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# Individual Differences in Children's Eyewitness Memory Skills

Kathryn M. Hammes

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Individual Differences in Children's  
Eyewitness Memory Skills

by

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Bachelor of Arts, University of Wisconsin-Milwaukee, 1984

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A Dissertation

Submitted to the Graduate Faculty

of the

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This dissertation submitted by Kathryn M. Hammes in partial fulfillment of the requirements for the Degree of Doctor of Philosophy from the University of North Dakota has been read by the Faculty Advisory Committee under whom the work has been done, and is hereby approved.

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## ABSTRACT

The present study investigated the impact of individual differences on children's eyewitness memory skills. Preschool (mean age of 4 years 8 months) and elementary (mean age of 11 years and 3 months) aged school children played a 5 minute game of Simon Says with an unknown male confederate. The children's memories for the game and the man with whom they played the game were assessed on an objective questionnaire, free recall and photo recognition task. Both the free recall and the objective questionnaire were given immediately after the game and exactly one week later. Half of the subjects were exposed to misleading postevent information, immediately after the event.

Several measures of individual differences were obtained from the children. The children's ages, sex, and visual and verbal short term memories were directly assessed. Parents provided measures of the children's anxiety, dependency, ego strength, intellectual functioning, attention, impulse control, reality contact, and social conformity using a standardized behavior rating scale. All of these variables were investigated to determine their impact on the various measures of eyewitness memory skills.

Overall the older children performed significantly better

than the younger children on the objective questionnaire, they were more expansive and accurate in their free recalls, they were less suggestible, and they were more accurate in identifying the man with whom they played the game from the photo lineup.

Children with inferior short term memory skills demonstrated a deficit in their performance on the objective questionnaire and their ability to resist postevent information. In addition children with an inability to sustain attention were more suggestible. The results suggest that age is not the only factor which the courts should use to determine the reliability of children's eyewitness testimonies. The impact of short term memory skills, time delays, and attention could provide the courts with additional valuable information.

## Chapter I

### Introduction

Recently in the news there have been several suspected cases of child sexual abuse which have been the subject of controversy and debate. In two such cases, (the Jordan, Minnesota case and the McMartin Preschool case) the courts determined that the prosecution used leading questions in examining the children. The leading questions were to such a degree that the courts felt that the testimonies of the children could no longer be considered valid.

The McMartin Preschool molestation case occurred in 1983 in Manhattan Beach, CA. The case involved 100 children who related testimonies of drugs, bondage, animal slaughter, and satanic rituals. Seven teachers and administrators of the McMartin Preschool would eventually be indicted on over 200 counts of child sexual abuse. In January of 1986, after an 18 month preliminary hearing (the longest hearing in California's history) a judge ruled that the prosecution of all seven defendants should proceed. A week later however the District Attorney, Ira Reiner, dropped all charges against five of the defendants stating that the evidence was "very weak" (Lacayo, 1986, p.64). He maintained however that the evidence against Peggy McMartin Buckey, 60,



and her son, Raymond Buckey, 28, was "strong and compelling" (Lacayo, 1986, p. 64).

The case is currently embroiled in controversy because one of the former attorneys for the prosecution, Glenn Stevens, believed that all seven cases should be dismissed. His viewpoint was represented in a recent news article, "The charges against the defendants are based mainly on interviews with the children and physical traces of sexual activity; no other substantial corroboration like pornographic photos was uncovered. Under cross examination during the hearing, the children's stories seemed to Stevens to unravel. He came to agree with the defense that an expert on child sexual abuse had asked leading and suggestive questions during the pretrial investigations. 'They're contaminated kids,' argues Stevens" (Lacayo, 1986, p.64).

Why did the courts decide that the testimonies of the children were invalid? Are children more problematic as eyewitnesses than adults? Are they more susceptible to leading questions? Are there individual differences in children's eyewitness testimonies? These are some of the questions that the following study will investigate.

The investigation of the eyewitness testimonies of children began around the turn of the century in Europe. On December 31, 1908, Whipple (1909) gave an address at the Seventeenth Annual Meeting of the American Psychological Association and his

purpose was to "stimulate" interest in American investigators in the area of the psychology of testimony. Whipple (1909, 1911, 1912, 1913, 1914, 1915, 1917) reviewed the literature in Europe (see Appendix A for a complete list of the European studies reviewed by Whipple), but unfortunately most of these studies have not been translated and therefore his reviews remain the only access to this research in the United States.

Whipple (1909) made the following observations in regards to the methods employed by Europeans to study eyewitness testimony:

- 1). The materials used to investigate eyewitness memory most often involved either a "picture-test" where the subject looked at a picture for a period of time, the picture was removed and the subject was asked to report on the contents of the picture or an "event-test" in which certain real life events (e.g., a murder) were acted out and subjects were then questioned.
- 2). The exposure times to the stimuli varied from five seconds to seven minutes, with forty-five to sixty seconds being the most frequently employed.
- 3). The time interval between exposure to the stimulus and the subjects' reports varied from immediate report to nine and a half weeks.
- 4). The two forms of report used to investigate memory were narrative or free recall and interrogatory.

- 5). Two forms of interrogatory questions were used. In the incomplete form subjects were only asked questions which they did not include in their narrative. In the complete form an exhaustive series of questions was asked regarding every detail of the experiment. The studies ranged in number of questions from 15 to 100 with 50 being the most common.
- 6). The studies varied in regards to the form of questions that they employed. Stern (as cited in Whipple, 1909) developed a classification system for the questions in which he distinguished between six different types of question which varied according to the degree to which they were leading or suggestive questions (see Appendix B, for an example of Stern's classification system).
- 7). The subjects' testimonies were scored for both quantitative accuracy, i.e., number correct, and qualitative accuracy, i.e., the correctness of the statements made in narrative reports.

Whipple (1909) summarized the results of the European studies and concluded that reports free of error were very rare and the average accuracy rate was 75%. The findings indicated that there was not a relationship between range of report (i.e., the amount of information recalled) and accuracy, and confidence of report and range. Males in both the adult and child samples were more accurate (by 20 to 33%) than females, although they were less comprehensive in their reports than females. There was not a conclusive relationship between intelligence and

accuracy of report. Cognitive and emotionally "defective" persons were very inaccurate and highly suggestible. A lengthened time interval between the event and report decreased accuracy. Colors and numbers were most susceptible to failures in memory and interrogatory questioning methods resulted in greater range and less accuracy than narrative reports.

Most importantly for the purpose of this paper the early European research (Whipple, 1909) suggested that the reports of children were more inaccurate than those of adults despite the fact that children were more confident and assured of their responses. Children were also found to be highly suggestible, in particular before puberty. Whipple concluded that

The inadequacy of the child's report is due not so much to poor memory as to the fact that he fails to perceive many features in the original experience, that he fails to put into words even what he does perceive, and especially to the fact that he is absurdly uncritical (his assurance, indeed, commonly reaches 100 percent). The education of the child in observation and report must therefore be directed in part to puncturing this bubble of unhesitating confidence and faith in his capacity to give unerring reports (Whipple, 1909, p.168).

Whipple (1911, 1912, 1913) continued to review the European studies regarding eyewitness testimonies. During these years there was emergent controversy over the eyewitness skills of children and investigators began to question "... is the testimony of children as unreliable as has been claimed?" (Whipple, 1911, p.307). Investigators formed a committee for the Investigation

of Pedagogical Problems of the Psychology of Report which attempted to train young children to improve their testimonies (Whipple, 1912). These experiments did not yield an improvement in the skills of the children and investigators concluded that children were not able to focus their attention as well as adults. It was further concluded that they were not critical when filling in memory gaps as they often used information from their imagination or material suggested by others (Lipmann, 1911, as cited in Whipple, 1912). Other investigators (Heindl, 1909, as cited in Whipple, 1912) began to conclude that the problem with children's testimonies may have more to do with their inability to verbalize their observations adequately than to poor initial observations.

According to Whipple (1914, 1915, 1917) the concern of the European studies from 1914-1917 focused on problems in using the picture test (Hegge, 1912, as cited in Whipple, 1914), the application of testimony research to jurists (Boden, 1913; Sturm, 1913, as cited in Whipple, 1914), and the study of individual differences via categorization by intellectual types which concluded that "a knowledge of the type to which a witness belonged would enable a judge to appraise in advance the probable reliability of his testimony" (Lelesz, 1914, as cited in Whipple, 1915, p. 222). He also noted that Kármán "protests against the low rating given by many psychologists to the testimony of

children, and agrees...that under some circumstances they are quite valuable witnesses" (Kármán, 1913, as cited in Whipple, p.248). The last review by Whipple came in 1917 when he noted "The past two years have brought forth relatively little in the field of testimony and the interruption of communication with Europe has made it impossible to obtain copies of periodicals in which some references are to be found" (Whipple, 1917, p. 234).

An example of the research described by Whipple is seen in the work of Alfred Binet (1900, as cited by Goodman, 1984) who is usually credited with conducting the first systematic investigation of children's eyewitness testimonies. In his experiment he asked 7 to 14 year old children to look at various objects which were attached to a card (picture test). He then used varying degrees of leading questions when he questioned the children about the objects on the card. He found that the majority of the children accepted his suggestions regardless of the degree of suggestiveness. He also found that young adults were susceptible to suggestion, although less frequently than the children. Binet concluded from his findings that the authorities should not question children, but they should let them write out their testimonies (Binet, 1900, as cited in Goodman, 1984).

At approximately the same time Binet was conducting his research in France, William Stern began his research on children's testimony in Germany at the University of Breslau (Stern, 1910,

1939). In his studies, Stern showed children and young adults (ages 7 through 18) a picture of a peasant's living room. Stern questioned the children about the information in the picture using both "narrative" and "interrogatory" techniques. He found that narrative or free recall accounts resulted in approximately 5-10% errors while interrogatory or direct questioning resulted in 25-30% errors. He did not find developmental differences using these two types of questioning. He did report age differences in the subjects' susceptibility to leading questions. Specifically he found that leading questions resulted in 50% errors in 7 year olds, but only 20% errors in 18 year olds. Stern concluded that although there are age differences in suggestibility, errors in testimony are due primarily to improper questioning techniques (Stern, 1910, 1939).

In the United States and England early research on the eye witness skills of children focused on the issue of suggestibility. Small (1896) concluded in his research with children that suggestibility is "a universal condition" and "high in degree." Pear and Wyatt (1914) compared the suggestibility of "normal" and "mentally defective" children, aged 11-14, and they found that 60% of the "mental defectives" and 36% of the "normal" children were suggestible. They also found that overall narrative reports were more reliable than interrogatory reports, and the children were very unreliable in their memories of colors. In

1929, Estabrooks attempted to determine the role of emotion in suggestion. He investigated the relationship between the psychogalvanic reflex and various measures of suggestibility, and he found an absence of any relationship between these variables. Messerschmidt (1933) reviewed the relevant literature and concluded that "individuals differ in degree of suggestibility for different situations rather than in being generally suggestible or non-suggestible...suggestibility decreases regularly with increases in age...there is little correlation between suggestibility and intelligence" (pp. 422-423).

Currently it is difficult to summarize the early European research on the eyewitness skills of children primarily because one must rely the reading of secondary sources since most of this literature remains to be translated. A widely held translation of the literature is expressed by Goodman (1984) in an article on the "historical perspective" of children's testimonies. She stated "Early studies tended to support some of the legal profession's stereotypes of children by claiming to show that children are 'the most dangerous of all witnesses'" (Goodman, p. 9). On the other hand a recent interpretation (Cunningham, 1988) of Binet's work brings into question some of the current interpretations of old research. Cunningham noted that Binet is usually cited in support of the notion that children are highly suggestible, however if one reads Binet this is a misinterpretation. In reality Binet actually



concluded that "suggestibility is not a static trait among children but rather is a function of cognitive and social factors associated with attempts to influence during interrogation" (Cunningham, p.271). Until the turn of the century research is translated and these studies are available as primary sources, conclusions based upon this data are subject to error. This author concluded that the turn of the century research did not necessarily view children as highly suggestible or dangerous but rather focused on the fact that these factors varied with the type of questioning and a combination of other factors such as age and cognitive level of functioning.

Contemporary research on the eyewitness testimonies of children brings the notion that children are "dangerous" witnesses into question. Researchers now have reason to believe that children will not always be less accurate witnesses than adults. A recent review of the literature concluded that if the events are familiar and comprehensible to children their memory for the event will be comparable to that of adults (Goodman, 1984). Current research on children's eyewitness testimonies has focused on the accuracy and completeness of children's verbal reports, their performance on cued recall and recognition tests, susceptibility to leading questions, and performance on photo identification tasks.

Studies investigating the accuracy and completeness of

children's verbal testimonies have studied the effects of varying questioning techniques. Dent and Stephenson (1979) used three different questioning techniques. They investigated the effects of free recall, general questions, and specific questions on the eyewitness testimonies of 10-12 year old children. The subjects viewed a short film in which a man stole a package from a car. The man was apprehended and he escaped and was pursued. After viewing the film the subjects were exposed to one of the previously mentioned questioning techniques. In the free recall condition the subjects were asked to recall as much as they could remember from the film. In the general questioning condition the subjects were asked 10 questions, each of which covered a large portion of the film, and in the specific questioning condition the subjects were asked 46 detailed questions. The following day the children were exposed to the same questioning techniques they had received immediately after viewing the film.

