

Children's false memory and true disclosure in the face of repeated questions

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Abstract

The current study was designed to investigate children's memory and suggestibility for events differing in valence (positive or negative) and veracity (true or false). A total of 82 3- and 5-year-olds were asked repeated questions about true and false events, either in a grouped order (i.e., all questions about a certain event asked consecutively) or in a nongrouped order (i.e., questions about a certain event were interspersed with questions about other events). Interviewer gender was also varied. Individual differences, including attachment style, inhibition, and behavioral adjustment, were examined as potential predictors of memory and suggestibility. Results revealed significant age, valence, and veracity effects on children's memory reports. Path analysis demonstrated that individual differences in behavioral problems and inhibitory ability predicted children's provision of inaccurate information. Implications for psychological theory and legal application are discussed.

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Introduction

Over the past few decades, the large number of children coming into contact with the legal system—mostly as a result of abuse cases—has motivated intense scientific effort to understand children's true and false memory reports. The seriousness of abuse charges and the frequency with which a child victim's testimony provides the central or sole prosecutorial evidence make issues of children's eyewitness memory abilities important considerations. Questions about children's ability to remember and report the truth revolve around both their capability to resist misleading information and their hesitancy to reveal negative experiences. Each of these possibilities poses a significant danger. If children are easily misled by zealous interviewers, then false charges against innocent adults may result. If children fail to reveal negative experiences such as physical or sexual abuse, then child abusers may escape justice and victims may be subjected to further mistreatment. Research has commonly focused on determining the likelihood of the first of these scenarios (Goodman & Schaaf, 1997; Poole & Lindsay, 2002), with much less research aimed at examining the second scenario, although many would say that the latter is at least equally important, if not more so.

Concerns have been raised not only that asking repeated questions within an interview increases the chance of creating false memories in children who have not suffered abuse but also that not asking repeated questions decreases the chances of obtaining accurate disclosures in actual abuse victims. If repeated questioning introduces misinformation, then this interviewing strategy, at least under certain circumstances (e.g., a weak memory or an event that never occurred) (Quas et al., 2007), may lead to false reports in young children (Garven, Wood, Malpass, & Shaw, 1998; Leichtman & Ceci, 1995). However, repeated questions are believed to have beneficial effects as well, including giving a child multiple opportunities to reveal negative information and acting as a measure of consistency and truthfulness. If a child is reluctant to acknowledge a negative event such as abuse, then repeated leading questions may encourage the child to reveal his or her victimization (e.g., Goodman & Clarke-Stewart, 1991). However, inconsistency in children's answers to repeated questions leads to a perceived lack of credibility in children's reports (Leippe, Manion, & Romanczyk, 1992).

Topic switching to minimize social demands

It seems clear that children's memory reports are at times negatively affected by suggestive interviewing techniques (e.g., Garven et al., 1998). Developmental questions about the fate of children's memory in the face of suggestive interviewing became a focus of concentration as the "misinformation effect" (Loftus, 1979) was replicated with children (e.g., Ceci, Ross, & Toglia, 1987; Schwartz-Kenney & Goodman, 1999; but see Zaragoza, 1991) and as underlying mechanisms were explored (e.g., Holliday, Reyna, & Hayes, 2002). Furthermore, implantation of entirely false memories in research studies (Loftus & Pickrell, 1995) indicated that such implantation was more likely in younger children than in older children and adults (Ghetti & Alexander, 2004; Pezdek & Hodge, 1999). Nevertheless, the extent to which children experience memory difficulties, and the degree to which they respond based on social demands rather than on the basis of their original memory, is not fully known. Indeed, social demands may play a larger role in children's memory reports than in adults' memory reports (Ceci et al., 1987). Studies that support

an important role of social demands include those in which misinformation and false memory effects drop significantly when a new interviewer and unbiased questions are introduced (Ceci, Loftus, Leichtman, & Bruck, 1994; Quas & Schaaf, 2002). To the extent that social demands play a prominent role in influencing children's memory and suggestibility, child interview techniques that reduce social demands become quite important.

In research, and perhaps also in the real world, repeated questions about the same event—be it a true or false event—often are grouped together in an interview (e.g., Bruck, Ceci, & Hembrooke, 1997), and such grouping is likely to maximize the social demands of the situation. Even very young children may be able to infer that repetition of the same or similar questions can indicate that the questioner is looking for a different answer. This inference might adversely affect children's sense of competence in the interview, which in itself may have negative consequences for performance. Altering the grouping of questions might have beneficial effects. By switching from topic to topic in an interview, repeated questions may preserve their ability to increase children's reports of true events while simultaneously failing to increase children's false reports by reducing the social demands in the repeated questions and bolstering children's feelings of competence in the interview.

“Topic switching” might also affect children's certainty about their memory. For instance, perhaps children's “do-not-know” responses increase in the face of repeated questions when the topic is switched, indicating uncertainty about their responses but also comfort or willingness to express that uncertainty. Grouped questions, which may increase social pressure to answer in a particular way, might decrease such responses. In that regard, effects of topic switching on do-not-know responses would be expected aside from age, which could also affect do-not-know responses. Older children are more likely than younger children to give do-not-know responses when asked unanswerable questions, even after warnings about such questions, perhaps reflecting older children's greater comfort with the social demands inherent in formal interview situations (Beuscher & Roebbers, 2005). Furthermore, the use of do-not-know responses has been linked to decreases in false alarms, or greater accuracy of memory reports, when children give do-not-know responses rather than make errors (Nesbitt & Markham, 1999; Quas et al., 1999). It is possible, then, that topic switching will lead to an increase in do-not-know responses, particularly among older children. This may, in turn, result in fewer false alarms. Thus, it is important to consider the pattern of do-not-know responses as affected by both topic switching condition and age.

Event valence and event veracity

Children are more likely to assent to positive or neutral false events than to negative false events (for a review, see Bruck et al., 1997). This tendency may underlie, at least in part, why earlier researchers repeatedly found that children are more resistant to untrue abuse-related suggestions (e.g., “He hit you, didn't he?”) than to numerous other untrue suggestions (Goodman & Aman, 1990; Goodman, Hirschman, Hepps, & Rudy, 1991). Because findings from child witness research often are seen as relevant to legal cases in which the events are largely of a strongly negative character, it is important to take event valence into consideration.

A dearth of research exists, however, on disclosure of positive versus negative true events. In many studies, researchers have used relatively positive events to test children's memory (e.g., Quas & Schaaf, 2002), yet generalizations across positive and negative

events may be inappropriate. For example, patterns of assents and do-not-know responses may vary according to valence and veracity; that is, children may be more likely to assent to positive true events but to provide do-not-know responses when asked about events they do not wish to discuss (i.e., negative events or false events). Studies suggest that children can be hesitant to disclose true events that are embarrassing, that implicate the self or a loved one, and/or that involve transgressions (Bottoms, Goodman, Schwartz-Kenney, & Thomas, 2002; Saywitz, Goodman, Nicholas, & Moan, 1991; Talwar, Kang, Nicholas, & Lindsay, 2004). Given such hesitancy, it has been proposed that leading questioning and/or repeated questioning may be needed to elicit true disclosures of negative experiences from children. Thus, event valence is important to consider when studying memory for true versus false events.

Interviewer gender

Little is known about how children's reports may be affected by interviewer gender, yet this is an issue of considerable practical interest to those who interview children. There are several possible effects of interviewer gender on children's memory. To the extent that males are perceived as wielding more authority, and to the extent that increased perceived authority in interview situations is associated with increased suggestibility (Ceci & Bruck, 1993; Kuehnle, 1996), children may be more inaccurate when male interviewers repeat misleading questions. This acquiescence to male authority, however, might serve to increase disclosure of true unpleasant events.

