1	2

DISCUSSION

The results of this study demonstrate that young children's vulnerability to suggestion is dependent, at least to some extent, on the degree of initial encoding of information in the memory system. The children who only had one opportunity to purchase the items on the grocery list (poorer initial encoding) were more likely to provide false reports related to intervening forced-choice suggestions than the children who returned to the store on multiple occasions until they had correctly purchased each requested item on two consecutive trips (stronger initial encoding). It is interesting that the largest degradations in reporting accuracy among the children in the one-trial suggestive interview condition were observed in their spontaneous accounts, that is, in the production of intrusions of suggested information. Moreover, many of the children in this group fabricated a large number of details in their reports of suggested items.

Perhaps the most important result to emerge from this study was that the largest decrements in reporting accuracy during the final interview were observed in the children's spontaneous accounts, rather than in their elicited recall. That is, many of the children did not simply respond *yes* to the yes–no questions about the typical: forced-choice items, but they generated spontaneous false narratives in response to only very general questions. Further, these errors were not limited to a few children; only 1 of the 14 children in the one-trial suggestive group did not produce an intrusion of suggested information during the open-ended questioning portion of the final interview. These data extend existing work by demonstrating that the initial encoding–suggestibility association is not limited to elicited recall and recognition procedures, but that poor initial encoding actually can elevate rates of spontaneous intrusions of suggested information. As hinted earlier, these findings hold some applied relevance because a number of researchers have emphasized that spontaneously provided information is likely to be accurate (e.g., Fivush, Peterson, & Schwarzmüller, 2002; Gordon & Follmer, 1994) and, as a result, spontaneity is often used in clinical and legal settings as a criterion for judging the credibility of children's accounts (Ceci & Bruck, 1995).

Why were the majority of errors in this research found in the children's spontaneous reports, whereas numerous other investigations have shown that children's open-ended accounts are highly accurate? One possibility is related to the differing conditions across studies under which children are misled. Studies that have demonstrated high levels of spontaneous reporting accuracy have posed only mild yes–no suggestions and have elicited children's accounts under supportive, unbiased interviewing conditions (e.g., Baker-Ward et al., 1993; see Ornstein et al., 1997, for a review). Further, most of these investigations have focused on activities that were highly implausible (e.g., "Did the nurse sit on top of you?"), a factor shown to decrease the likelihood that a suggestion will become incorporated into children's subsequent reports (Pezdek & Hodge, 1999). In contrast, the partici-

pants in this study were exposed to repeated, forced-choice suggestions that directly stated the occurrence of activities that were plausible but that did not take place. Indeed, our findings are consistent with a growing body of research demonstrating that high rates of spontaneous intrusions can arise from a range of aggressively suggestive techniques, such as parental coaching (Poole & Lindsay, 1995, 2001) and repeated misleading interviews incorporating stereotypes (Leichtman & Ceci, 1995) and guided imagery (Ceci et al., 1994) but go beyond existing work by demonstrating that the rate of intrusions is affected by the degree of completeness of initial encoding of the to-be-remembered information. Further, these data show that aggressive suggestions do not always lead to high levels of intrusions and that strong initial encoding can serve to protect against the interfering effects of such suggestions.

Some researchers have argued that the inclusion of elaboration in children's recall is a central indicator of an accurate account, as opposed to a confabulated report (Schooler, Gerhard, & Loftus, 1986). In our investigation, however, the presence of elaborative details was not necessarily indicative of accuracy (see also Ceci et al., 1994; Leichtman & Ceci, 1995; Poole & Lindsay, 1995, 2001). Analyses of erroneous elaborations showed that many of the children embellished their spontaneous reports of suggested items with false elaborative details. In fact, the children's spontaneous accounts of these items contained more detail than their open-ended reports of items that were actually purchased. Although follow-up work is needed, these results provide suggestive evidence that postevent exposure to aggressive suggestions may prompt some children to generate false elaborative detail, especially when the original event has been poorly encoded and children may be unsure of the actual details.