Regardless of the initial questioning techniques, all subjects were administered the specific questions two days, two weeks, and two months after viewing the film. The results indicated that in the last three testing sessions when all of the subjects received the specific questions there were no significant differences between the groups in recall. However there was a significant difference in the number of correct answers in the first two testing sessions, when the subjects were exposed to

different questioning techniques. Notably, the subjects in the specific questioning condition gave more correct answers than both the general questioning and free recall groups. The group exposed to general questioning performed significantly better than the free recall group. The results also indicated that subjects in the free recall group gave fewer incorrect responses. Dent and Stephenson concluded that although the free recall method was not as complete as the others, this method should be employed when the accuracy of testimony is important, such as in court cases.

Marin, Holmes, Guth, and Kovac (1979) also investigated the effects of various questioning techniques on the eyewitness capabilities of 4 different developmental groups. In their study there were 24 subjects each from a) kindergarten and first grade, b) third and fourth grades, c) seventh and eighth grades, and d) college students. Each age group was equally divided between females and males. The subjects were tested individually. They entered the testing room with a male experimenter and a female assistant. A few minutes after the subject was seated in the room a male confederate entered the testing room and stated to the male experimenter "Why are you using this room? I told you that I asked for it three weeks ago, and I need it right away." The male experimenter started to apologize but the confederate interrupted with "I'm going to see that someone hears about this

right now." The entire episode lasted 15 seconds. The male experimenter then left the room while the female assistant administered the Embedded Figures Test. The children's memory for the event was obtained using both free recall and objective questioning. The recalls were obtained after either a 10 or 30 minute delay.

The results of the Marin et al. study (1979) showed a significant effect of age for the subjects' performance on free recall. The youngest group recalled a mean of 1.38 items about the previously described event, the third and fourth graders recalled a mean of 3.29 items, the seventh and eight grade group recalled a mean of 6.00 items, and the college students recalled a mean of 7.46 (the total possible was 20). The number of items incorrectly recalled also increased linearly with age. The subjects' free recall significantly improved after the time delay with subjects recalling 25% more in the 30 minute delay than in the 10 minute time delay.

There was not a significant age difference between the groups' responses to the 20 objective yes/no questions. No time delay differences were found but the authors reported significant sex differences, in that females correctly answered 77% of the objective questions while males correctly answered 71%. Marin et al. (1979) concluded that "children as young as five years of age are no less competent or credible as eyewitnesses than are

adults when responding to direct objective questions" however the younger children were not as "capable as adults of providing a narrative description of what they had seen" (p. 304).

In a recent review of studies investigating the effects of various questioning techniques on children's memory for events, Cole and Loftus (1987) concluded that "one of the most stable findings is that children spontaneously recall less than adults" (p. 181). Specifically they found that "...studies suggest that the amount of information provided in a free recall report of a previously experienced event increases steadily until preadolescence, at which time it reaches adult levels" (p.182). One possible reason for the developmental differences in free recall was provided by Johnson and Foley (1984) who hypothesized that "the relationship between age and recall seems to be associated with a developmental trend in the acquisition both of enriched knowledge structures (e.g., an apple is a fruit) and of memory strategies (e.g., organizing or generating images)" (p.45).

The memories of both children and adults have been found to be more accurate on free recall than recognition tests (Loftus & Davies, 1984), but on the latter tests both children and adults remember more information (Cole & Loftus, 1987). Some studies have found that on recognition tests children perform as well as adults (Marin, et al., 1979; Saywitz, 1987) whereas other studies

have found significant age differences in recognition (Cohen & Harnick, 1980; Goodman, Aman, & Hirschman, 1987). Cole and Loftus concluded that in general by the age of eight children's performance on yes/no and short answer tests reaches adult levels.

An important component to the eyewitness research is the degree to which subjects are susceptible to leading questions. Numerous studies have shown that adults are misled by inconsistent postevent information (Berkian & Bowers, 1983; Bowers & Berkian, 1984; Christiannsen, Sweeney, & Ochalek, 1983; Loftus, 1974, 1975, 1977, 1978, 1979; Loftus & Greene, 1980; Loftus, Miller, & Burns, 1978; Loftus & Palmer, 1974; Loftus & Zanni, 1975; Weinberg, Wadsworth, & Baron, 1983). Typically in these studies subjects have viewed a film or slide strip of an automobile accident. The subjects are then exposed to written information about the event, which for half of the subjects contains misleading information (e.g., in most experiments a stop sign in the experiment is described as a yield sign in the postevent narrative) and for the other subjects no information about the sign is provided. The subjects are then given a two item forced test in which both the stop and the yield signs are presented. The results indicate that misled subjects choose the yield sign significantly more than the control subjects.

Some researchers (e.g., Loftus and her colleagues) interpret the above findings to indicate that the original memory for the event is impaired by the postevent information by either erasing the original event or rendering it inaccessible (Christiaansen & Ochalek, 1983, support this notion). Recent research by McCloskey and his colleagues bring into question these conclusions (McCloskey & Zaragoza, 1985a, 1985b; Zaragoza, McCloskey, & Jamis, 1987). Specifically they criticize the methods used by Loftus and others, which they call the "original" test method. In this procedure presented above the subjects are forced to choose between the originally presented item (stop sign) and the suggested item (yield sign). They feel that a more appropriate design would include a choice between the original item and a new unseen item. They call this procedure the modified test and their rationale is that by using this method one can truly assess if a memory trace for the original item remains without interference of the demand factors that go along with the original test. Namely in the original tests subjects may remember both the original and suggested items but choose the suggested item because they have no reason to doubt its source. There is currently a theoretical debate over the meaning of the results found in the adult literature (see Loftus, Schooler, & Wagenaar, 1985; McCloskey & Zaragoza, 1985b, for arguments for and against the memory impairment hypothesis).

The studies which have investigated children's susceptibility to leading questions have employed a wide variety of methodologies. Most of the studies have used films, slides, or orally presented narratives to test children's suggestibility (Ceci, Ross, & Toglia, 1987a, 1987b; Cohen and Harnick, 1980; Dale, Loftus, Rathbun, 1978; Duncan, Whitney, & Kunen, 1982; King & Yuille, 1987; Saywitz, 1987). The Dale et al. study exposed preschool children to four 1 minute long films. They tested the children's memories for the films using a variety of yes/no questions. Some of the questions pertained to items that were present in the film, while other questions were misleading in that they pertained to absent items. They varied the question forms along the following dimensions: affirmation-negation (e.g., Did you see vs. Didn't you see); indefinite versus definite article (i.e., a vs. the); and quantifier variables (some vs. any). The results of their study indicated that the form of the questions did not effect the accuracy for objects actually present in the film, but for objects not present they found that Did you see the?, Did you see any?, and Didn't you see some? were the question forms that were most likely to lead the subjects to agree with the misleading information.

Cohen and Harnick (1980) compared the suggestibility of third grade, sixth grade, and college aged subjects. The subjects viewed a 12 minute film which depicted two petty crimes. All



the subjects were presented with 11 leading and 11 nonleading questions immediately after viewing the film. One week later they were asked 22 multiple choice questions which contained both the correct information and that suggested by the leading questions. The results of their study indicated that for the immediate test the third graders were more suggestible than the sixth graders and adults. There was no significant difference between the suggestibility of sixth graders and adults. However for the week delayed test there were no significant age differences and indeed all subjects were highly suggestible. The authors concluded that the third graders were more susceptible to leading questions in the immediate test because their encoding of the initial events was inferior.

Duncan et al. (1982) presented children aged 6, 8, 10 and college students with a series of cartoon slides. Subjects were then asked consistent, inconsistent, and open ended questions. They found that accuracy at answering regular questions increased with age; however there were no significant differences in the subjects' susceptibility to leading questions.

Saywitz (1987) also did not find significant differences in children's susceptibility to leading questions. In her study she had children in third, sixth, and ninth-tenth grades listen to an audiotape of a crime. She then tested the children's memories for the events and gave them three misleading questions concerning a

character in the story. She found that overall subjects were quite resistant to misleading information and that after a five day delay only 14 out of 72 subjects presented any suggested information in their free recalls. The results of these studies are interesting in that the effect of age on the amount of misleading information produced was marginal ( $p < .07$ ) with younger children being less suggestible than older children.

Ceci et al. (1987a) reported on a series of studies which they conducted with children aged 3-12 years old. In their first study they orally presented a 3-4 minute story about a little girl. They presented children with two misleading questions and three days later used a forced choice test to assess their memories for the event. They found that the younger children were more suggestible than older children. They felt that one possible reason that younger children were more suggestible could be that they were more likely to "conform to their perception of adult wishes." In a second study they replicated the methods of the first experiment except this time instead of an adult they had a seven year old boy interview the children and suggest the postevent misinformation. They found that accuracy rates improved from 37% when they used an adult interviewer to 53% when they used the child interviewer. They still found that younger children were more suggestible.

In a third experiment they used the same procedures as

experiment two but this time they also included the modified test procedures suggested by McCloskey & Zaragoza (1985a). They found that 3 year old children in the modified test performed better than 3 year olds in the original test (71% vs. 52% correct), but both groups were significantly worse than a control group who received no misinformation. Once again younger children were found to be more suggestible. A fourth study replicated the third experiment and included an adult comparison group. The results of this study also suggested significant age differences in suggestibility. Based on this series of studies Ceci et al. (1987a) concluded that

One thing seems clear to us: preschoolers do appear more likely to incorporate erroneous postevent information into their subsequent recollections than older children. The reason for their enhanced suggestibility is not clear; we have ruled out several variables as the primary causes of age differences in suggestibility, but we have not yet discovered a single dominant variable. It may be that some combination of the variables we have studied along with some that we have not studied will yield an adequate account of children's heightened vulnerability to distortion. One variable that suggests itself as a candidate is metamemory. Preschoolers' memory may be more suggestible than older subjects' because they either fail to detect erroneous information or else they fail to take the necessary mental actions to combat erroneous information when they detect it. (pp. 89-90).

A few studies have used live events to study the suggestibility of children (Goodman et al., 1987; Goodman & Reed, 1986; King & Yuille, 1987; Marin et al., 1979). The Marin et al.

(1979) study involved a 15 second argument between a confederate and the experimenter. During the subsequent test the subjects were exposed to one of the following two leading questions, Was the package the man carried small? or Did the man slam the door as he closed it? The nonleading forms of these questions were: Did the man close the door as he left? and Was the man carrying a package? The two leading questions which were presented at the first testing time caused a significant increase in false positive responses on a corresponding nonleading question two weeks later. However further analysis did not reveal a significant effect of sex, time delay, or age in the subjects' susceptibility to leading questions. The authors concluded that children as young as five were no more susceptible to leading questions than adults. One problem with the Marin et al. study was that subjects were exposed to only one leading question.

Goodman and Reed (1986) extended several factors of the Marin et al. (1979) study to include factors such as longer exposure time and direct involvement with a confederate, and a longer delay in the testing. They assessed the eyewitness testimonies of three year olds, six year olds, and adults who played a 5 minute game similar to Simon Says with a confederate. Their results replicated the Marin et al. study in that they found the six year old children performed as well as adults on the nonsuggestive objective questions. Their results differed in that they found that both the

six year olds and the three year olds were more suggestible than the adults. They noted that this was particularly evident when the information in the leading question was peripheral to the main theme of the interaction.

Goodman et al. (1987) reported on two additional studies in which they tested the children's memories for events which they thought would provoke anxiety and stress. In these studies children aged 3-7 years who were receiving venipunctures and children aged 3-6 years who were receiving inoculations were suggested misinformation about the laboratory technician and the nurse, respectively. They found that the older children were less suggestible than the younger ones. Similar to the Goodman & Reed (1986) study they also found that resistance to suggested information was greater for central than for peripheral details. Namely they found that subjects were more easily misled about characteristics of the room than the physical attributes of the nurse (similar results have been found in the adult eyewitness testimony research by Marquis, Marshall, & Oskamp, 1972).

The above studies which have investigated children's eyewitness testimonies and susceptibility to leading questions have employed a wide variety of stimuli, (i.e., direct contact with a live confederate vs. viewing a film) type and time of testing, (free recall vs. recognition tasks, and immediate vs. delayed memory testing) exposure periods, (15 seconds vs. 5 minutes) and

age groups (3 years old to college undergraduates). These methodological variations have led to conflicting results which make conclusive statements about children's suggestibility problematic, however in a recent review Cole and Loftus (1987) concluded that:

...children under 7 years of age are particularly vulnerable to misinformation regarding peripheral details of events, and this susceptibility to suggestion may be heightened in stressful situations. However, there is little evidence that they are more suggestible than adults with respect to the central events of an event. In addition, the demand characteristics of being given certain information by an adult, and even of being questioned by an adult are powerful components of suggestibility in young children (p.199).

The present study was designed to assess the eyewitness testimonies of preschool (ages 4-5) and grade school (ages 10-12) children. Ten to 12 year old subjects were chosen because as a general rule children 10 and above are considered competent to testify in court (Marin et al., 1979). Four to 5 year old children were included because they are frequently the victims of crime and some states allow them to provide their testimonies in court (Goodman & Reed, 1986). In fact, children as young as 3 years old have recently been considered to be competent witnesses (Berliner & Barbieri, 1984). The present study did not use an adult comparison group because previous research has provided evidence that 10 year olds often perform comparably to adults on eyewitness tasks (e.g., Cohen & Harnick, 1980).

The subjects in the present study were asked to play a game for 5 minutes with an unknown adult. The direct interaction with a confederate was considered a more ecologically valid (i.e., more reflective of real life) measure of children's eyewitness capabilities than having the children view a film. Like the Goodman and Reed (1986) study, 5 minutes was considered a sufficient amount of time for the subject and confederate to interact. The interaction with the confederate involved a Simon Says game similar to the one described by Goodman and Reed.