On the other hand, children of both genders might perform better in interviews conducted by females who may be viewed as more supportive. In the interview environment, supportiveness tends to increase accuracy and decrease suggestibility (Carter, Bottoms, & Levine, 1996; Davies, Westcott, & Horan, 2000; Davis & Bottoms, 2002; Goodman, Bottoms, Schwartz-Kenney, & Rudy, 1991; but see Imhoff & Baker-Ward, 1999). Evidence from adults in mental health interviews suggests that both genders may be more responsive and divulge more information to female interviewers regarding sensitive issues such as mental health, finances, and fertility (Axinn, 1991; Pollner, 1998). A meta-analysis of 205 studies supported greater information being provided to female interviewers (Dindia & Allen, 1992).

Furthermore, the gender of children and interviewers may interact to affect children's accuracy and suggestibility. One study specifically investigated interviewer and child gender in suspected child sexual abuse cases. Lamb and Garretson (2003) examined forensic interviews in a large sample of alleged victims of child sexual abuse. Their results suggested that boys tended to respond similarly to male and female interviewers, whereas girls provided more information to female interviewers. Differences in child responses may have been influenced by variation in questioning styles of male and female interviewers because that study also found that male interviewers questioned boys and girls similarly, whereas female interviewers tended to ask boys more suggestive questions. The accuracy of children's statements was not examined.

Individual differences

Knowledge about how individual differences affect children's ability and willingness to provide accurate answers to questions about both true and false events is important for developmental theory as well as for gaining practical knowledge about children's suscep-

tibility to suggestive questioning. Knowledge of individual differences can lead to refinement of theoretical formulations of memory development. In forensic settings, such knowledge could be used profitably to tailor children's interviews individually according to the likely strengths and weaknesses of particular children. The current study was designed to test the contributions of a number of individual difference factors to children's memory and suggestibility. Based on a complex series of predicted interrelations, a path model was proposed (Fig. 1). Each variable included in the model is discussed next.

Age

Age-related improvements in memory, suggestibility, and relevant cognitive individual difference factors (e.g., inhibition) are well established (e.g., Alexander, Goodman, et al., 2002; Brainerd & Ornstein, 1991; Harnishfeger & Bjorklund, 1994); thus, age was included in the model. It was predicted that older age would be associated with less memory error and greater cognitive inhibition.

Parental attachment

Derived from Bowlby's (1969, 1982) attachment theory, adult attachment refers to strategies that adults use to regulate their affect in interpersonal relationships. Attachment patterns formed during infancy are believed to be relatively stable throughout the life span and to apply not only to the primary caregiver-child relationship but also to other intimate relationships (Ainsworth, 1989; Hazan & Shaver, 1987). Self-report measures of adults' romantic attachment are thought to represent relational style (i.e., attachment anxiety and avoidance) in close relationships (e.g., Brennan, Clark, & Shaver, 1998) and have also been linked to caregiving in stressful situations (e.g., Edelstein et al., 2004) and to children's memory and suggestibility for stressful events (e.g., Alexander, Goodman, et al., 2002; Goodman, Quas, Batterman-Faunce, Riddlesberger, & Kuhn, 1997; Quas et al., 1999). For instance, Alexander, Goodman, and colleagues (2002) interviewed 3- to 7-

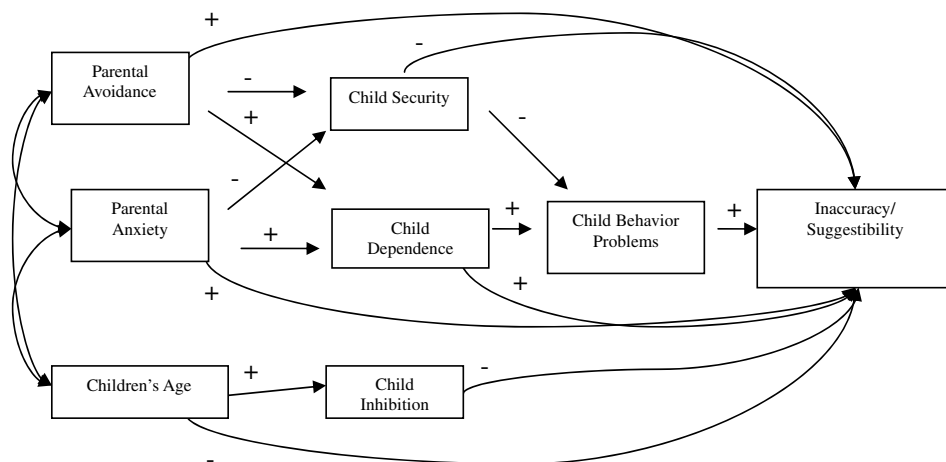


Fig. 1. Proposed path model.

year-olds about receiving an inoculation. Findings revealed an interaction between children's stress and parental attachment. More avoidant parents had children whose memory suffered as stress increased, whereas parents who were less avoidant had children whose memory was, if anything, enhanced with greater stress.

The relation between parental attachment and children's eyewitness reports about false events has rarely, if ever, been investigated. Because parental working models of attachment likely are important contributors to parents' relational style with their children (Edelstein et al., 2004; George & Solomon, 1999), and because parents' relational style predicts their *adult* children's false memory performance (Qin, 1999), it is important to examine associations between parents' attachment style and children's memory and suggestibility.

In the current study, children were questioned about emotional events (positive and negative). Parental attitudes and behaviors may affect their children's opportunities to explore and conduct open discussions about life experiences (Bowlby, 1958; Goodman & Quas, 1996) and, thus, their processing of emotional events (e.g., van IJzendoorn, 1995; for a review, see Alexander, Quas, & Goodman, 2002). Children raised by more secure parents expect to be supported during and after emotional events. They may have better coping strategies and increased attentional resources, leading to improved encoding of those events, and they may be more likely to discuss those events afterward, thereby rehearsing and reinforcing their memories.

Although there is evidence for a link between parental attachment style and children's memory and suggestibility, many questions remain concerning the nature of this association. For instance, studies examining the relation between parental attachment and children's memory have focused on highly stressful and/or embarrassing medical procedures such as inoculations and urinary tract catheterizations. It is of interest to determine whether these findings replicate in other types of situations. The current study explored the possibility that parental attachment is related to false memory about emotional events.

Finally, it is also important to examine possible mediators of the relations between adult attachment and children's memory and suggestibility. Although to date mediators of this relation have eluded researchers, as explained next, children's own attachment security and/or behavioral problems should be considered.

Child attachment

Parental attachment is likely to influence, or at least to be correlated with, children's own attachment tendencies. One potential mediator of relations between adult attachment and children's memory and suggestibility is children's own security of attachment to their caretakers (Fig. 1). Although there is little research examining children's own attachment and their memory and suggestibility (but see Alexander, O'Hara, & Kraft, 2007; Belsky, Spritz, & Crnic, 1996; Kirsh & Cassidy, 1997), such relations have been found for adults in regard to their attachment status (e.g., Edelstein et al., 2004, 2005; Fraley, Garner, & Shaver, 2000). For example, adults who self-report greater insecurity of attachment, especially greater avoidance, tend to have greater difficulty in retrieving early memories and to be more prone to false memory (Mikulincer & Orbach, 1995; Wilson, Simpson, & Smith, 2005). It is as yet unclear when in development such relations first emerge. However, because internal working models associated with attachment patterns form early in life (Bowlby, 1969, 1982), it is likely that information processing, and thus memory, is directly affected early in life as well (Johnson, Dweck, & Chen, 2007). To examine these issues, we

included a measure of child attachment in the current study, specifically the Q-Sort (Waters & Deane, 1985), which yields measures of child attachment security (e.g., mother as a secure base) and attachment dependence (e.g., clinginess). We predicted that adult and child attachment measures would be significantly related and that they would also significantly predict children's memory inaccuracy and suggestibility. Specifically, adults low in attachment avoidance and anxiety should have children who are high in security and low in dependence, all of which should be associated with less memory error.