The experimental procedures used in this study were not designed to test directly the previously described hypothetical mechanisms underlying the initial encoding-suggestibility relationship. Nonetheless, several pieces of evidence have implications for understanding the conditions under which reporting errors are mediated by cognitive changes versus deliberate reporting of suggested information. In line with studies that have demonstrated the memory-impairing effects of misleading information (e.g., Loftus & Hoffman, 1989), exposure to suggestive forced-choice questioning interfered with the children's recall of the original grocery list. However, the absence of a significant interaction with learning condition indicates that memory impairment was not more likely when initial encoding was strong than when it was poor. Consistent with previous work (Howe, 1991; Marche, 1999; Marche & Howe, 1995), these findings indicate that the heightened reporting of suggested information among the children in the one-trial learning group was not associated with increased levels of memory impairment for the original information. One implication of this result for understanding children's suggestibility is that postevent suggestions may be reported under conditions of poor initial encoding not because they have overwritten or altered the original memory

but because competing information about the original event was not completely encoded in memory in the first place.

These data have important implications for understanding the conditions under which preschoolers' legal testimony is likely to be more or less accurate. For example, the finding that poorly encoded memory representations are especially vulnerable to misleading information suggests that when a child constructs only a weak or fragmented memory of the to-be-remembered information, due to factors such as a lack of relevant knowledge or attention failures, he or she may more readily accept and later report false suggestions than another child who has a coherently organized memory of the original information. Moreover, these findings emphasize that clinical and legal professionals must be cautious in using spontaneity and elaborateness of young children's reports as criteria for gauging the reliability of children's accounts, particularly in situations where the original memory is likely to have been encoded poorly and suggestive interviews have taken place.

Finally, some limitations need to be addressed concerning the generalization of these results to young children in actual legal settings. First, the to-be-remembered event used here was not as stressful, significant, or complex from the child's perspective as the types of events about which children typically are called on to testify. It is clear that additional work is needed to test how factors such as level of arousal, victimization, and embarrassment affect the initial encoding of information and children's subsequent vulnerability to suggestion. Second, the delay intervals used in this investigation were quite short, relative to the lengthy delays common in forensic situations. It is therefore important to determine whether there exists a critical window of time beyond which the extent of initial encoding no longer influences susceptibility to suggestion or, perhaps, whether the effects of initial encoding become stronger over time. Third, the use of schema-consistent rather than schema-inconsistent suggestions may limit the generalizability of the findings. Although these data demonstrate that poor initial encoding can increase rates of intrusions of details that are generally consistent with the queried event, it is unknown whether the degree of initial encoding would similarly affect children's susceptibility to suggestions about less plausible occurrences. This question is especially relevant to court cases in which young witnesses make bizarre allegations or claims that would seem beyond most children's knowledge and experience. Finally, the varied effects of initial encoding observed in this study raise questions about the role of differences in encoding of postevent suggestions. A number of studies have indicated that suggestibility, as measured by children's performance on cued recall and recognition tasks, is jointly determined by the relative strengths of the original and suggested information (Holliday et al., 1999; Marche, 1999). Our findings suggest extending existing work to test how differences in the encoding of suggested information interacts with differences in the encoding of original information to affect children's spontaneous narratives.

In addition, the fact that only one set of items was asked about in a suggestive, forced-choice manner presents an important qualification in the interpretation of the results. Because question type (i.e., forced-choice vs. yes–no) in the suggestive interviews was not counterbalanced with item, it is impossible to know whether the three items queried (e.g., cookie cutter, frosting, and juice) are somehow special and have elicited a suggestibility effect that might not have been found by using other related items. Before concluding that forced-choice questioning, rather than the particular items suggested, accounted for the variance, this effect needs to be replicated with a different set of items.

Taken together, the results of this study illustrate that young children's memory reports can be either highly accurate or greatly inaccurate, depending on the integrity of the initial representation and the extent to which they are subjected to repeated suggestive interviews. Given the varied results associated with the four experimental conditions in this investigation, it is clear that situations can be constructed in which preschoolers' accounts can be very accurate. As demonstrated by the criterion neutral interview group, when the context of children's reporting of an event is free from aggressive suggestions and the original event has been successfully encoded, the odds are tilted in favor of accurate reporting. Moreover, these data indicate that exposure to suggestive interviews does not necessarily lead to erroneous reports. That is, many of the children in the criterion suggestive interview group maintained highly accurate free recall during the final interview, despite repeated erroneous suggestions. However, the same request for free recall, followed by the same set of suggestive interviews, led to highly inaccurate spontaneous reports among children in the one-trial condition, indicating the powerful effect of suggestive questioning when the event has been encoded poorly. Hence, these group effects point to the importance of examining factors outside of the interview environment, such as initial encoding, that lead to individual differences in reporting accuracy. Research on encoding-time processes and suggestibility thus has important implications regarding emerging conceptualizations of memory development and for understanding those conditions under which young children's testimonial accuracy is prone to suggestive interviews.

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