Many of the previous studies used both objective and free recall memory tasks (e.g., Dent & Stephenson, 1979; Goodman & Reed, 1986; Marin et al., 1979). The current study first presented the objective (yes/no) questions and then provided a free recall period, in order to ascertain if, given the opportunity, children would embellish the information they provided the experimenter via objective questioning. It was hypothesized that such embellishments would more likely be obtained from the older children. Also providing the opportunity for free recalls after the objective questioning would enable the examiners to determine if the information presented by the leading questions was incorporated into the free recalls of the subjects.

The children's performance on the objective questionnaire and the free recall task was obtained immediately after the Simon Says game and after a one week delay. It was hypothesized that

both the younger and older children's performance on these tasks would deteriorate after one week.

The suggestibility of children to leading questions was investigated at two levels in the current study. Immediately after interacting with a confederate in a "Simon Says" game the children were given an objective questionnaire. Half the children in each age group were given questionnaires in which half the questions were leading. The other half of the children were given questionnaires which contained only nonleading questions. The leading questions suggested incorrect information. Special care was taken to ensure that the children understood the subtlety of the suggestion. Research (Loftus & Davies, 1934) has suggested that because children do not have the linguistic capabilities of adults, they may fail to make the "appropriate semantic inferences from the interpolated material" (p. 55).

In the current study it was assumed that the subject was susceptible to suggestion if he or she agreed with the misinformation the examiner presented. One problem with this methodology is that very young children may feel intimidated to disagree with information presented by an older adult (as seen in the Ceci et al., 1987a, study). Therefore although they may not agree with the false statement presented in a leading question they may feel too intimidated to say so. Thus a second measure was also employed to determine the possible impact of the leading



questions. All subjects returned one week after the study and were administered only the nonleading questionnaire. It was hypothesized that presenting the leading question at the first testing would produce a significant increase in the number of false positive responses to the corresponding nonleading question one week later as compared to subjects who received only the nonleading form of the question both times.

A photo line-up task was included to determine the children's abilities to identify the confederate. Most of the studies which have investigated children's facial recognition skills have been conducted in the laboratory. The laboratory studies typically have presented children with a set of pictures for a limited exposure time. The children are then administered a recognition test which contains both the familiar and unfamiliar portraits. The tests employ either a multiple choice format or the children are asked to judge each photo separately (i.e., have you seen this photo?).

Typically the subjects are prewarned that their memory will be tested immediately after exposure to the stimuli and they often have to identify several target photographs.

The results of the laboratory studies have for the most part found a pronounced developmental trend, where memory for faces increases with age (Blaney & Winograd, 1978; Carey, Diamond, & Woods, 1980; Chance, Turner, & Goldstein, 1982; Diamond & Carey, 1977; Flin, 1980). In a recent review of the literature Chance &

Goldstein (1984) found only one laboratory study (Cross, Cross, & Daly, 1971) in which an increase in accuracy was not found with an increase in age and they noted that this study was unique in that there was an interference task prior to the test and the subjects were not prewarned that a test would follow exposure to the target photos.

In their review of the literature Chance and Goldstein (1984) found that the accuracy rates of the children in the laboratory studies were very consistent. Specifically they found that children at the kindergarten level perform just above chance (35-40% correct) on facial recognition studies. Children aged 6 to 8 scored between 50-58%; 9-11 year old children had 60-70% accuracy rates and 12-14 year olds and adults had rates of 70-80%.

Chance and Goldstein (1984) noted in their review that there was a paucity of studies which used real life events to assess children's facial recognition. In fact they could only find two studies that used simulated real life events to investigate children's facial recognition skills. They reported that these studies (Dent & Stephenson, 1979; Marin et al., 1979) did not find significant age differences in children's photo identification skills using events which simulated real life. Since their review other authors have used live events to investigate the photo identification skills of children (Brigham, Van Verst, Bothwell,

1986; Goetze, 1980; Goodman & Reed, 1986; King, 1984).

King's (1984) study investigated photo identification skills in children from first, fourth, sixth grades and high school. She found developmental differences in facial identification when a live confederate was used but she did not find age increases when a slide event was used. Goetze (1980), who exposed third, sixth, and eighth graders to a staged theft of a woman's handbag by a male confederate also did not find significant age differences in facial identification.

Goodman and Reed (1986) did not find significant differences between adults and 6 year old subjects, but they found that 3 year olds correctly identified the confederate significantly less than the adults and 6 year olds. They also found that after a delay the 5-6 year old subjects' performance did not decrease whereas there was a marked drop in the performance of the 3-4 year olds.

Brigham et al. (1986) used a live confederate in a staged theft to assess the photo identification skills of fourth, eighth, and eleventh grade students. They found that the fourth graders performed significantly worse on this task than the eighth and eleventh graders who did not differ in their accuracy. Specifically they found respective accuracy rates of .68, .93, and .88.

One problem with the above research is that the target photo of the confederate was always present in the photo lineup and inappropriate conclusions can be made using a photo present lineup

only (e.g., see Wells & Lindsay, 1980). Furthermore, in real forensic cases the suspect is not always present in the lineup, and therefore researchers (King & Yuille, 1987; Peters, 1987) have begun to include both the presence and absence of the target in order to make their studies more forensically relevant (Malpass & Devine, 1984; Wells, 1984).

The importance of manipulating the presence/absence of the target photo was presented in a recent meta-analysis of facial identification studies (Shapiro & Penrod, 1986) which reported that there is a 52% false alarm rate for subjects who viewed a target-absent lineup versus a 25% false alarm rate for subjects who were exposed to a target-present lineup.

The studies which have manipulated target absence/presence have found (King & Yuille, 1987; Peters, 1987) that accuracy decreases when the target is absent from the lineup. King and Yuille reported a study of 6-17 year olds in which they found that photo identification accuracy was 80% across the age groups when the target photo was present but only 40.5% of the children correctly rejected the lineup when the target photo was absent.

Peters (1987) found similar results in facial recognition skills of children aged 3-8. In his study, children aged 3-8 who were visiting the dentist for the first or second time were asked to identify the dentist, the assistant, and the examination room from photo spreads. After delays of 1-2 days or 3-4 weeks an

experimenter went to the children's home and exposed them to the photo spreads with either the target picture absent or present. Then 1-2 days or 3-4 weeks later another experimenter used the same procedure to test the children's memories for the first experimenter. Peters found that overall 71% of the children made false identifications from the target absent condition whereas 31% did so when the target was present. The present study presented half of the children with a lineup in which the confederate was present and the other half with the target photo absent from the lineup.

Another variable that researchers investigating eyewitness facial identifications have deemed important is the level of certainty that subjects adhere to their identifications. Research has shown that people assume that the more confident eyewitnesses are of their identification the more accurate they are on this task (Lindsay, Wells, & Rumpel, 1981; Wells, Ferguson, & Lindsay, 1981). However the experimental evidence has not substantiated this relationship (see Deffenbacher, 1980; Leippe, 1980; Wells & Murray, 1984; Wells & Turtle, 1987, for reviews).

The confidence of the children's photo identifications was investigated in the present study to further understand the relationship between accuracy and confidence. A delay of one week between the subjects' interaction with the confederate and the subsequent administration of the photo identification task was

also included because in real life situations photo identifications are rarely administered immediately following the event in question.

Goodman and Reed (1986) were concerned that the 3 year olds in their experiment may have been more impulsive than the older subjects so they presented the photo line-up in two different conditions. In the "array" condition all of the photos were presented at once. In the "individual" condition the photos were each presented individually to the subject before they made a decision. They hypothesized that the 3 year olds might benefit from the individual condition. They did not find significant differences between these two methods of presenting the photos. Nor did they find a significant interaction of method of display and age. This methodology was also employed by Dent and Stephenson (1979) who did not find significant differences between the two methods of presentation using 10 and 11 year old subjects. Therefore the present study decided to employ the "array" method in presenting the photo line-up.

A major criticism of the previous studies is that they have not attempted to investigate potential individual differences in children's eyewitness abilities. In general, the research on eyewitness skills has focused on determining how various experimental manipulations impact upon eyewitness skills, e.g., varying the interval between the event and the questioning and

varying the types of questions. There has not been much research conducted on individual differences in eyewitness testimonies.

In the individual differences approach to eyewitness testimonies researchers (Gudjonsson, 1983, 1984; Gudjonsson & Clark, 1986; Schooler & Loftus, 1986) focus on the various factors which determine why individuals respond differently to leading questions and other eyewitness skills. Gudjonsson and Clark have made a large contribution to this area of research and they have focused on investigating how cognitive factors such as encoding and retrieval structures, mood, self-esteem, and field dependence impact upon susceptibility to leading questions.

Ward and Loftus (1986) investigated the susceptibility of adults, who viewed a slide presentation of an automobile accident, to leading questions. They used the Myers-Briggs Type Indicator (Briggs & Myers, 1976) to classify subjects on the extroversion/introversion and the sensation/intuition dimensions of Jung's personality types. They found that introverts and intuitives, both alone and in combination were more susceptible to leading information than extroverts and sensing subjects. They hypothesized that intuitives and introverts have poorer self esteem and less confidence and assurance in their memories and therefore they may be more accepting of misleading information. Clifford & Scott (1978) used the Eysenck Personality Inventory (Eysenck & Eysenck, 1968) to measure introversion and

extroversion. They did not find any correlation between these dimensions and subjects' accuracy on both narrative and interrogatory tasks. However it should be noted that they had a rather small sample size and they may have missed valuable information by using only a mean split on the Eysenck Personality Inventory to categorize introversion and extroversion. A more sensitive measure of introversion and extroversion may have yielded significant results.

Marin et al. (1979) used the Embedded Figures Test (Witkin, Oltman, Raskin, & Karp, 1971) to determine if field independence/dependence was highly correlated with both children's and adults' free recall, objective questionnaire performance, susceptibility to leading questions, and photo identification. They did not find any relationship between subjects' scores on the Embedded Figures Test and their performance on the above variables. Christiaansen, Ochalek, & Sweeney (1984) also investigated the relationship between field dependency, as measured by the Group Embedded Figures Test, and locus of control on the Rotter scale (Rotter, 1966) with college students' eyewitness accuracies. They found that neither of these variables were significant predictors of eyewitness accuracy.

Deffenbacher, Brown, and Sturgill (1975) investigated the relationship of nonverbal intelligence, manifest anxiety, extroversion-introversion, and vividness of visual imagery to



facial recognition. They did not find a significant correlation between these variables and photo identification accuracy. Siegel & Loftus (1978) found that persons who were more anxious (as measured by the Multiple Affect Adjective Checklist, Zuckerman & Lubin, 1965) and more preoccupied (as measured by the Sarason & Stoops, 1978, scale) were less accurate in eyewitness skills. A significant correlation between recent life stress and eyewitness skills was not found.

Sex differences were found in one study (Powers, Andriks, & Loftus, 1979) in which college students' susceptibility to leading questions were investigated. The results indicated that women were more resistant to suggestions about female-oriented details, whereas men were more resistant to suggestions about male-oriented details. Overall intelligence and verbal and spatial abilities were not found to be related to suggestibility. Sah (1973) also found sex differences in children with girls being more suggestible to leading questions than boys.

King (1984) and Goetze (1980) both conducted doctoral dissertations which investigated individual differences in children's eyewitness skills. Goetze found that IQ was not correlated with eyewitness performance. King used the Matching Familiar Figures (MFF) task (Kagan, 1965, 1966) to determine if children used a cognitive style of reflection or impulsiveness. She did not find a significant relationship between this variable and

eyewitness performance. She also assessed verbal fluency by having the children describe their classroom and did not find a significant relationship between this variable and eyewitness skills.

The present study was unique in that it was designed to investigate individual differences in children's performance on objective questionnaires, free recall, susceptibility to leading questions, and photo identification. One obvious variable which may predict individual differences in children's eyewitness abilities is age. Another factor in children's capabilities on these tasks may lie in differences in their abilities to remember an event initially. Therefore subjects' verbal and auditory memory skills were assessed with a standardized test to determine the impact of initial memory differences on eyewitness abilities. Lastly parents rated the behavior of their child, using the Burks' Behavior Rating Scales (Burks, 1977), to determine if various behaviors were related to eyewitness skills.

The Burks' Scales contain 19 subscales. Of the 19 subscales the following 8 scales were considered of interest to eyewitness skills: excessive anxiety, excessive dependency, poor ego strength, poor intellectuality, poor attention, poor impulse control, poor reality contact, and poor social conformity. These Burks' scales were used in the regression analysis as predictor variables.

The Burks' excessive anxiety subscale was chosen as a

possible predictor in order to determine if higher levels of anxiety in the children were significantly correlated with inferior performance on eyewitness testimony skills. Several researchers have found that anxiety interferes with eyewitness testimony (Buckhout, Alper, Chern, Silverberg, Slomovits, 1974; Deffenbacher, 1980, 1983; Siegel & Loftus, 1978). Siegel and Loftus have hypothesized that very anxious persons may miss important cues and crucial information.

Recent research investigating the impact of anxiety on children's eyewitness skills (Goodman et al., 1987; Peters, 1987) has been inconclusive. Goodman et al., did not find a significant correlation between parent's ratings of stress during inoculations and accuracy on recall, photo identification, objective or suggestive questions. Peters found that children who experienced more anxiety were less accurate in only one out of three facial identification cases.