Behavioral adjustment

Some forms of child maladjustment are likely to be associated with poor memory performance and suggestibility. For instance, memory reports by children with depression or attention deficit disorder tend to be more minimal and to include more intrusion errors, depending in part on the type of information to be retained (e.g., Bishop, Dalgleish, & Yule, 2004; Kourakis, Katachanakis, Vlahonikolis, & Paritsis, 2004; Osborn & Meador, 1990). Children who, because of adjustment problems, are more distracted, intimidated, and/or eager to please, might be more likely to assent to false events (Eisen, Qin, Goodman, & Davis, 2002). Thus, behavioral adjustment may serve as a predictor of children's memory inaccuracy and suggestibility. Furthermore, studies link behavior problems to children's earlier attachment status. For example, Clarke-Stewart, Allhusen, McDowell, Thelen, and Call (2003) found that children's attachment insecurity assessed via Q-Sort at 2 years of age positively predicted their behavior problems as measured by the Child Behavior Checklist (CBCL) at both 3 and 5 years of age. Thus, it was predicted here that children with higher attachment security and lower attachment dependence would have less behavioral maladjustment.

Children's inhibitory ability

Cognitive individual differences may also influence children's memory and suggestibility. Because of conversational rules, children's tendency may be to assent to interviewer questions (e.g., Cordon, Saetermoe, & Goodman, 2005). This is particularly likely under highly suggestive conditions such as the grouping condition in the current study, during which children were repeatedly asked (in a single session) suggestive questions about false events. Children who have less ability to inhibit responses may be less likely to inhibit assents and, thus, tend to make more errors when asked misleading questions about false events. Conversely, children with more advanced inhibition skills may be better able to deny inferences made by interviewers. Past research suggests that inhibition and impulsivity play a role in children's memory and suggestibility (e.g., Alexander, Goodman, et al., 2002; Melinder, Endestad, & Magnussen, 2006; Quas & Schaaf, 2002).

Furthermore, less advanced inhibitory capacities may impair children's ability to attend closely to questions (e.g., lack of focus on the interviewer's exact questions). Small inaccuracies in questions might then go unnoticed and, thus, children might respond incorrectly. For instance, if a child were asked the question, "Did the man talk to you when you were playing in the park?," an inattentive child might hear only part of the question and respond incorrectly by saying "yes" because the child's mother or another child had spoken to the child in the park or because they were in fact simply playing in the park.

It has been shown that children's suggestibility is negatively related to inhibition even when age is statistically controlled (e.g., Alexander, Goodman, et al., 2002; Melinder et al.,

2006). Thus, research supports the prediction that children with less controlled executive function will evince poorer memory and greater suggestibility than will children with more sophisticated executive function (Brown, 1998).

The current study

In the current study, effects on children's memory reports of question order, event veracity, event valence, and interviewer gender were examined. Furthermore, relations between children's suggestibility and individual differences were explored. The 3- and 5-year-old participants were questioned repeatedly in a leading fashion within one session regarding true and false events and were then interviewed again by a new interviewer who asked direct questions. Relevant individual difference measures were administered. Primary dependent measures included first assents, do-not-know responses, and units of information provided for each event type. Specifically, the first assent marked the first time that the child's answer indicated that the event had happened. Thus, depending on the veracity of the event in question, the first assent represented either resistance to suggestion (false events) or repeated questioning necessary for disclosure (true events). Children's answers were also scored for do-not-know responses and units of correct and incorrect information, producing indexes of the amount of information provided (e.g., total units, proportion units incorrect).

Based on previous research, several predictions were advanced. First, 5-year-olds were expected to be more resistant to suggestion than 3-year-olds, consistent with prior findings indicating age differences in memory and suggestibility (e.g., Alexander, Goodman, et al., 2002; Goodman & Reed, 1986; Gordon, Baker-Ward, & Ornstein, 2001). Second, it was hypothesized that children would be more suggestible when questions about a single event were grouped and asked consecutively than when questions were interspersed throughout the interview. Third, children were expected to be more suggestible when events were positive in valence than when events were negative in valence (e.g., Ceci et al., 1994). In addition, children were expected to be less willing to disclose true negative events than to disclose true positive events. Fourth, children were expected to provide more do-not-know responses for negative events than for positive events, and for false events than for true events, because of a hesitancy to discuss the events. In addition, older children were hypothesized to be more likely than younger children to give do-not-know responses because of greater comfort with social demands of the interview. Do-not-know responses were also expected to be more common in the topic switching condition than in the topic grouping condition, especially for older children. Fifth, children interviewed by females were expected to be more accurate and resistant to suggestion than were children interviewed by males.

Sixth, higher scores on attachment security for both children and parents were expected to predict greater resistance to suggestion. Parents who rated themselves as more secure (i.e., less anxious and avoidant) were expected to have children with better memory and greater resistance to suggestion than were children of parents who rated themselves as insecure (i.e., more anxious and/or avoidant) (e.g., Goodman et al., 1997; Quas et al., 1999). Furthermore, children who were more secure were also expected to evince greater resistance to false suggestions. Children's attachment insecurity was also expected to predict their behavior problems, consistent with previous research (e.g., Clarke-Stewart et al., 2003). Behavioral problems, in turn, were expected to be associated with increased mem-

ory errors. Finally, consistent with theoretical expectations about the relation of cognitive inhibition to memory (Harnishfeger & Bjorklund, 1994), children with higher levels of inhibition were expected to provide more accurate information and to be less suggestible (Alexander, Goodman, et al., 2002).

Method

Design

The current study conformed to a 2 (Age: 3 years vs. 5 years) $\times$ 2 (Interview Condition: group vs. switch) $\times$ 2 (Interviewer Gender: male vs. female) $\times$ 2 (Event Veracity: true vs. false) $\times$ 2 (Event Valence: positive vs. negative) mixed design. Age, interview condition, and interviewer gender were varied between participants, whereas event veracity and event valence were varied within participants. Within each age group, children were randomly assigned to interview condition and interviewer gender conditions, with the restriction that an approximately equal number of girls and boys be included in each cell of the study.

Participants

Participants were 82 children (42 3-year-olds, mean age = 3.51 years, range = 36–48 months, and 40 5-year-olds, mean age = 5.37 years, range = 60–72 months). An additional 3-year-old was tested; however, her data were excluded because of nonresponsiveness during the interview. Regarding ethnicity, 60% of participants were Caucasian (non-Hispanic). Socioeconomic status (SES) was derived from parent occupation using Watt's (1976) adaptation of the Hollingshead SES scale; participants had ratings ranging from 1 (high SES) to 7 (low SES), $M = 2.70$, $SD = 1.61$. Children were recruited through advertisements in the community inviting families to participate. Children received small toys to thank them for their participation, and families were compensated with \$5.

Measures

Demographic questionnaire

A standard parent report demographic questionnaire was used to gather information about each child's and family's background (e.g., child's date of birth, ethnicity, parents' occupations).

Parental relationship questionnaires

Parental attachment was assessed using both the Relationship Questionnaire (Bartholomew & Horowitz, 1991) and an adapted version of the Relationship Scales Questionnaire (Griffin & Bartholomew, 1994). For the Relationship Questionnaire, adults rate the similarity of their current relationship style to each of four attachment styles: secure, preoccupied, dismissing, and fearful. Ratings are made on 7-point Likert scales (1 = *very much like me*, 7 = *not at all like me*). For the Relationship Scales Questionnaire, adults rate their level of agreement (7-point scale: 1 = *absolutely disagree*, 7 = *absolutely agree*) with 30 statements concerning close relationship styles. The means for items corresponding to

each of the four attachment styles were calculated (Griffin & Bartholomew, 1994). The internal consistency of the subscales ranges from .75 to .79 (Scharfe & Bartholomew, 1994), and the measure shows moderate stability over an 8-month period (i.e., correlations ranging from .64 to .73) (Scharfe & Bartholomew, 1994). Standardized (*z*) scores for each of the four categories were summed across measures to create a composite index (Ognibene & Collins, 1998), and these scores were further combined as per Griffin and Bartholomew's (1994) suggestion, to compute scores for the two dimensions underlying the four attachment patterns: anxiety and avoidance. For the purpose of the current article, these two scales were considered sufficient to represent individuals' location in the two-dimensional space defined by anxiety and avoidance and described by Bartholomew and Horowitz (1991) and Fraley and Shaver (2000). Higher scores indicate higher levels of parental attachment anxiety and avoidance (i.e., less security). Because some parents were not in a current relationship or opted not to complete these measures, 69 participants are included in analyses involving parental attachment.

Inhibition measures

To measure children's inhibition, a battery of measures was used. The Day/Night Task (Gerstadt, Hong, & Diamond, 1994), designed to approximate the Stroop test with 3- to 7-year-olds, was administered. Children are shown two cards: one white with a yellow sun and the other black with a white moon. They are instructed to say "night" when shown the sun card and "day" when shown the moon card. Performance on this task is significantly related to other measures of cognitive inhibition (Carlson & Moses, 2001). Once children demonstrate an understanding of the rules, 16 trials are administered: 8 with each card in a mixed order that is the same for each child. Scores were determined as the proportion correct of 16 trials.

The Tapping Task (Diamond & Taylor, 1996) was adapted from Luria's tapping test used to assess patients with damage to the frontal lobe of the brain. Like the Day/Night Task, the Tapping Task also involves children learning two rules and inhibiting the prepotent response, in this case to imitate the interviewer. Children are told that when the experimenter taps one time, they should tap two times. Alternatively, if the experimenter taps two times, children should tap one time. Thus, children must inhibit the tendency to imitate the experimenter and/or tap continuously. After children correctly demonstrate understanding of the rules, a set of 16 trials is administered. The proportion correct of 16 trials served as the measure for this task.

The Three Pegs Task (Diamond, Prevor, Callender, & Druin, 1997) involves a wooden block with three pegs (green, red, and yellow) and a small hammer. Children are instructed to tap each peg only once—first tapping the red peg, then the green peg, and then the yellow peg. This requires children to inhibit the prepotent response to tap the pegs in the order they appear on the block in addition to inhibiting tapping each peg more than once. There are three levels at which children might succeed. First, children are given only verbal instructions. Second, if success does not follow, children are given the instructions again accompanied by a demonstration. Third, children are given the instructions and demonstration again in addition to being instructed to name each color as they tap the peg. Children were given 3 points if they succeeded with verbal instructions alone, 2 points if they succeeded with verbal instructions plus a demonstration, 1 point if they succeeded with verbal instructions plus a demonstration plus color naming, and 0 points if success never was achieved.

For the current study, a composite inhibition score was calculated. Standardized (*z*) scores were created for each of the three variables. The mean of these scores served as the indicator of inhibition. Higher scores indicate greater inhibitory control and more advanced executive functioning.

Child behavior checklist

The well-established parent report versions of the CBCL for 2- and 3-year-olds and for 4- and 16-year-olds were included to identify individual differences in children's general psychological and behavioral adjustment (Achenbach & Edelbrock, 1983). Both versions contain a list of 100 statements about behaviors that children might exhibit. Parents are asked to rate each statement with 0, 1, or 2 depending on the prevalence of that behavior for their children. Higher overall T scores indicate greater behavioral disturbance.

Q-Sort

The Attachment Q-Sort (Waters & Deane, 1985) was used to assess children's attachment security and dependence. This measure includes a set of 90 cards that parents sort into 10 equal piles according to likeness to their children's behaviors. Parents become familiar with the behaviors listed on the cards (e.g., "Child has a cuddly toy or security blanket that he carries around, takes to bed, or holds when upset") and are instructed to observe their children during the week prior to the final sorting task. This measure of attachment security and dependency is scored according to a criterion sort method validated for use with 12- to 60-month-olds. The measure creates a continuous variable of children's attachment security representing the underlying construct of secure base behavior and of children's attachment dependency representing clinginess (Waters & Deane, 1985). For the current study, children's card piles were compared with an "ideal" secure child, yielding scores for security, and a highly dependent child, yielding scores for dependency. Higher scores indicate greater security and dependence.

Detailed memory interview

This interview included six questions about each of eight events. Four true events and four false events were queried, including a true and false event for each of the following: embarrassing event (e.g., getting pants pulled down in front of a store), punishment (e.g., getting a time-out for throwing a rock through a window), gift (e.g., receiving a big stuffed giraffe as a present), and trip (e.g., going to Disneyland). For each category, true events were selected by parents among those suggested by the researcher, and the researcher chose events verified by parents as false. Each series of six questions about an event was highly similar and included questions that were open-ended (e.g., "Who was with you?" "What did you do when you got your pants pulled down in front of a store?") and yes/no (e.g., "Did you go on the rides?" "Was your mom there when you got a time-out for throwing a rock through the window?"). The number of open-ended and yes/no questions was constant in each series. Because of the individual nature of the events, and the particular facts mentioned by parents for true events, questions could not be absolutely standardized across events. Small differences in the question series typically concerned details about events, for instance, salient details of a trip such as meeting

another child or traveling in an airplane. The order of events was counterbalanced with the requirement that each interview started with a true event and alternated between true and false events.

For the topic grouping version of the interview, all six questions per event appeared consecutively. After six leading questions about one event, the interviewer asked six leading questions about a different event. In the case of all false events, the six questions were misleading in that they presupposed untrue information.

For the topic switching condition, the six questions per event were semi-randomly interspersed with questions about other events, with the requirement that the order of events be maintained throughout. For example, if the true gift event (e.g., receiving a Barbie house) was asked about first, then one question about each of the other events followed before a second question about the true gift event was included. This continued until all six questions about each event were asked.

Final memory interview

This interview included a direct question about whether children had experienced each of the eight events included in the prior interview (e.g., “Did you get your pants pulled down in front of a store?”). If children indicated that the event occurred, then two follow-up prompts (i.e., “Tell me about that time.” “Anything else?”) were used to glean further information about the event. The order of events in this interview was identical to that of the detailed memory interview.

Procedure

The procedure was approved by the university’s institutional review board. On making an appointment for their children’s participation, parents were interviewed by phone regarding true and false events to be used in the memory interview. Children’s memory interviews were tailored individually according to parents’ answers following typical false memory paradigm procedures (e.g., Gheiti & Alexander, 2004; Hyman & Billings, 1998; Loftus & Pickrell, 1995). At the conclusion of the phone interview, parents were asked not to discuss those particular events or the details of the study with their children prior to participation.

At the laboratory, children were tested individually. Consistent with standard procedure in child memory research and child forensic practice (e.g., Alexander, Goodman, et al., 2002), when each child arrived, the first interviewer built rapport. At the same time, a researcher obtained informed consent from the parent and showed the parent the memory interview to verify accuracy of true and false events.

Children then entered a room with the first interviewer. Instructions read by the interviewer were as follows: “I’m going to ask you a bunch of questions, and I want you to answer as best you can. It is important to tell me the truth, and remember that you won’t get in trouble for anything you say. If you don’t know the answer, it’s okay to say ‘I don’t know.’ If I make a mistake in a question, you can tell me I made a mistake.” All interview questions were asked in the order specified by the interview condition regardless of children’s answers.

Parents watched the interview via closed-circuit television and provided researchers with information regarding the accuracy of children’s statements during the interview,

and this information was added to that already gathered via the parent phone interview to be used for scoring children's memory accuracy.

Following completion of the detailed memory interview, individual difference measures were administered to children. These included the Day/Night Task, the Tapping Task, and the Three Pegs Task. Parents filled out all parent questionnaires at this time.

Children were then led back to the lobby to play, and the first interviewer left. A new interviewer (matched in gender to the first interviewer) then entered the lobby and introduced herself or himself to the children. After brief rapport building, the children and second interviewer entered the interview room. Once there, the interviewer administered the final memory interview. Again, parents watched the interview and verified children's statements.

Coding

Two primary measures of accuracy were derived from children's responses during the memory interviews: global responses and units of information. First, children's responses to each question were scored globally. Specifically, for each question, children were assigned a score of assent, reject, do-not-know, or unscorable. Because our main interests were in assents and do-not-know responses, only these global response-dependent measures were considered further. Responses were unscorable if children did not answer a question or if it was unclear whether children were endorsing the event. Unscorable responses constituted only 8% of children's answers.