The poor attention subscale was selected to assess if inability to sustain attention was significantly correlated with eyewitness skills. Goodman and Reed (1986) found that 3 year old children demonstrated inferior performance on a photo identification task and they spent significantly less time looking directly at the confederate than the older children and adults. However, there was not a significant correlation between identification accuracy and inattention. Despite the

nonsignificance of this result other research (Yuille, 1980) has suggested that the relationship between attention and eyewitness testimony skills needs to be further explored. Yuille also suggested that the relationship between perceptual processes and eyewitness skills merits further study. Thus, the poor reality contact subscale was included in the present study in order to determine if the children's ability to adequately perceive and evaluate the environment was significantly related to eyewitness skills.

Although level of intellectual functioning has not been found to significantly correlate with children's (Goetze, 1980) or adult's (Deffenbacher et al., 1975; Powers et al., 1979) eyewitness performance the poor intellectuality subscale was included in the present study in an attempt to replicate these studies.

A child's level of impulse control has an intuitive appeal when investigating eyewitness skills. Although King (1984) did not find a significant correlation between cognitive style (impulsiveness/reflectiveness) and eyewitness skills the poor impulse control subscale was included as a possible predictor in order to determine if parents' ratings of impulsiveness would produce varying results from King's direct measure of impulsiveness on the MFF.

Ward and Loftus (1986) found that adults whom they hypothesized to have poor self-esteem and little self confidence

were highly suggestible. The poor ego strength and excessive dependency subscales were included as predictors in the current study to determine if these relationships were true in children as well. Lastly, Gudjonsson (1983) found that adults who presented themselves in a socially desirable fashion were highly suggestible. The poor social conformity subscale was included in the present study to assess the impact of social desirability on the children's eyewitness skills. Perhaps children with poor social conformity on the Burk's scale would be less suggestible than children who were eager to appear socially desirable.

## Chapter II

### Method

#### Subjects

The subjects were 63 preschool and elementary school children from Grand Forks, North Dakota. Informed consent from both the children and their parents and written parental consent were obtained prior to the experiment. The preschool children received Snoopy stickers and the grade school children received one dollar for their participation. All subjects were native English speakers and had normal or corrected-to-normal vision.

Twenty-nine of the children were preschoolers from the Kiddie Kampus at the Grand Forks Air Force Base. They ranged in age from 4 years 0 months to 5 years 6 months, and they had a mean age of 4 years 8 months. There were 34 children from fourth, fifth, and sixth grades at Wilder Elementary School in Grand Forks. These children ranged in age from 9 years and 11 months to 12 years and 9 months, with a mean age of 11 years and 3 months. The preschoolers were comprised of 10 males and 19 females and the elementary school children consisted of 19 males and 15 females. Twenty-two of the preschool children were Caucasian and 7 were black. All of the grade school students were Caucasian.

All subjects were tested on two separate sessions which were exactly one week apart. Two of the preschoolers were sick with the chicken pox at week two and one elementary school child had the flu. This resulted in 27 preschoolers and 33 elementary school subjects who participated in both weeks of the study.

The children in each age group were alternately assigned to either the leading question or nonleading question condition such that there were 13 preschoolers and 16 fourth- sixth graders in the nonleading question condition and 14 preschoolers and 17 fourth-sixth graders in the leading question condition.

### Materials

All subjects played a 5 minute "Simon Says" game with an unknown male confederate (see Appendix C for the "Simon Says" script). The script involved having the children touch and move various body parts under the direction of the confederate.

After playing the game the children were asked to respond to a series of 20 objective yes/no questions. The questions concerned the experimental room, the male confederate's appearance and dress, and details of the "Simon Says" game. Ten of the questions were straightforward nonleading questions. The remaining 10 questions had two forms. In one form a nonleading question was presented which inquired into the child's actions. The other form of the questionnaire contained 10 leading

questions which corresponded to the same information in the nonleading questions but suggested incorrect information. For example, question number one in the nonleading form asked "Did the man wear glasses"? (he wasn't wearing glasses). In the leading form this question read "Did the man touch his glasses"? Thus the nonleading question simply asked if the man was wearing glasses whereas the leading question implied that he was wearing glasses by asking the children if the man touched his glasses (see Appendix D for a comparison of the nonleading and leading questions and a rationale for each question).

Two questionnaires were constructed. One questionnaire contained only nonleading questions (see Appendix E for a sample of the nonleading questionnaire). The other questionnaire contained 10 nonleading questions and 10 leading or suggestive questions (see Appendix F for a sample of the leading questionnaire). Subjects in each age group were alternately assigned to either the leading or nonleading condition. The questions were randomly ordered on both questionnaires resulting in three different randomly ordered nonleading questionnaires and three randomly ordered leading questionnaires. The purpose of the nonleading objective questions was to assess the children's initial memory for the experiment. The leading questions were used to suggest incorrect information. It was assumed that if the children



disagreed with the leading questions they were not suggestible.

All subjects were tested with the nonleading questionnaire exactly one week after interacting with the confederate. This was done for two reasons. One reason was to determine the difference between the subjects' memories immediately after the event versus one week later. The other reason was to determine if subjects who were initially presented with the suggestive questions incorporated this material into their memories for the initial event (e.g., did the subjects who were initially presented with "The man had you do this didn't he"? incorporate this misinformation and answer the nonleading form of the question incorrectly one week later?).

All subjects were administered the Bead Memory and Memory for Sentences subscales of the Stanford Binet Intelligence Scale-Fourth Edition (Thorndike, Hagen, & Sattler, 1986). These subscales were normed on children from 2 years 0 months and 0 days to 23 years 11 months and 15 days. The subscales have a mean of 50 and a standard deviation of 8. The Bead Memory subscale was used to assess subjects' visual memories. In this task subjects were asked to identify and reproduce a series of bead sequences which varied according to color, shape, and order. The Memory for Sentences subscale was used to assess auditory memory. On this subscale subjects were asked to repeat a series of sentences. The Bead Memory and Memory for Sentences

subscales were combined to form a global Short Term Memory Standard Age Score.

The Burks' Behavior Rating Scales (Burks, 1977) were completed by one parent of each of the subjects. Two different forms of the Burks' Scales were given to the parents. One form was the Burks' Behavior Rating Scales of Preschool and Primary Children which is normed for children three to six years old. The other form is the Burks' Behavior Rating Scales which is normed for children in grades one to nine. The Burks' Scales contain 110 questions. The parents rate their child's behavior using the following 5 point scale:

- 1= You have not noticed this behavior at all.
- 2= You have noticed the behavior to a slight degree.
- 3= You have noticed the behavior to a considerable degree.
- 4= You have noticed the behavior to a large degree.
- 5= You have noticed the behavior to a very large degree.

The questions on the Burks' Behavior Rating Scales are subdivided into the following 19 subscales.

- 1). Excessive Self-Blame: Measures the child's tendency to accept blame for wrongdoings.
- 2). Excessive Anxiety: Assesses the child's expression of unpleasant or painful feelings.
- 3). Excessive Withdrawal: Measures the child's unwillingness to respond in an emotional capacity to others.

- 4). Excessive Dependency: Tests the child's exaggerated need of support from others.
- 5). Poor Ego Strength: Assesses the degree to which child's abilities are inhibited due to a lack of self-confidence.
- 6). Poor Physical Strength: Measures the child's ability to sustain adequate energy levels in ordinary physical activities.
- 7). Poor Coordination: Tests the child's inability to assert him or herself through voluntary muscle activity.
- 8). Poor Intellectuality: Measures the potential indicators of lowered cognitive functioning.
- 9). Poor Academics: Assesses the child's inability to succeed on basic academic tasks.
- 10). Poor Attention: Tests the child's inability to maintain and sustain material in consciousness.
- 11). Poor Impulse Control: Measures the inability of the child to delay responding in an acceptable fashion.
- 12). Poor Reality Contact: Tests the impaired ability of the child to evaluate and respond to daily life events.
- 13). Poor Sense of Identity: Assesses the degree to which the child demonstrates nonconforming behaviors.
- 14). Excessive Suffering: Determines the expression of the child's wish to fail or harm the self.
- 15). Poor Anger Control: Measures the child's inability to control rage.

- 16). Excessive Sense of Persecution: Tests the child's feelings of being mistreated.
- 17). Excessive Aggressiveness: Determines the child's wish to inflict harm on others.
- 18). Excessive Resistance: Measures the child's noncompliance with the demands of others.
- 19). Poor Social Conformity: Tests the child's inability to respond in an acceptable and socially approved fashion.

The Preschool Edition has the same subscales except it does not have a Poor Academics measure.

At the second week of the study all subjects were exposed to a five person photo line-up. The five photographs were obtained from an initial set of 10 photographs. All photographs were taken of men who matched the physical description of the confederate (e.g., they were Caucasian, had short brown hair, no facial hair and no glasses). The confederate and all of the men in the line-up were police in the Air Force and they were all wearing the same uniform which consisted of a dark blue, v-neck sweater with a light blue, button down collar shirt underneath. The photographs of the men were taken with a Polaroid camera and all the men stood exactly 6 feet from the camera. The same white backdrop was used for all the photographs.

Initially these 10 photographs were shown to 25 adults. The

adults were instructed to eliminate the four photographs that were least similar to the others. This resulted in five photographs that looked most like the confederate and each other. The nature of the experiment was explained to another 25 adults who were exposed to the final photo line-up. They were asked to choose which man would most likely be the confederate in such an experiment. Their responses were analyzed using a Chi-square to ensure that any differences in the photo line-up were not obtained because of a response bias.

### Procedure

All subjects participated in two experimental sessions, which were exactly one week apart. The subjects were tested at their respective schools during school hours. Permission to test the subjects was obtained from letters which were sent home with all of the children from the Kiddie Kampus and all fourth, fifth, and sixth graders from Wilder Elementary School. The permission letter provided the parents with a detailed description of the experiment, and it also explained that either the parent or the child could withdraw from the experiment at any time without experiencing prejudice from either the University or their child's school. Furthermore the parents were given the opportunity to receive a written summary of the study's results. The children were allowed to participate in the study after their parents gave their written informed consent

and the children gave their verbal consent.

In the first session the children were removed one by one from their classroom by a female experimenter and taken to the experimental room to meet the male confederate and play the Simon Says game. The female experimenter did not stay in the room, but left the children alone with the confederate. Recent research (King, 1984) has suggested that the absence of the person who will later obtain the subjects' memories is essential in order to provide a more logical reason for the experimenter's later questioning of the children (i.e., it does not make sense for the experimenter to question the children if he or she were present during the activities in question). Also the presence of the experimenter during the actual experience may have impacted on his or her ability to suggest misleading information to the children.

Two separate experimental rooms were used at the Kiddie Campus, one room was the director's office and the other room was a piano room. Three different rooms served as the experimental rooms at Wilder Elementary School. These rooms were the music room, the lunch room and the principal's office. All of the experimental rooms were very quiet and free from distraction. The children were comfortably seated and had plenty of room to perform the physical tasks of the Simon Says game.

The confederate was well rehearsed to ensure that he followed the same procedures for each subject. He began the game by introducing himself and obtaining some information about the child (e.g., his/her age). Great care was taken to ensure that an adequate level of rapport was obtained before the confederate began the "Simon Says" game. The confederate spent exactly five minutes with each child. Pilot data showed that the Simon Says game took approximately 5 minutes to complete. If the game ended prior to the end of the five minutes the confederate was instructed to sit quietly and look at his papers to control for the amount of interaction he had with each subject.

After the subjects participated in the "Simon Says" game they were administered the 20 objective questions by the female experimenter in a separate room from the experimental room. Once again these rooms were quiet, comfortable and free from distraction. The subjects were alternately assigned to either the leading or nonleading condition. After completing the 20 questions the subjects were asked to report any additional information they could remember to the examiner. The free recalls were either tape recorded in the case of the older children (they spoke too fast for the experimenter to record them verbatim) or hand recorded for the preschoolers (a pilot study with 3 preschoolers indicated that they were frightened of

the tape recorder). The subjects were asked to recall anything they could remember about the man and the game. The subjects then received an envelope containing the Burks' scales and they were asked to have their parents fill out the Burks' forms. The parents were instructed to try to be as honest as possible when rating their child's behavior. They were then instructed to seal the envelope and have the child return the Burks' scales to his or her teacher.

All subjects were asked to return for a second session exactly one week later. During this session all the subjects were administered the nonleading form of the questionnaire. Once again the children were given the opportunity to freely recall any additional information after the objective questionnaire. This time in addition to the game and man cues provided in the immediate test an additional cue of room was used.

After the free recall the children were presented with a photo line-up. The children were presented with 5 photos placed in an array on a table. Half of the subjects in each age group received the photo lineup with the confederate present while the other half of the subjects received the photo lineup without the confederate present. When the confederate was present the 5 other photos used in the lineup were randomly presented and omitted such that there was an equal opportunity for each photo



to be present in the lineup with the confederate. When the confederate was not present the photo lineup consisted of these five men randomly arranged.

The subjects were then presented with the photo lineup and they were asked "Is the man you played the Simon Says game with last week here? Take your time and look over all the pictures carefully. Now do you see the man you played Simon Says with?" If the subjects responded yes, they were asked to point to the man and they were then asked to determine how sure or certain they were of their choice. The level of certainty of their responses was assessed by the experimenter varying the distance between her arms and asking the subjects to determine if they were "a little sure" (hands an inch apart), "so/so sure" (hands shoulder length apart) or "a lot sure" (hands complete arm span apart). If the subjects answered no in response to the question "Is the man you played the Simon Says game last week here...," they were also asked to determine how certain they were of their choice by using the same method described above, i.e., "a little, so/so, or a lot sure."