Within the global scoring system, first assent was determined for each event queried. For the seven questions per event, the first assent score was assigned based on each child's first indication that she or he experienced that event. For example, if a child accurately denied that a false event was experienced when he or she was asked the first two questions about the false event, and then affirmed the next two questions about that event but denied it had occurred when asked the fifth, sixth, and seventh (final interview) times, then the child received a score of 3.0 for assenting the first time to the third question. Mean first assent was calculated by averaging first assents across the two events in each of the four categories of the valence–veracity factorial design (i.e., true positive, true negative, false positive, false negative). The number of questions to which children gave do-not-know responses was summed and divided by the total number of questions answered to provide the index of do-not-know responses used in subsequent analyses.

First assent indicated how quickly children affirmed that an event had occurred. This could have been done by a simple response of “yes” or by a lengthy narrative about the experience. Thus, all narrative information provided by children also was scored for units of information using a system similar to the systems employed in previous studies of children's memory (e.g., Alexander, Goodman, et al., 2002; Poole & Lindsay, 1995; Quas & Schaaf, 2002). This provided the opportunity not only to distinguish between these types of responses but also to examine the quality of the information provided (i.e., correct vs. incorrect).

Information was verified based on parent reports before and during children's interviews. A statement about any agent, object, action, recipient, or descriptor that included information about the event beyond that provided in the question was considered a unit of information and was scored as correct, incorrect, or unverifiable. When asked about throwing a rock through the window (i.e., false punishment event), one child responded,

“Yes, and my mom spanked me when I threw the rock.” This child was given an incorrect assent in addition to units incorrect for “mom,” “spanked,” and “me” (“when I threw the rock” was not scored because of redundancy with the question).

Regarding scoring of units of information, unverifiable units were scored only in cases where we could not verify the veracity of children’s responses for true events (i.e., parents did not confirm). For example, a child stated “Johnny screamed” in response to a true gift question. Although scored as an assent (for global response coding) because the child indicated that the event itself occurred by stating that other people were present, the child was assigned two unverifiable units as well because the parent did not remember whether Johnny screamed. Unverifiable units constituted 9% of all units for true events and are not considered further. For false events, at times children provided specific and verifiable information about a different, but true, event (according to parents). These units were scored as “correct–other” and constituted less than 5% of all units for false events and are not analyzed further.

Units were combined to form mean units correct and incorrect for each valence–veracity pairing. Irrelevant information, such as children’s digression about what they did yesterday, was not included in the scoring.

Two independent coders scored 20% of the memory interviews. Proportion agreement for global responses (e.g., assent, do-not-know) and units of information (agreement scored if exact match between the raters on the number of units and subcategories of those units) ranged from .80 to .93. Discrepancies were resolved, and each researcher coded half of the remaining interviews.

Results

The current study examined children’s memory and suggestibility by (a) identifying effects of age, event, and interview factors and (b) identifying sources of individual differences. Means for memory variables are presented in Tables 1 and 2. Preliminary analyses were conducted to identify possible order effects (e.g., whether positive events were responded to more accurately if they were asked first in the interview rather than last).

Table 1

Means and standard deviations for global memory measures by event valence, event veracity, and age

	Type of event					
	True			False		
	Positive	Negative	<i>M</i>	Positive	Negative	<i>M</i>
<i>First assent (of 7 questions)</i>						
3-year-olds	1.39 (0.73)	2.60 (1.90)	1.99 (1.06)	3.38 (2.51)	3.54 (2.30)	3.46 (2.20)
5-year-olds	1.36 (0.85)	2.26 (2.04)	1.81 (1.18)	5.56 (2.52)	6.39 (2.23)	5.98 (2.05)
<i>M</i>	1.38 (0.78)	2.43 (1.97)		4.45 (2.73)	4.93 (2.67)	
<i>Do-not-know (proportion global responses)</i>						
3-year-olds	.08 (.13)	.11 (.15)	.09 (.12)	.07 (.14)	.10 (.17)	.09 (.13)
5-year-olds	.08 (.08)	.14 (.17)	.11 (.11)	.09 (.13)	.07 (.12)	.08 (.10)
<i>M</i>	.08 (.11)	.13 (.16)		.08 (.14)	.08 (.14)	

Note. Standard deviations are in parentheses.

Table 2

Means and standard deviations for units of information by event valence, event veracity, and age

	Type of event					
	True			False		
	Positive	Negative	<i>M</i>	Positive	Negative	<i>M</i>
<i>Total units</i>						
3-year-olds	23.81 (17.81)	14.43 (14.59)	38.24 (26.76)	11.69 (11.90)	11.17 (15.17)	22.86 (23.82)
5-year-olds	33.58 (21.02)	17.18 (12.25)	50.75 (29.35)	6.88 (11.08)	3.53 (9.51)	10.40 (17.30)
<i>M</i>	28.57 (19.93)	15.77 (13.49)		9.34 (11.69)	7.44 (13.22)	
<i>Proportion incorrect units</i>						
3-year-olds	.11 (.22)	.16 (.24)	.14 (.18)	.63 (.45)	.74 (.41)	.69 (.34)
5-year-olds	.04 (.09)	.06 (.12)	.05 (.08)	.37 (.46)	.31 (.46)	.34 (.39)
<i>M</i>	.08 (.17)	.12 (.20)		.50 (.47)	.53 (.49)	
<i>Proportion correct units</i>						
3-year-olds	.72 (.32)	.59 (.36)	.66 (.25)			
5-year-olds	.90 (.13)	.71 (.34)	.81 (.18)			
<i>M</i>	.81 (.26)	.65 (.35)				

Note. Standard deviations are in parentheses.

Results revealed no significant effects of event order on children's accuracy, $F_s(3, 78) \leq 1.53$, $ps \geq .21$.

To examine hypotheses related to effects of interviewer gender and child gender, a series of 2 (Child Gender) $\times$ 2 (Interviewer Gender) analyses of variance (ANOVAs) were conducted. With only one exception, no significant effects or interactions emerged. The exception was a significant Child Gender $\times$ Interviewer Gender interaction for total units provided in response to true positive events, $F(1, 78) = 3.98$, $p < .05$, $\eta^2 = .05$. For male interviewers, boys provided significantly more information than did girls, $F(1, 39) = 4.51$, $p < .05$, $\eta^2 = .10$. For female interviewers, girls and boys recalled a similar number of total units, $F(1, 39) = 0.32$. Thus, although there were few significant gender effects, boys provided more units of information than did girls, but only when boys were interviewed by a male regarding true positive events. Gender was not analyzed further.

Effects of age, event, and interview conditions

A series of 2 (Age: 3 years vs. 5 years) $\times$ 2 (Interview Condition: group vs. switch) $\times$ 2 (Event Veracity: true vs. false) $\times$ 2 (Event Valence: positive vs. negative) mixed ANOVAs were conducted with event valence and event veracity as within-subjects factors. Dependent measures were first assent, do-not-know responses, and units of information.

First assent

The ANOVA for first assents yielded several interesting results. Significant main effects of age, event valence, and event veracity were observed, $F_s(1, 78) \geq 16.17$, $ps < .001$, $\eta^2 \geq .17$, but were qualified by a significant Age $\times$ Event Veracity interaction, $F(1, 78) = 30.79$, $p < .001$, $\eta^2 = .28$. To interpret this interaction, simple effects analyses were conducted separately for true and false events. For true events, 3- and 5-year-olds were equally likely to assent early, $F(1, 80) = 0.54$. For false events, however, younger children

assented earlier than did older children, $F(1, 80) = 28.61, p < .001, \eta^2 \geq .26$. Finally, there was a significant Age $\times$ Event Veracity $\times$ Event Valence $\times$ Interview Condition interaction, $F(1, 78) = 6.31, p < .05, \eta^2 \geq .08$. Univariate ANOVAs with Bonferroni correction were carried out to examine the interaction with interview condition as the independent variable and first assent for each valence–veracity–age pairing as the dependent variable, yielding no significant effects of interview condition and mirroring the pattern of mean differences in the Age $\times$ Event Veracity interaction effect.

Do-not-know responses

Also of interest was the pattern of do-not-know responses. It was predicted that children were more likely to give such a response to events that did not occur and/or events that they did not want to discuss with the interviewer (i.e., negative events). Results revealed a significant main effect of event veracity, which was qualified by significant interactions of Event Veracity $\times$ Event Valence, $F(1, 78) = 6.68, p < .05, \eta^2 = .08$, and Age $\times$ Event Veracity $\times$ Event Valence, $F(1, 78) = 5.17, p < .05, \eta^2 = .06$ (Table 1).

Simple effects analyses of the three-way interaction revealed that for 3-year-olds, there was not a significant difference in do-not-know responses according to event valence or event veracity, $F_s(1, 41) < 2.50, p_s \geq .12, \eta^2 \leq .06$. For 5-year-olds, there was a significant interaction between event valence and event veracity, $F(1, 39) = 8.53, p < .01, \eta^2 = .18$. For true events, 5-year-olds were more likely to give do-not-know responses to negative events than to positive events, $F(1, 39) = 8.03, p < .01, \eta^2 = .17$. For false events, 5-year-olds were equally likely to give do-not-know responses to positive events and negative events, $F(1, 39) = 0.97$.

Total units

Next, the total number of units provided (regardless of accuracy) was entered into the ANOVA. There were significant main effects of event veracity and event valence as well as significant Age $\times$ Event Valence, Age $\times$ Event Veracity, and Event Veracity $\times$ Event Valence interactions, $F_s(1, 78) \geq 4.80, p_s < .05, \eta^2 \geq .06$ (Table 2). Simple effect analyses revealed that both 3- and 5-year-olds provided more units about positive events, $M_s = 35.50$ and 40.45 , $SD_s = 24.22$ and 25.12 , respectively, than about negative events, $M_s = 25.60$ and 20.70 , $SD_s = 22.99$ and 18.34 , respectively; however, the effect was stronger for 5-year-olds, $F(1, 39) = 41.91, p < .001, \eta^2 = .52$, than for 3-year-olds, $F(1, 41) = 9.18, p < .01, \eta^2 = .18$. Moreover, both 3- and 5-year-olds provided more units about true events, $M_s = 38.24$ and 50.75 , $SD_s = 26.76$ and 29.35 , respectively, than about false events, $M_s = 22.86$ and 10.40 , $SD_s = 23.82$ and 17.30 , respectively; however, again the effect was larger for 5-year-olds, $F(1, 39) = 85.87, p < .001, \eta^2 = .69$, than for 3-year-olds, $F(1, 41) = 12.64, p = .001, \eta^2 = .24$. The Event Veracity $\times$ Event Valence interaction revealed that children provided a greater number of units about true positive events than about true negative events, $F(1, 81) = 39.39, p < .001, \eta^2 = .33$, whereas they provided similar amounts of information for false events regardless of valence, $F(1, 81) = 1.94$.

Proportion units incorrect

Measures of accuracy were created based on proportion of total units in each category (i.e., true positive, true negative, false positive, false negative). The denominator for pro-

portion memory scores was total units in all categories (i.e., correct, incorrect, correct–other, unverifiable). For proportion units incorrect, there were significant main effects of age and event veracity, qualified by a significant Age $\times$ Event Veracity interaction, $F_s(1, 78) \geq 11.70$, $p_s \leq .001$, $\eta^2 \geq .13$ (Table 2). One-way ANOVAs were conducted separately for each age group to examine the interaction. Results revealed that 3-year-olds provided proportionally more incorrect units of information to false events than to true events, $F(1, 41) = 116.37$, $p < .001$, $\eta^2 = .74$. The 5-year-olds showed a similar pattern, $F(1, 39) = 24.68$, $p < .001$, $\eta^2 = .39$, although the mean difference was smaller than for the 3-year-olds.

Proportion units correct

Because correct units were possible only for true events, a 2 (Age) $\times$ 2 (Interview Condition) $\times$ 2 (Event Valence) mixed ANOVA was conducted, including children's responses to questions about true events only, with proportion correct units as the dependent measure. There was a significant effect of event valence, $F(1, 78) = 11.97$, $p = .001$, $\eta^2 = .13$, such that children provided more correct information in response to positive events. There was a significant main effect of age, $F(1, 78) = 9.47$, $p < .01$, $\eta^2 = .11$, such that older children provided more correct units of information than did younger children.

Individual differences

The current study permitted the testing of a model concerning individual difference predictors of children's memory reports. To reduce the number of dependent measures, all independent memory measures were included in a factor analysis—first assents for false positive, false negative, true positive, and true negative events; proportion correct units for true positive and negative events; and proportion incorrect units for true positive and negative events and false positive and negative events. A maximum likelihood factor analysis with oblim rotation revealed one meaningful factor (eigenvalue > 2), namely, inaccuracy. All variables with factor loadings greater than .30 were included in the inaccuracy factor (i.e., first assent for false positive and negative events, proportion correct units for true positive and negative events, and proportion incorrect units for true positive and negative events and false positive and negative events). Items were scaled in the same direction (i.e., false assents and proportion correct units were reversed, Cronbach's $\alpha = .82$). An inaccuracy score was created by standardizing scores for the eight variables and calculating the mean for each participant. Higher scores indicate greater inaccuracy. This factor served as the main dependent variable for remaining analyses.

As predicted, age in months was significantly associated with fewer inaccuracies, $r = -.53$, $p < .001$. Age was also significantly related to greater inhibitory ability, $r = .66$, $p < .001$. We were also interested in whether increased do-not-know responses were related to less inaccuracy. The correlation between inaccuracy and overall do-not-know responses was negative and significant, $r = -.25$, $p < .05$ (with age partialled).

Correlations among inaccuracy and individual difference measures (with age partialled) are reported in Table 3 (missing values for individual difference measures were imputed by

Table 3

Correlations among individual difference variables and memory report inaccuracy (age partialled)

Variable	1	2	3	4	5	6	7
1. Report inaccuracy		.19	-.25*	-.01	.08	-.06	-.03
2. Behavior problems			-.03	-.44***	.23*	.35***	.21
3. Inhibitory ability				-.04	-.14	.06	.06
4. Attachment security					-.05	-.22*	-.21
5. Attachment dependence						.08	.25*
6. Parental anxiety							.46***
7. Parental avoidance							

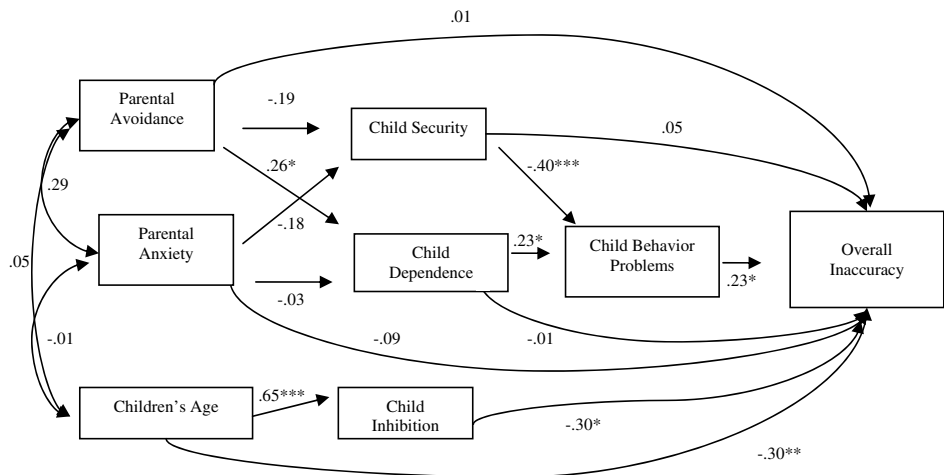
* $p \leq .05$ (two-tailed test).*** $p \leq .001$ (two-tailed test).