After the subjects performed the photo identification task, they were administered the Bead Memory subtest of the Stanford Binet, Fourth Edition. Then they were administered the Memory for Sentences subtest. After the subjects completed the Memory for Sentences the older children received a one dollar bill. The

Snoopy stickers for the younger children were sent home with them because their teacher was concerned that they would disrupt the class.

### Analysis

The design involved two between subjects factors, age (preschool or grade school), and type of questionnaire, (leading or nonleading), and one within subjects factor, time of recognition and recall test (immediate and one week later). There were several types of measures examined, free recall (both immediate and delayed), objective test performance (both immediate and delayed), and photo identification (delayed only). For the subjects with the leading form of the questionnaire their susceptibility to leading questions was also analyzed. The subjects were considered susceptible if they agreed with the misinformation presented in the leading questions in the immediate test, or if they wrongly answered the nonleading form of the same questions incorrectly one week later, or if they incorporated the leading information into their free recalls. A mixed model, repeated measures analysis of variance was run on all data. All significant effects were further analyzed by post hoc tests.

In addition a multiple regression analysis was conducted to examine the influence of the hypothesized variables on the subjects' eyewitness skills (free recall, objective test

performance, susceptibility to leading questions, and photo identification). The predictor variables varied according to intrinsic interest and previous research for the different dependent variables. Core predictors of sex, age, and the Stanford Binet Bead Memory, Memory for Sentences and Short Term Memory Standard Age Scores were used.

The Burks' Behavior Scales were assessed to determine which variables would be of theoretical interest to the study, since all the scales would not be pertinent to eyewitness skills e.g., physical strength, coordination, and aggressiveness were not of interest. Of the 19 subscales the following 8 scales were considered of interest to eyewitness skills: excessive anxiety, excessive dependency, poor ego strength, poor intellectuality, poor attention, poor impulse control, poor reality contact, and poor social conformity. Thus these Burks' scales were used in the regression analysis as predictor variables.

### Results

#### Objective Questionnaire Data

The subjects' raw scores on the 20 yes/no objective questions were computed for both the immediate test and the delayed test one week later. The data were then subjected to a 2 (Age Group-preschool or grades 4-6) x 2 (Questionnaire Form-leading or nonleading) x 2 (Time-immediate or delayed) mixed model, repeated measures ANOVA.

For the 2 (Age Group) x 2 (Questionnaire Form) x 2 (Time) mixed ANOVA, significant main effects of age  $F(1,56) = 27.79, p < .001$ ; and time  $F(1,56) = 79.23, p < .001$  were found. The older children recalled more than the younger children (77.09% vs. 65.29%), and subjects recalled more in the test immediately after the game than one week later (77.75% vs. 65.84%). A significant interaction of Age x Time  $F(1,56) = 9.35, p = .003$  was also found (see Table 1). A subsequent analysis revealed that older children performed better than younger children on both the immediate  $t(58) = -5.89, p < .001$ , and the delayed tests,  $t(58) = -3.26, p = .002$ , with a difference in performance between the older and younger children of 22.84% on the immediate test and a 12.87% one week later.

Table 1Percent Correct on Yes/No Questionnaire  
as a Function of Age and Time

Age Group	Time	
	Immediate	Delayed
Preschool	69.07%	61.48%
Grades 4-6	84.85%	69.39%

The objective questionnaire was designed in order to assess the children's abilities to remember information about the confederate, the Simon Says game, and the room in which they played the game. (see Appendix E for a listing of questions pertaining to each category). The questionnaire had seven questions which pertained to descriptive information about the man with whom the children played the game, these questions included information about the man's physical appearance and dress. Eight of the questions concerned information about the contents of the Simon Says game and six questions pertained to the room in which the game was played.

A 2 (Age) x 2 (Questionnaire Form) x 2 (Time) ANOVA was performed separately for the children's performance on questions pertaining to the man, game, and room. The results of the 2 x 2 x 2 analysis for the man revealed significant main effects of age  $E(1,56) = 29.05$ ,  $p < .001$ ; questionnaire form  $E(1,56) = 4.59$ ,  $p = .037$ ; and time  $E(1,56) = 22.71$ ,  $p < .001$ . The older children remembered more information about the man than the younger children (80.89% vs. 64.91%), subjects with the leading form of the questionnaire performed better than those with nonleading questions (76.09% vs. 69.09%), and subjects' memories for information about the man were superior in the immediate test to what they were one week later (78.33% vs. 69.29%). A significant interaction of Questionnaire Form x Time  $E(1,56) = 5.16$ ,  $p = .027$  was also found (see Table 2). Subsequent analysis revealed that subjects who received the leading questions remembered more information about the man in the immediate test only,  $t(58) = -2.65$ ,  $p = .010$ . Specifically the leading question group demonstrated a 14.70% advantage in the immediate test and only a 3.16% advantage one week later.

A 2 (Age) x 2 (Questionnaire Form) x 2 (Time) mixed ANOVA was performed on the eight questions pertaining to the Simon Says game. This analysis revealed main effects for age  $E(1,56) = 32.47$ ,  $p < .001$ ; and time  $E(1,56) = 76.51$ ,  $p < .001$ . Older children performed better on the objective questions pertaining

to the game than younger children (85.44% vs. 70.01%) and subjects remembered more in the immediate test than one week later (86.88% vs. 70.00%). A significant Age x Time interaction  $F(1,56) = 7.79, p = .007$  was also found (see Table 3).

Table 2

Percent Correct on Objective Questions Pertaining to Information About the Man with Whom the Game was Played as a Function of Questionnaire Form and Time of Testing.

Questionnaire Form	Time	
	Immediate	Delayed
Nonleading	72.04%	67.41%
Leading	82.63%	69.54%

Table 3Percent Correct on Objective Questions Pertaining to Simon Says Game as a Function of Age and Time

Age Group	Time	
	Immediate	Delayed
Preschool	75.59%	64.42%
Grades 4-6	96.25%	74.64%

A subsequent analysis showed that older children remembered more information on the objective questionnaire about the game than younger children for both the immediate,  $t(58) = -6.99$ ,  $p < .001$ , and the delayed tests,  $t(58) = -2.83$ ,  $p = .006$ . Specifically, older children remembered 27.33% more information than the younger children on the immediate test and 15.86% more one week later.

The 2 x 2 x 2 mixed ANOVA for the five objective questions concerning the room in which the game was played revealed a significant main effect of time  $F(1,56) = 7.38$ ,  $p = .009$ .

Subjects remembered more in the immediate test than one week



later (62.34% vs. 54.34%). A significant interaction between Age and Time  $F(1,56) = 6.41, p = .014$  was also found (see Table 4).

Table 4

Percent Correct on Objective Questions Pertaining to the Experimental Room as a Function of Age and Time.

Age Group	Time	
	Immediate	Delayed
Preschool	58.52%	58.02%
Grades 4-6	65.36%	51.40%

Subsequent analysis found that older children performed better on the objective questions pertaining to the experimental room in the immediate test only,  $t(32) = 3.94, p < .001$ , whereas younger children's performance did not differ from the immediate to the delayed test.

The means of the subjects' performance on the questions pertaining to the man, game, and room as a function of age on the immediate test are presented in Figure 1, performance on the delayed test in Figure 2, and overall performance in Figure 3.

Figure 1. Performance on the Immediate Objective Questionnaire as a Function of Age

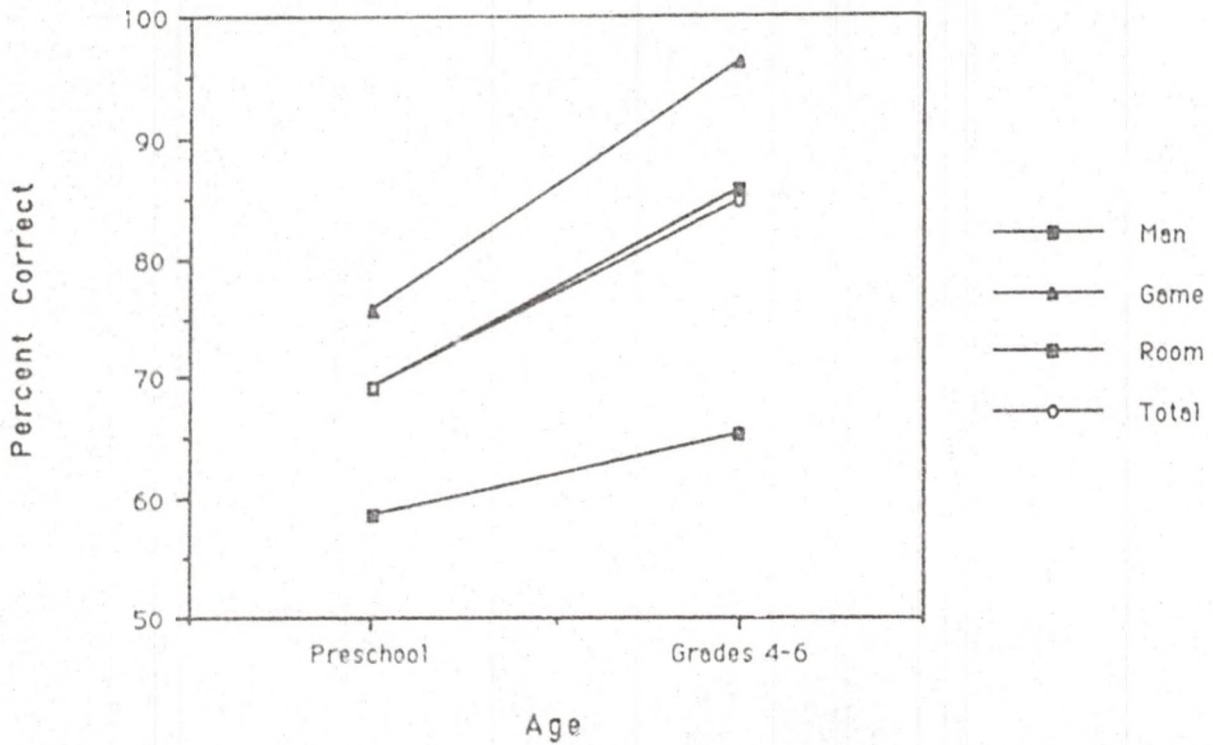


Figure 2. Performance on the Delayed Objective Questionnaire as a Function of Age.