SPSS using Expectation Maximization²). Of note, children's inhibition significantly predicted fewer inaccuracies. To test whether inhibition mediated the relation between age and memory inaccuracy (Baron & Kenny, 1986), inaccuracy was regressed on age and inhibition, yielding a significant relation for inhibition, $\beta = -.27$, $p < .05$. Age was also significant, $\beta = -.34$, $p < .05$, indicating that inhibition is a partial mediator of the relation between age and memory inaccuracy. Such mediation was further explored in the path model. No other significant relations between individual differences and inaccuracy resulted. However, a number of individual difference measures were intercorrelated (e.g., child attachment security was inversely related to child behavior problems, parent anxiety was positively related to child behavior problems).

To examine the proposed path model predicting children's inaccuracy using observed indicators of parental attachment (avoidance and anxiety), inhibition, behavior problems (CBCL total T score), and child attachment (security and dependence), structural equation modeling (SEM) was employed. Use of this approach permitted goodness-of-fit tests of the path model. Standard maximum likelihood estimation of the paths was computed using AMOS 5.0 (Arbuckle, 2003; McDonald & Ho, 2002). Models were evaluated according to three recommended indexes of fit: χ^2 (nonsignificant), root mean square error of approximation (RMSEA $\leq .05$), and closeness-of-fit index (CFI $\geq .90$) (Browne & Cudeck, 1993; Hoyle & Panter, 1995; Jaccard & Wan, 1996; Loehlin, 1998). To maximize statistical power, missing data were imputed using maximum likelihood imputation in the AMOS statistical package (Byrne, 2001).

The model predicting inaccuracy provided a good fit, $\chi^2(11) = 12.24$, $p = .35$, RMSEA = .04, CFI = .99 (Fig. 2). Children's attachment dependence was positively predicted by their parents' attachment avoidance. Furthermore, children's attachment dependence was related to increased behavior problems, whereas children's attachment security was related to decreased behavior problems. In addition, increases in age were associated with greater inhibitory ability. Of special interest, significant predictors of memory inaccuracy included more behavior problems, younger age, and lower degree of inhibitory ability. Children rated by their parents as having more behavior problems provided more inaccurate information. In addition, the path between age in months and inhibition was significant (i.e., older children were better at inhibiting), as was the path between inhibition and memory inaccuracies (i.e., greater inhibition predicted fewer inaccuracies).

² The pattern of results and significance was the same with missing values excluded rather than estimated.



Note: * $p < .05$; ** $p \leq .01$; *** $p < .001$.

Fig. 2. Path model predicting inaccuracy.

Discussion

The goal of the current study was to investigate the influence of interview, event, and individual difference factors on children's memory and suggestibility. Results supported many of the hypotheses. The discussion focuses first on contributions of age, then on factors related to the event and interview, and finally on individual differences.

Age

We expected age differences in children's memory and suggestibility. Consistent with previous literature (e.g., Goodman & Reed, 1986; Ornstein et al., 2006; Roberts & Blades, 1999), increasing memory skill and decreased suggestibility with age were evident. Younger children were quicker to assent to false events than were older children. Younger children also provided fewer correct units of information than did older children when discussing true events and provided more incorrect units of information when discussing false events. In addition, SEM revealed that increasing age was associated with decreasing overall inaccuracy. Of importance, this was not associated with an overall increase in confabulation by younger children, as revealed by the lack of age difference in the proportion of incorrect information provided about true events. Overall, with age, children's skill at accurately retrieving memories of their experiences and resisting suggestion improve dramatically because of a variety of age-related cognitive improvements (e.g., Brainerd & Ornstein, 1991; Carter et al., 1996; Case, 1998; for a review, see Bjorklund, 2005). Although age clearly is important, analyses revealed mediators of relations between age and memory/suggestibility, as discussed in several of the following sections.

Event and interview factors

Overall, our hypotheses concerning effects of event characteristics, interview format, and interviewer gender received mixed support. Interesting effects of event valence and veracity were evident for first assent, do-not-know responses, and units of information. In contrast, regarding interview format, our supposition that repeated but nonconsecutive questions about a single topic would elicit greater accuracy than would the same number of questions asked consecutively was generally not borne out by our data. There were no significant effects of interviewer gender or child gender regarding memory and suggestibility for false events.

Effects of event factors on first assent

First assent is a potentially critical index relevant to forensic interviews because it corresponds to the number of questions about an event that can be asked before a child assents to that event. In the case of false events, it indexes resistance to suggestion. Our results revealed that children in both age groups were likely to assent early to true events (i.e., after one or two questions). For false events, however, younger children assented earlier than did older children, as expected (Ghetti & Alexander, 2004). On average, younger children assented after three questions, whereas older children required six repeated questions before responding affirmatively to a false event.

These results provide evidence for the idea that a minimal number of questions can be asked about false events without causing false assents and that this number increases with age. Imagine an interviewer who wishes to ask a 5-year-old about a suspected abuse event. To the extent that our negative events cause responses similar to those that would be caused by events of a truly traumatic and possibly painful nature such as abuse, Table 2 indicates that, on average, the child would be likely to assent to the event (if it is true) after approximately 2 questions and that the interviewer is not likely in danger of eliciting a false assent (if the event did not occur) until after 6 questions about the event (whether consecutive or not), again on average. Unfortunately, if the same interviewer were to approach a 3-year-old, the separation between true assent (at ~2.5 questions) and false assent (at ~3.5 questions) offers less helpful guidance about what may be acceptable numbers of repeated questions to ask a younger child.

Effects of event factors on do-not-know responses

We predicted that children would be more likely to give do-not-know responses when questioned about negative events compared with positive events and when questioned about false events compared with true events. Our results revealed an interaction between child age and event type. Younger children did not exhibit differences in proportion of do-not-know responses based on the valence or veracity of target events. In contrast, concerning true events, older children provided more do-not-know responses to negative events than to positive events. That do-not-know responses were more frequent for 5-year-olds than for 3-year-olds for true negative events mirrors results found by Beuscher and Roebbers (2005). This suggests that 5-year-olds have more sophisticated understanding of the consequences of affirming true negative events (e.g., they could get in trouble again, they would be embarrassed during the interview). Of importance, however, for false events, 5-

year-olds gave do-not-know responses to positive and negative events at similar rates to each other and to 3-year-olds. This suggests that age differences in do-not-know responses are dependent on the type of event queried.

Furthermore, similar to findings of previous studies, correlations revealed that children who used do-not-know responses more frequently provided proportionally more accurate (and less inaccurate) information (Nesbitt & Markham, 1999; Quas et al., 1999). Taken together, these results suggest that older children's do-not-know responses are prompted both by questions about events that do not align with children's actual experiences, as in the case of events that never took place, and by questions about true but unpleasant events that children are reluctant to discuss, such as misdeeds and embarrassing events (e.g., Saywitz et al., 1991; Talwar et al., 2004).

Effects of event factors on units of information

Both age groups provided more information overall to questions about positive events than about negative events (Baker-Ward, Eaton, & Banks, 2005) and to questions about true events than about false events (e.g., Qin, 1999). Interactions revealed that children provided similar amounts of total information for false events regardless of valence but, as expected, provided more information about true positive events than about true negative events. Again, such results suggest children's hesitancy to discuss true negative events. However, discussing true negative events in detail is crucial in certain contexts (e.g., forensic interviews). Overall, the results provide additional evidence that reports of false events may be qualitatively different from reports of true events, with the difference being reflected in the total amount of information provided.

Examination of incorrect units of information revealed effects of veracity and valence. There was a propensity for both age groups to provide more incorrect units of information to false events than to true events. This result points to a qualitative difference between true and false reports, but one that cannot be easily exploited within the forensic context without independent knowledge about the details of events. By the nature of the events in question, any information recalled for a false event was considered incorrect, whereas children relied on the accuracy of a real memory trace for the true events.

Correct units of information could be provided only for true experiences. Thus, examination of the effect of valence, but not of veracity, was possible for correct units of information. As was true for total units of information, children provided more correct units of information about positive true events than about negative true events.

Effects of interviewer gender

Despite mixed findings in the literature, we expected that female interviewers would elicit the most complete and accurate accounts from children (e.g., Dindia & Allen, 1992). This hypothesis was not supported. Regarding true positive events, boys provided greater amounts of information to male interviewers than to female interviewers; however, girls provided similar overall amounts of information to interviewers of both genders. This finding is the opposite of that reported by Lamb and Garretson (2003), who found that girls recounted more information to female interviewers in a real forensic context. However, because of the nature of that study, the accuracy of girls' statements could not be examined. Moreover, because male and female interviewers in the current study asked

identical sets of questions, results more clearly are due to factors such as children's interpretation of social rules and innuendos and not to differences in interviewer questions. Of importance, no effects of interviewer gender were found in the current study for the most forensically relevant types of events, namely, true negative and false negative events. Thus, further investigation is needed to determine whether previously reported gender differences apply to accuracy of memory reports as relevant to the forensic setting.

Individual differences

Attachment

Direct relations have been observed in previous studies between parents' attachment (Alexander, Goodman, et al., 2002; Goodman et al., 1997; Quas et al., 1999) and children's attachment (Belsky et al., 1996; Kirsh & Cassidy, 1997) and children's memory for a variety of experiences. Our results provided support for the hypothesis that more secure child attachment would be associated with increased resistance to false suggestion (e.g., Alexander, Hafer, Bortfeld, O'Hara, & Kraft, 2007), although this relation in the current study was indirect (i.e., mediated by children's behavior problems). The reason for lack of direct relations may be due to the nature of the events. Specifically, the events found previously to relate directly to parents' and children's attachment were stressful (i.e., medical procedures) or overtly attachment related. Although our negative events involved embarrassing episodes or transgressions, and parents frequently (but not always) were present at the true events (and always were suggested to be present at false events), the events might not have evoked the attachment system directly. It is also possible that because parents who were not in current relationships (potentially the highly avoidant or highly anxious parents) tended not to complete the adult attachment measures, the effect of parental attachment may be statistically underestimated.

In addition, children's attachment was predicted by their parents' attachment (e.g., Main & Goldwyn, 1984). Although the current study measured adult romantic attachment, patterns of anxiety and avoidance in adults' romantic relationships predicted how their children were rated for attachment security and attachment dependence. This is consistent with a growing body of literature suggesting the intergenerational transmission of attachment (e.g., Feeney, 2006). The finding must be viewed with caution, however, because children's and parents' attachment scores were not independent. Specifically, both were derived from parent ratings. The internal working models by which parents view relationships likely influence how they perceive their children's behaviors in attachment-relevant situations. Further research should seek independent information, or information from multiple sources, to bolster evidence of the effects of attachment. In addition, these findings do not address the mechanisms (e.g., parenting style, opportunities for rehearsal, increased child comfort discussing emotional events) through which parental attachment may have its effects.

Furthermore, children's attachment and behavior problems, as indicated by CBCL scores, were important mediators of the relation between parental attachment and children's memory inaccuracies. Both child security and child dependence were predictive of behavior problems (Guttman-Steinmetz & Crowell, 2006). This is consistent with other studies showing insecure attachment linked to concurrent or subsequent behavior problems (Clarke-Stewart et al., 2003; Easterbrooks, Davidson, & Chazan, 1993; Speltz, DeK-

lyen, & Greenberg, 1999; but see Thompson, 1998). Of course, increased behavior problems would be expected to have a host of other effects, and future research might provide additional linkages between attachment styles of parents and children and other outcome variables.

Behavioral adjustment

In support of our hypothesis, results showed a direct link between behavior problems and memory inaccuracies. Increased behavior problems may be related to, or indicative of, more distractibility, lower emotion regulation, greater intellectual deficits, and/or social immaturity (e.g., Lyons-Ruth, Zeanah, & Benoit, 1996; Pérez-Edgar & Fox, 2003). Thus, in the face of recounting an emotional event (positive or negative) or in the face of suggestion, children with more behavior problems might not always have the means to deal with the pressures, emotionally or cognitively, so as to conduct an adequate memory search successfully or to resist suggestion.

Inhibition skills

As expected, inhibition skills mediated the relation between children's age and memory inaccuracies (e.g., Alexander, Goodman, et al., 2002; Ruffman, Rustin, Garnham, & Parkin, 2001). Lack of inhibition skills may cause the initial memory trace to be impoverished for a variety of reasons, including limited encoding of relevant stimuli (Harnishfeger & Bjorklund, 1994). Poor inhibition may also impede children's ability to deny false events because of a limited capacity to ignore irrelevant information (Lorsbach, Katz, & Cupak, 1998) and increased tendency to assent to a conversational partner's assertions. In addition, lack of inhibition likely causes more impulsive answering, for instance, before understanding the entirety of a question or before thorough memory searches have been conducted; impulsivity has been linked to memory errors (Brown, 1998; Quas & Schaaf, 2002). Further research is needed to delineate the mechanisms whereby lack of inhibition may cause decrements in memory. Such findings could potentially be useful in applied interview situations. For instance, if impulsive answering is found to prevent thorough memory searches, training in delaying answers may have a beneficial effect on accuracy. Of importance, inhibition seems important to understanding age differences in memory and suggestibility (Alexander, Goodman, et al., 2002; Melinder et al., 2006). Additional research focusing on the role of executive function in memory and suggestibility is needed.

Conclusions

This study has uncovered several interviewing, event, and child factors related to the accuracy of children's reports. Consistent with past research, increasing memory skills and decreasing inaccuracy were evident with children's age. Our results reveal that children tend to succumb eventually to repeated leading questioning but that, at least for older children, there may be a "safe" low number of repeated questions that can be asked about an unknown event to maximize the likelihood of reporting a true negative event while minimizing the likelihood of assents about a false event. Furthermore, interviewers of both genders are likely able to elicit accurate information from children of both genders.

It is important to note that, in the current study, repeated misleading questions about true and false events were asked in a kind but persistent manner, consistent with techniques used in past studies on implantation of false memories. However, we did not go to greater lengths to implant false memories, as have some researchers, such as by telling children that their mothers said all of the events had actually occurred, by telling children that the interview session was just a pretend game (e.g., Ceci et al., 1994; Ghatti & Alexander, 2004), and all of our questioning took place in one session. It is likely that increased false reports could be elicited with even stronger suggestions and that different factors might influence memory reports given more powerful false memory implantation techniques. Our study does, in any case, offer information relevant to children's resistance to suggestion, which is likely important in both implantation and suggestive questioning paradigms.

The results of the current study could be taken to imply that standardized tests of individual difference factors (e.g., inhibition, behavioral adjustment, attachment) should be administered to children in the legal system as predictors of inaccuracies in children's eyewitness memory reports. However, results from the path model underscore the complex interplay among many factors, indicating that no single indicator explains children's inaccuracies. Interactions among these factors (and numerous others not assessed in the current study) across development highlight the serious risk of overemphasizing standardized testing to judge the accuracy of an individual child within a unique event and interview context. Based on the standardized measures we employed, our results suggest, for example, that many children with behavioral maladjustment likely could still provide quite accurate memory reports and that many children without behavioral maladjustment could be quite inaccurate.

The current study offers several important findings for theories of children's memory and suggestibility about personal experiences. Investigations of children's suggestibility would profit from attending to both accuracy and potential unwillingness to respond (e.g., do-not-know responses) given that both may reveal processes underlying children's reports. Furthermore, the types of events about which children are questioned can yield different patterns of responses. Also, inhibition skills and other indicators of executive function may be crucial for understanding age improvements in young children's resistance to suggestion. Finally, there is a predictable interplay between relational styles of parents and children that may relate to children's behavior problems and, ultimately, their memory errors.

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