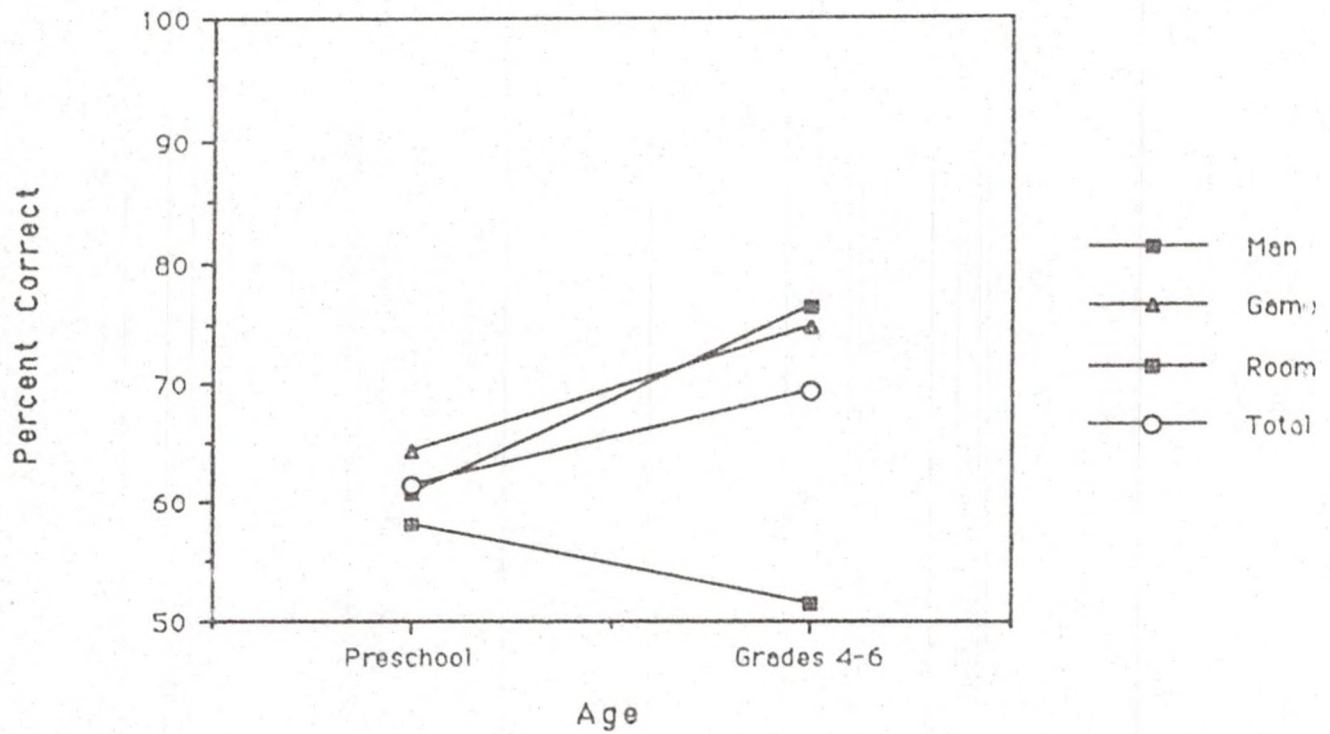
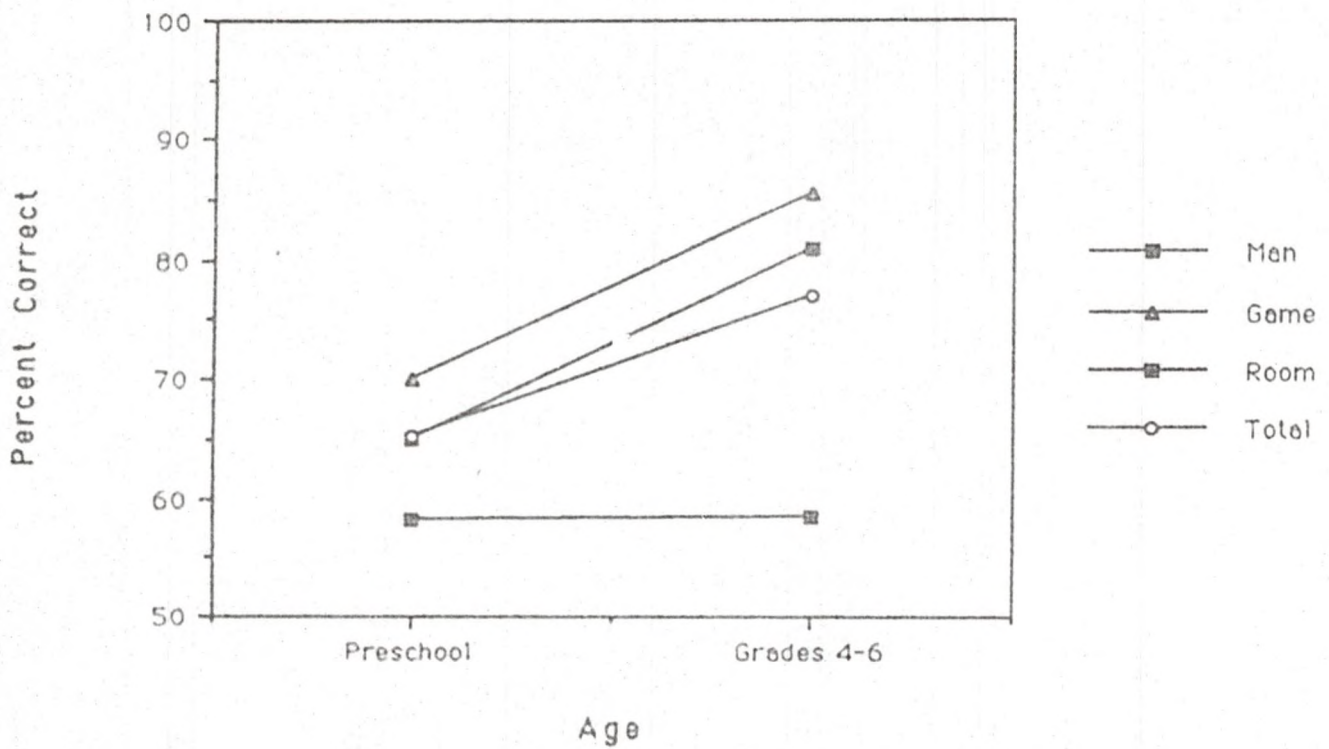


Figure 3. Overall Performance on the Objective Questionnaire as a Function of Age.



### Recall Data

The recall data were scored (blind) to determine the amount of information that the subjects recalled correctly and the amount of information they embellished or recalled incorrectly. This was done for both the recalls taken immediately and one week later. At the immediate testing the children were instructed to recall everything they could remember about the man and the game. The recalls were scored separately for the man and the game. The recalls were not scored separately for the room because five different rooms were used in the experiment and the subjects had not had equal exposure to the rooms prior to the experiment, e.g., one room was the piano room at the Kiddie Kampus and the children had never been exposed to this room, whereas at the elementary school a classroom and lunchroom were used. Therefore the children were not asked to recall information for the room in the immediate test.

The children were asked to recall anything they could remember about the room one week later to determine if they incorporated any of the misleading information from the leading questions given in the immediate objective questionnaire into their memories for the room e.g., did they recall at the second testing that the room had a picture of a bird, which was suggested to them one week earlier. Thus the data from the recalls for the room were only used in the suggestibility data.

The recalls for the immediate and week delayed testing were scored to determine the amount of correct and incorrect information the children recalled about the man and the game they played. The scorer used the criteria in Appendix G to determine if the child correctly described the man. The criteria used to score the free recalls for the game are presented in Appendix C. If the children recalled false information this was also scored separately for the man and the game. Twenty-five percent of the recalls were randomly selected and independently scored by a second scorer, resulting in an interrater reliability of .93.

The recalls were subjected to a 2 (Time) x 2 (Age) x 2 (Questionnaire Form) mixed ANOVA. This analysis was computed separately for the number of correct items recalled for the man and game and the total (items pertaining to man and game) number of correct and incorrect items recalled.

In the 2 x 2 x 2 mixed ANOVA for the mean amount of correct information recalled about the man significant main effects of age  $F(1,56) = 27.50, p < .001$ ; and time  $F(1,56) = 13.61, p = .001$  were found. Older children recalled more information about the man than younger children (3.26 facts recalled vs. 1.30) and the children recalled more information about the man after a one week delay than they did immediately after the game (2.85 vs. 1.90 facts).

For the 2 x 2 x 2 mixed ANOVA conducted on the amount of correct information recalled about the Simon Says game there were no significant main effects, however significant interactions of Age x Questionnaire Form  $F(1,56) = 4.31, p = .043$ ; and Age x Questionnaire Form x Time  $F(1,56) = 5.66, p = .021$  were found (see Table 5).

Table 5

Mean Number of Items Correctly Recalled About the Simon Says Game as a Function of Age Group, Questionnaire Form, and Time of Test.

Age Group		Questionnaire Form	
	Time of Test	Nonleading	Leading
Younger	Immediate	2.54	4.50
	Delayed	4.31	4.43
Older	Immediate	4.50	3.59
	Delayed	4.25	4.53

Subsequent analysis revealed that the younger children who received the nonleading questions recalled significantly more information about the Simon Says game on the delayed than on the immediate test,  $t(12) = -2.36$ ,  $p < .05$ .

A 2 (Age) x 2 (Questionnaire Form) x 2 (Time) mixed ANOVA was performed for the total number of correct items that subjects recalled about the man and the game. This analysis revealed significant main effects of age  $F(1,56) = 20.96$ ,  $p < .001$ ; and time  $F(1,56) = 11.84$ ,  $p = .001$ . Older children recalled more total information than younger children (7.48 facts vs. 5.14) and the subjects recalled more after a one week delay than immediately (7.13 facts vs. 5.72). A significant Age x Questionnaire Form x Time interaction was found (see Table 6).

Subsequent analysis revealed that younger children who received the nonleading questions remembered significantly more in the delayed than the immediate condition,  $t(12) = -3.07$ ,  $p = .010$ . In contrast, older children in the leading question condition recalled significantly more in the delayed than the immediate condition,  $t(16) = -3.78$ ,  $p = .002$ .

A 2 (Age) x 2 (Questionnaire Form) x 2 (Time) ANOVA was also performed on the mean number of false items that subjects recalled. A significant main effect of time  $F(1,56) = 13.05$ ,  $p = .001$  was found where subjects recalled more false items after a week delay than immediately after the game (1.95 vs. 1.08).



Table 6

Mean Number of Total Items Correctly Recalled as a Function of Age Group, Questionnaire Form, and Time of Test.

Age Group	Questionnaire Form		
	Time of Test	Nonleading	Leading
Younger	Immediate	3.46	5.71
	Delayed	6.31	5.07
Older	Immediate	7.25	6.00
	Delayed	8.19	8.47

A significant interaction of Age x Questionnaire Form x Time  $F(1,56) = 7.93, p < .007$  was also found (see Table 7). Post hoc analysis revealed that the younger children in the nonleading condition recalled more false information on the delayed than the immediate test,  $t(12) = -4.18, p = .001$ . Older children in the leading condition recalled more false information after one week than on the immediate test,  $t(16) = -2.97, p = .009$ .

Table 7

Mean Number of Total Items Incorrectly Recalled as a Function of Age Group, Questionnaire Form, and Time of Test.

Age Group	Time of Test	Questionnaire Form	
		Nonleading	Leading
Younger	Immediate	1.39	1.57
	Delayed	2.77	1.57
Older	Immediate	.88	.65
	Delayed	1.25	2.29

The recall data were then analyzed for accuracy whereby each subject obtained an accuracy score where the total number correct was divided by the total number recalled both correctly and incorrectly. This was done to give meaning to the raw scores reported in the above analysis. For example if one subject recalled 11 items correctly and 3 items incorrectly the accuracy score would be 79%; whereas another person may have

only recalled 5 items correctly but no items incorrectly and he or she would receive an accuracy score of 100%.

A 2 (Age) x 2 (Time) x 2 (Questionnaire Form) mixed ANOVA was computed for the accuracy of recall for subjects who recalled information about the man. This revealed a significant main effect of age  $F(1,43) = 16.63$ ,  $p < .001$ . Older children more accurately recalled information about the man than younger children (.771 vs. .488).

A 2 (Age) x 2 (Time) x 2 (Questionnaire Form) mixed ANOVA was also computed for the accuracy of recall of subjects who recalled information about the game. Significant main effects of age  $F(1,56) = 6.94$ ,  $p = .011$ ; and time  $F(1,56) = 6.17$ ,  $p = .016$  were found. Older children more accurately recalled information about the game than younger children (.967 vs. .882) and subjects were more accurate when their recalls were taken immediately than one week later (.962 vs. .897).

A 2 (Age) x 2 (Time) x 2 (Questionnaire Form) mixed ANOVA was performed on the accuracy scores for the total recall of man and game. A significant main effect of age  $F(1,55) = 8.07$ ,  $p = .006$  was found. Overall the older children were more accurate in their recalls than the younger children (.863 vs. .759). The immediate, delayed, and overall mean accuracy scores for the game, room, and total as a function of age are presented in Figures 4, 5, and 6 respectively.

Figure 4. The Immediate Total Recall Corrected for Accuracy as a Function of Age.

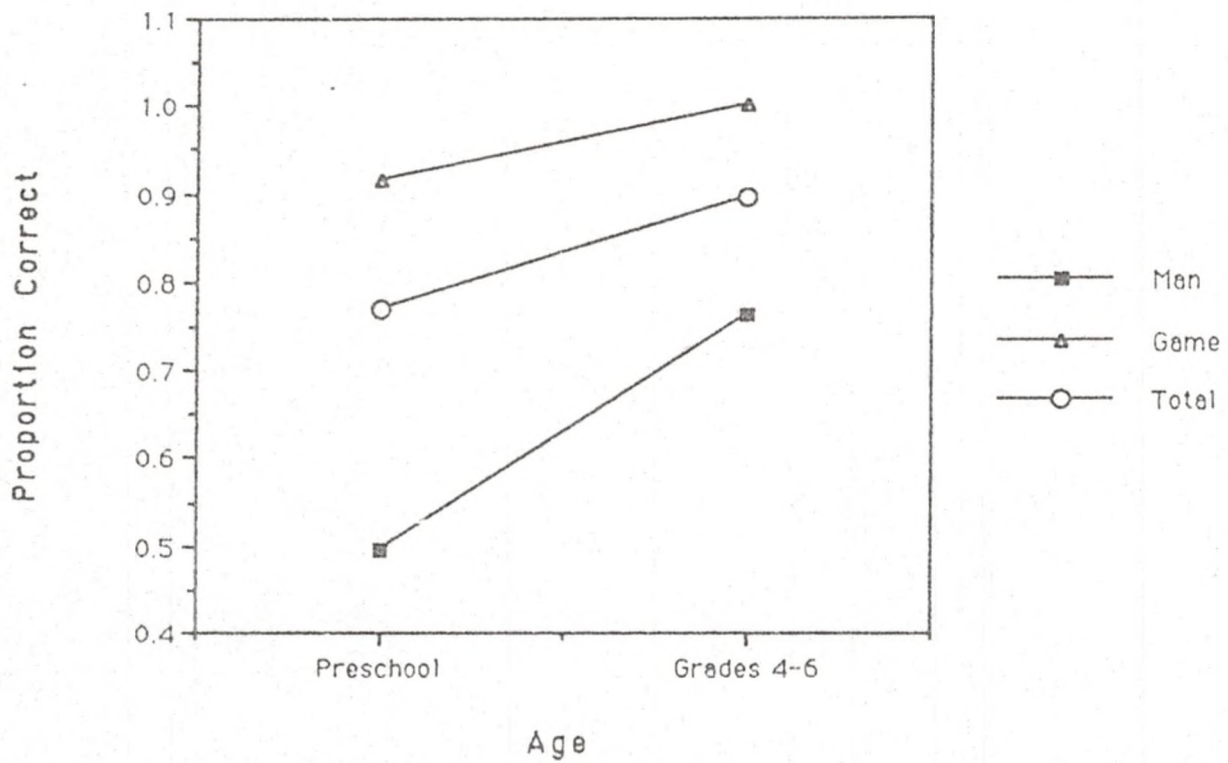


Figure 5. The Delayed Total Recall Corrected for Accuracy as a Function of Age.

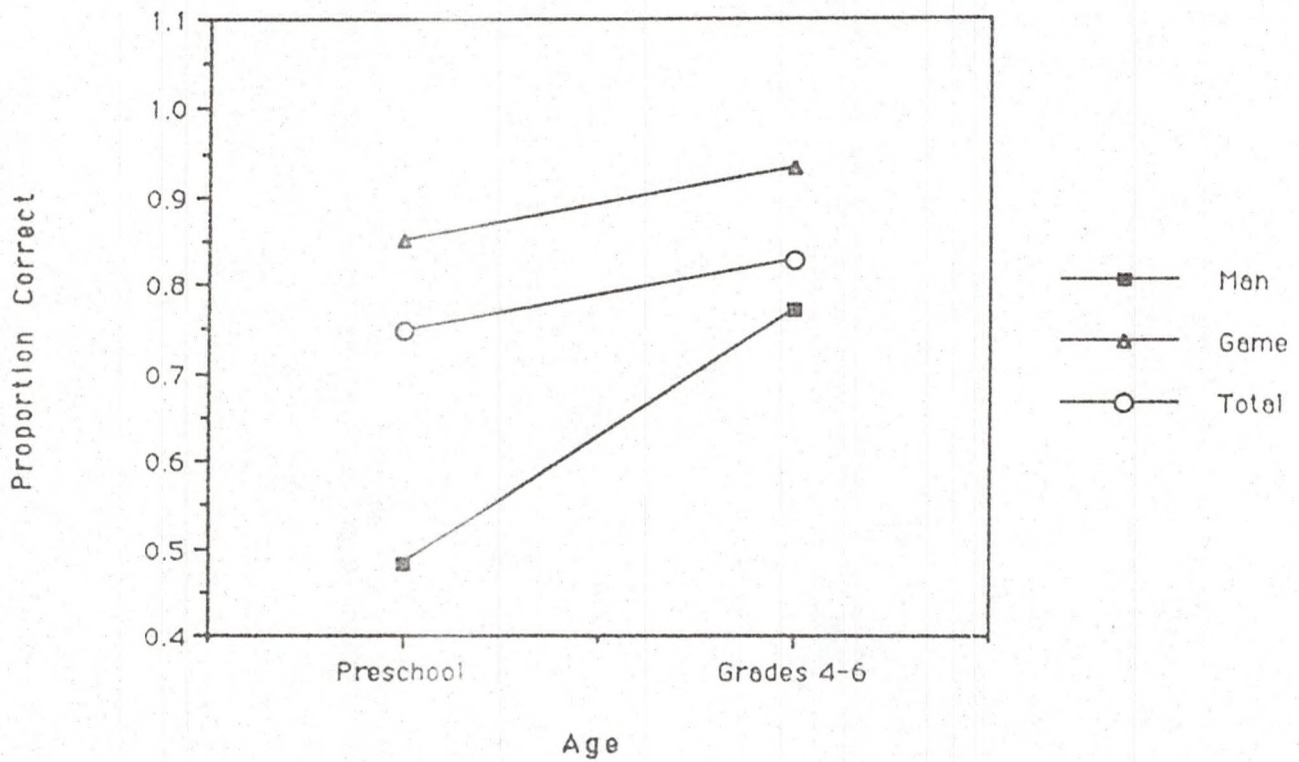
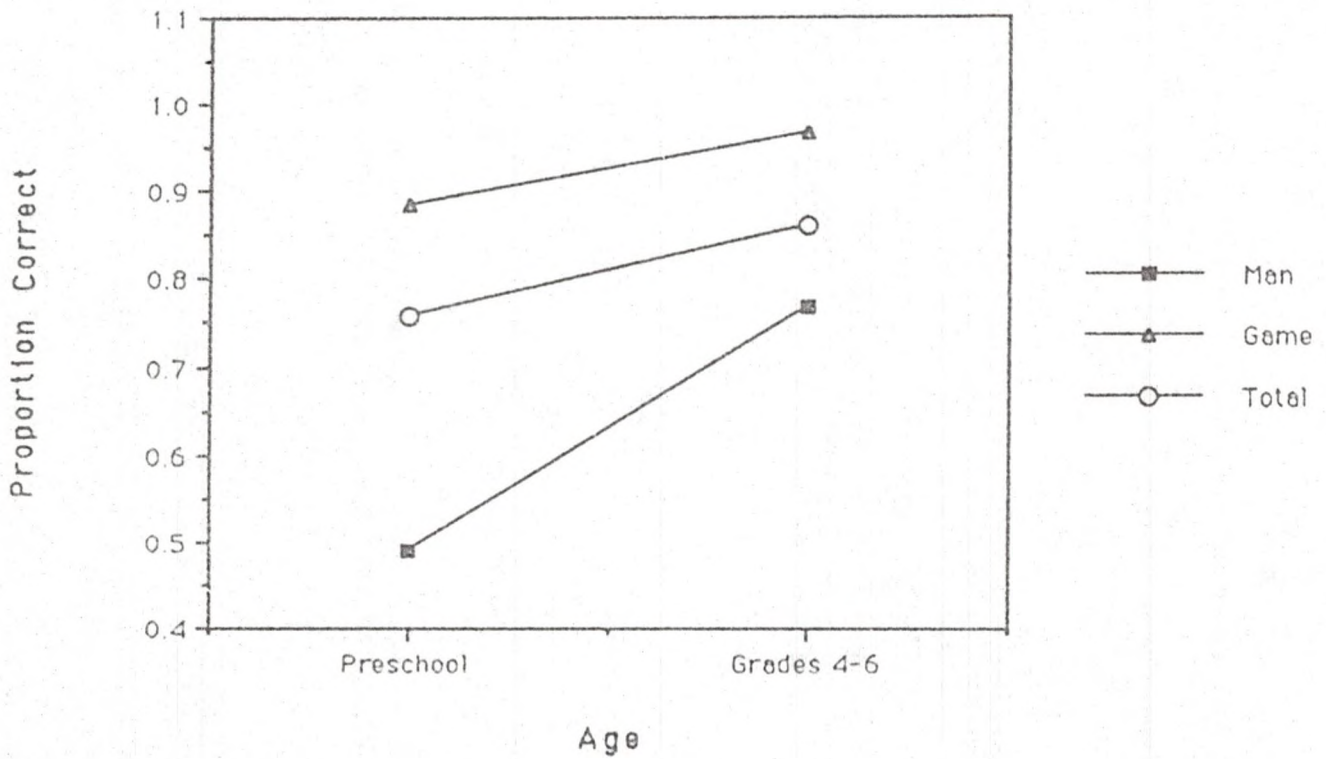


Figure 6. The Overall Total Recall Corrected for Accuracy as a Function of Age.



### Suggestibility

One method that was used to measure suggestibility was the performance of subjects on the first 10 questions of the questionnaire in Appendix F. This was done to compare the performance of the subjects who had the leading questions versus the performance of the subjects who had the nonleading questions. The lower a subject scored on the first 10 questions the more suggestible he or she was considered.

Thus all subjects' performances on the first ten questions were subjected to a 2 (Age) x 2 (Questionnaire Form) x 2 (Time) mixed ANOVA. There was not a significant main effect of questionnaire form  $F(1,56) = .17, p = .682$ , for the first ten questions. Thus the subjects who received the leading questions did not perform differently than the subjects who received the nonleading questions (68.50% vs. 67.25%). Therefore receiving the leading questions did not significantly impact on performance on either the immediate test or one week later. There were significant main effects of age  $F(1,56) = 15.40, p < .001$  and time  $F(1,56) = 70.35, p < .001$ . Older children performed better than younger children on the first ten questions (73.89% vs. 61.87%); and the subjects performed better in the immediate test than after a week's delay (77.83% vs. 59.17%). These results reflect the same pattern that was found for the mixed ANOVA on all of the questions of the objective

questionnaire. A significant interaction of Age x Time  $F(1,56) = 6.36$ ,  $p = .015$  was also found (see Table 8).

Table 8

Percent Correct on First Ten Questions of Objective  
Questionnaire as a Function of Age and Time

Age Group	Time	
	Immediate	Delayed
Preschool	68.16%	55.58%
Grades 4-6	85.59%	62.19%

Subsequent analysis revealed that older children recalled significantly more than younger children in the immediate test  $t(58) = -4.57$ ,  $p < .001$ ; however they lost this advantage one week later  $t(58) = -1.79$ ,  $p = .079$ . Specifically older children recalled 25.57% more than younger children on the immediate test and only 11.89% more one week later.

In sum, both the preschool and grade school children who received the leading questions were able to resist the misleading information and perform in a similar fashion to subjects in the nonleading condition. Indeed, the pattern of



results for the separate analysis of the first ten questions revealed a similar pattern of results with older children performing better than younger children and both groups performing better on the immediate test than one week later. The only evidence that receiving leading questions may have impacted on performance was seen in a marginally significant Questionnaire Form x Time interaction  $F(1,56) = 3.52, p = .066$  (see Table 9).

Table 9

Percent Correct on First Ten Questions as a Function of Questionnaire Form and Time of Test

Questionnaire Form	Time	
	Immediate	Delayed
Nonleading	74.23%	60.26%
Leading	79.52%	57.50%

Photo Identification Data

A Chi-square analysis was conducted on the photo identification results in order to observe any differences between the age groups. An overall Chi-square on the accuracy

of the children's ability to correctly identify the confederate was conducted. The results showed significant differences between the age groups Chi-square (2,  $N = 60$ ) = 7.52,  $p < .02$ . Specifically 94% of the elementary school children and 67% of the preschoolers correctly identified the male confederate (see Table 10).

Table 10

Photo Identification as a Function of Age Group

	Age Group	
Photo Identification	Preschool	Grade School
Correct Identification	67% (18)	94% (31)
Incorrect Identification	30% (8)	6% (2)
Do Not Know	3% (1)	- - -

One possible confound with the above results is that the younger children were a mixed race sample and although current research (Lindsay and Wells, 1983) brings into the question the widely held belief that cross racial identification is less accurate a separate analysis was undertaken all the same in an

attempt to further assess the impact of race on the significant age differences. A Chi-square assessing the difference between the two races showed no significant race differences, Chi-square (1,  $N = 60$ ) = 2.07,  $p < .15$ , thus black subjects overall did not perform worse than white subjects. One other analysis was attempted and in this case the black subjects were removed from the sample to see if the overall age difference remained without them. The results of this analysis showed that the age difference was not significant when the black subjects were removed (Chi-square (1,  $N = 53$ ) = 2.42,  $p = .12$ ).

Recent research (Rosenthal & Rosnow, 1984; Rosenthal & Rubin, 1989; Rosnow & Rosenthal, 1989) has emphasized the use of effect size comparisons when discussing the magnitude of a specific result. A comparison of the effect sizes for the Chi-square analysis with and without the inclusion of the black subjects (.354 and .214, respectively) revealed that the removal of the black subjects from the analysis lessened but did not totally remove the effect of age. Further support for the effect of age on photo identification skills was seen in discriminant analysis (the results of this analysis are discussed at length later in the paper) in which age was found to account for the most variance. It should also be noted that race was not a significant predictor of performance in this analysis. Based on the results of these analyses one can conclude that black

subjects appear to account for some of the age differences in the current study but not all of this effect can solely be attributed to race.

A Chi-square analysis on the subjects' certainty of their responses was undertaken. The subjects were asked to determine if they were a lot sure, so/so sure, or a little sure of their photo identification. The Chi-square analysis ( $3, N = 60$ ) = 9.08,  $p = .03$  revealed significant age differences. Specifically 70% of the preschoolers indicated that they were a lot sure of their responses while only 49% of the grade school children acknowledged this level of certainty. Furthermore, 4% of the preschool and 33% of the grade school subjects were so/so sure (see Table 11).

An analysis of the effect of age group was also performed for the subjects who had the confederate present in the lineup versus the subjects who had the lineup with the confederate missing. The results of this analysis are summarized in Table 12.

Table 11Subject's Level of Photo Identification Certainty as a Function of Age

Certainty Level	Age Group	
	Preschool	Grade School
A Lot Sure	70% (19)*	49% (16)
So So Sure	4% (1)	33% (11)
Little Sure	22% (6)	18% (6)
Would Not Do	4% (1)	- - -

\*Raw scores are in parentheses

Table 12Photo Identification as a Function of Age  
and Target Presence in a Lineup

Age Group		Lineup Condition	
		Target Present	Target Absent
Preschool	Correct Response	73% (11)	58% (7)
	False ID	20% (3)	42% (5)
	Don't Know	7% (1)	---
Grade School	Correct Response	100% (17)	88% (14)
	False ID	0% (0)	12% (2)
	Don't Know	---	---

In sum, the analysis of the photo identification data indicated that overall the younger children were less accurate than the older children. It appeared that race may contribute to this effect and although they are less accurate younger children are more certain of their responses.

Regression Analysis

A regression analysis was conducted separately for the performance on the objective questionnaire, total free recall

with correction for accuracy and the subjects' suggestibility (see Table 13 for the mean, standard deviation, and range of the dependent variables). A discriminant analysis was performed on the photo identification data.

Several predictor variables were used for each of these dependent measures. The predictors varied according to their theoretical and empirical importance to the dependent variable being analyzed. The subjects' age and visual, auditory, and overall short term memory skills as measured by the Stanford Binet were used as predictors.

The Burks' Scales were analyzed in order to assess which subscales may be theoretically or empirically relevant to eyewitness skills. It was determined that the following eight subscales would be included: excessive anxiety, excessive dependency, poor ego strength, poor intellectuality, poor attention, poor impulse control, poor reality contact, and poor social conformity (see Table 14 for the mean, standard deviation, and range of the predictor variables).

Table 13The Mean, Standard Deviation, and Range of the Dependent Variables

Dependent Variable	Mean	SD	Range
Number Correct on Immediate Objective Questionnaire (REC1)	15.679	2.472	11-20
Number Correct on Delayed Objective Questionnaire (REC2)	13.179	1.927	8-17
Total Free Recall on Immediate Test Corrected for Accuracy (RC1)	.853	.188	.25-1.00
Total Free Recall on Delayed Test Corrected for Accuracy (RC2)	.801	.163	.43-1.00
Number Correct on Immediate Leading Questions (SUG1)	8.065	1.843	2-10
Number Correct on Delayed Nonleading Questions (SUG2)	5.744	1.407	3-8
Total Free Recall Items With Leading Information Incorporated into the Content (SRC)	.484	.769	0-2



Table 14  
The Mean, Standard Deviation, and Range of the Predictor  
Variables

Predictor Variable	Mean	SD	Range
Age in Month (AGE)	101.339	39.269	48-152
Bead Memory SAS (BMSAS)	44.071	6.155	32-60
Sentence Memory SAS (SMSAS)	51.518	5.461	38-63
Short Term Memory SAS (STSAS)	95.589	9.001	76-112
Burks' Excessive Anxiety (BANX)	6.929	1.757	5-12
Burks' Excessive Dependency (BDEP)	8.964	3.027	6-19
Burks' Poor Ego Strength (BEGO)	10.161	2.940	7-20
Burks' Poor Intellectuality (BIQ)	8.714	2.051	7-17
Burks' Poor Attention (BATTN)	7.500	2.464	5-14
Burks' Poor Impulse Control (BIMPC)	7.518	3.063	5-19
Burks' Poor Reality Contact (BRC)	9.821	2.208	8-19
Burks' Poor Social Conformity (BSC)	10.304	2.319	8-16

The intercorrelations of the dependent variables and the predictor variables are presented in Table 15.

Table 15

Bivariate Correlations Between Variables

Variable	REC1	REC2	RC1	RC2	SUG1	SUG2	SRC	1
1.AGE	.627*	.440*	.285*	.274*	.671*	.223	.033	
2.BMSAS	-.014	-.328*	-.106	.037	-.041	-.273	-.263	-.246*
3.SMSAS	.079	-.064	.016	-.029	.255	.204	.045	-.126
4.STSAS	.041	-.263*	-.063	.007	.133	-.073	-.168	-.246
5.BANX	.082	-.098	.197	.004	-.084	-.153	.008	.184
6.BDEP	-.252*	-.030	-.178	-.083	-.554*	.007	.179	-.454*
7.BEGO	-.090	-.037	.033	-.024	-.398*	.033	-.063	-.188
8.BIQ	-.112	-.084	.007	-.162	-.187	.040	-.032	-.118
9.BATTN	-.122	-.092	.072	.208	-.515*	-.292	-.184	-.109
10.BIMPC	-.100	.012	-.058	-.016	-.390*	-.145	-.072	-.139
11.BRC	.029	.085	.015	-.232*	-.177	.064	-.052	-.202
12.BSC	-.262	-.106	.063	-.022	-.401	-.122	-.239	-.259*

Table 15 Continued


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Variable	2	3	4	5	6	7	8	9	10	11
3. SMSAS	.198									
4. STSAS	.804*	.742*								
5. BANX	.293*	.063	.239*							
6. BDEP	.196	-.064	.096	.266*						
7. BEGO	.241*	-.083	.114	.354	.671*					
8. BIQ	.061	-.266*	-.120	.211	.517*	.553*				
9. BATTN	.253	-.062	.136	.269*	.451*	.649*	.464*			
10. BIMPC	.250	-.007	.167	.318	.524*	.592*	.354*	.618*		
11. BRC	.048	.068	.074	.212	.510*	.497*	.434	.301*	.425*	
12. BSC	.176	-.084.	.069	.287*	.538*	.537*	.561*	.479*	.684*	.376

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\* indicates  $p < .05$

REC1= score on objective questionnaire taken immediately after game.

REC2= score on objective questionnaire taken after one week.

RC1= total amount accurately recalled immediately.

RC2= total amount accurately recalled after one week.

SUG1= score on first ten questions for subjects with leading questionnaire taken immediately after game

SUG2=score on first ten questions for subjects with leading questionnaire taken after one week

SRC=total amount of free recall pertaining to leading question information

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Multiple regression analysis requires some degree of independence among the predictor variables (Knight, 1984), because as the variables approach dependency the regression coefficients become inaccurate. Thus before the multiple regression analysis was conducted the predictor variables were assessed for their degree of colinearity. Nie, Hull, Jenkins, Steinbrenner, and Bent (1975) have suggested that a bivariate correlation of .80 or higher is indicative of colinearity. An examination of Table 15 indicated that there was one instance of possible colinearity between the Bead Memory SAS and the Short Term Memory SAS, however because of the level of correlation (.804) and the theoretical importance of visual memory skills to eyewitness abilities Bead Memory SAS was retained as a separate predictor.

#### Objective Questionnaire Performance

A separate regression analysis was conducted for the total correct on the objective questionnaire. This was done for the questionnaire given immediately after the game and for the questionnaire given one week later. The fourteen predictor variables used for the number correct on the immediate test were questionnaire form, age, sex, Bead Memory SAS, Memory for Sentences SAS, Short Term Memory SAS, and the eight pertinent Burks' scales. These fourteen predictors were entered into a stepwise multiple regression analysis. The results of the

regression analysis for the immediate recognition test are presented in Table 16.

Table 16

Regression Analysis of the Main Effects for Overall Performance on the Objective Questionnaire Given Immediately After the Game.

Factor	Coefficient	Beta	Weight	F	p	R**2
Age	.045		.726			
Short Term Memory SAS	.060		.218	26.21	under 001	.497

The age of the subjects accounted for most of the variance, specifically the older a child the better his/her performance on the immediate recognition test. The other significant predictor of performance on the immediate recognition test was the subjects' Short Term Memory SAS as measured on the Stanford Binet Intelligence Scales- Fourth Edition (Thorndike et al., 1986). This scale was comprised of the subjects' visual and auditory short term memory skills as measured by the Bead Memory and Memory for Sentences subscales. The better subjects performed on the Short Term Memory Scales of the Stanford Binet, the more superior was their performance on the immediate questionnaire.

The same fourteen predictor variables and the number correct on the immediate test were used for the regression analysis for the number correct on the objective questionnaire given after a week delay. These fifteen predictors were entered into a stepwise regression and the results are presented in Table 17. The number correct that subjects received on the immediate test was the best predictor of performance on the delayed recognition test. The other significant predictor was the subjects' short term visual memory as measured by the Standard Binet (Thorndike et al., 1986) Bead Memory Scale. Specifically as subjects' short term visual memory scores decreased their performance on the delayed recognition test increased.

Table 17

Regression Analysis of the Main Effects for Overall Performance on the Objective Questionnaire Given One Week After the Game.

Factor	Coefficient	Beta Weight	F	p	R**2
Number Correct On the Immediate Test	.429	.551			
Bead Memory Memory SAS	-.101	-.322	18.47	under .001	.411

### Recall Data

The subjects' total accuracy scores were felt to best represent their performance on the recall task and therefore these scores were the dependent variables used for the regression analyses. A regression analysis was done separately for the subjects' immediate recall and the week delayed recall. The following fourteen predictors were used for the immediate total recall corrected for accuracy: age, questionnaire form, Bead Memory SAS, Memory for Sentences SAS, Short Term Memory SAS, and the eight Burks' scales. These variables were entered into a stepwise regression and age was found to be the only significant predictor, coefficient = .001, Beta = .285,  $E(1,54) = 4.76$ ,  $p = .034$ ,  $R^2 = .081$ , of immediate free recall. Once again as the subjects' age increased their performance on free recall tasks improved.

For the total number of items recalled and corrected for accuracy after a week delay the same fourteen predictors were used in addition to the number they correctly recalled on the immediate test. The results of this stepwise regression indicated that the only significant predictor of the delayed recall was the performance on the immediate test, coefficient = .255, Beta = .296,  $E(1,54) = 5.18$ ,  $p = .027$ ,  $R^2 = .088$ .

### Suggestibility Data

A regression analysis was conducted on the subjects' performances on the first ten items of the questionnaire in Appendix F. These were the leading questions and this analysis was performed only for the subjects who received the leading questions. The purpose of this analysis was to determine what predicted the inability of subjects who received the leading questions to resist the examiner's suggestive questioning. The following predictor variables were used to determine what predicted subjects' suggestibility, age, sex, Bead Memory SAS, Memory for Sentences SAS, Short Term Memory SAS, and the eight Burks' Scales. These variables were entered into a stepwise regression and the results are presented in Table 18. As subjects' ages and short term memory skills improved they were less susceptible to leading questions. For the Burks' Poor Attention Scale the higher a subject's score the more problematic he or she was at attending. Thus the worse a subject's attention skills were the more likely they were to be susceptible to suggestion.



Table 18

Regression Analysis of the Main Effects for Performance on the First Ten Questions of the Objective Test Given Immediately After the Game for Only Subjects With the Leading Form of the Questionnaire

Factor	Coefficient	Beta	Weight	F	p	R**2
Age	.031		.671			
Short Term Memory SAS	.085		.416			
Burks' Poor Attention Scale	-.285	-.364		20.357	under .001	.693

A second measure of suggestibility was obtained from the above subjects' performances on the nonleading form of the first ten questions after a week's delay. These scores were investigated in order to determine what might predict why some subjects incorporated the misleading information from the prior week's leading questions into their answers on the nonleading questions the following week. The following predictor variables were used to determine what predicted subjects' performances on this second measure of suggestibility, age, sex, Bead Memory SAS, Memory for Sentences SAS, Short Term Memory SAS, the eight Burks' Scales, and performance on the leading form of the questionnaire one week earlier. These variables were entered

into a stepwise regression. The results indicated that the only significant predictor was performance on the leading form of the questionnaire one week earlier, coefficient = .250, Beta = .327,  $F(1, 29) = 3.475$ ,  $p = .072$ ,  $R^2 = .107$ . Thus susceptibility to suggestion on the immediate test was the only predictor of poorer performance on the corresponding nonleading form of the questionnaire one week later.

The third variable used to measure subjects' suggestibility was the incorporation of misleading information from the leading questions into the free recalls in the immediate and delayed tests. Once again this analysis was done only for the subjects who received the leading form of the questionnaire in order to determine what predicted if their incorporation of the suggested information into their free recalls. The following predictor variables were entered into a stepwise multiple regression analysis, age, sex, Bead Memory SAS, Memory for Sentences SAS, Short Term Memory SAS, and the eight Burks' Scales, in order to determine their relationship to the third measure of suggestibility. The results indicated that none of the above variables were significant predictors of the incorporation of misleading information into free recalls.

#### Photo Identification

A discriminant analysis was conducted to determine which variables correlated with correct performance on the photo

lineup task. Discriminant analyses are used to categorize subjects into one of two previously defined groups. For this task subjects were classified as either correct or incorrect. Correct performance was either defined as accurate identification of the confederate when he was present in the lineup or correct rejection of the lineup when the confederate was missing. The following variables were used as predictors in the discriminant analysis: sex, race, age group, presence or absence of target photo in lineup, level of certainty of choice on the photo lineup, Bead Memory SAS, and the eight Burks' scales. These variables were then entered into a discriminant analysis with corrected post hoc tests. The results are presented in Table 19.

The child's age, the presence or absence of the target photo in the lineup, and the children's reality contact (as measured by the Burks' scales) were significantly related to performance on the photo identification task. Specifically, since younger children were coded as one and older children were coded as two, the negative canonical correlation indicated that as the age of the child increased his or her performance on the photo identification task improved.

The children performed better when the confederate was present in the lineup than when he was absent. Children who had poor reality contact, or an impaired ability to evaluate and respond to daily life events, also demonstrated inferior

performance on the photo identification task. The resulting discriminant model correctly classified 83.93% of the cases. The model was more accurate in classifying the subjects with the correct answer than those with the incorrect answer.

Table 19

Discriminant Analysis of the Main Effects for the Photo Identification Task.

Variable	Wilks' Lambda	Canonical Coefficients	F	p
Age	.912	-.735		
Presence of Target Photo in Lineup	.874	.546		
Burks' Poor Reality Contact	.854	.410	3.532	.021

## Chapter IV

### Discussion

The present study was designed to investigate the eyewitness testimonies of preschool and grade school children. A major purpose of the study was to determine if the children demonstrated any developmental differences on a variety of eyewitness tasks. The results indicate that the preschool and grade school children differed in many respects. Overall the older children performed better than the younger children on the yes/no questionnaire; they were more expansive and accurate in their free recalls; they were less suggestible; and they were more accurate in identifying the confederate.

Although the older children demonstrated superior performance on the objective questionnaire both groups of children showed similar patterns of performance on this task in that both the older and the younger children performed better on questions pertaining to the man and the game than on questions pertaining to the room in which the game was played. One possible reason for this pattern of results could be that because the children were directly involved with the confederate and active participants in the game, the information about the man and the game was more salient than the information about the

room. Thus both groups of children demonstrated superior performance on questions regarding salient information than on questions regarding peripheral data.

The results of the present study are consistent with several other eyewitness testimony studies (Cohen & Harnick, 1980; Goodman et al., 1987; Goodman & Reed, 1986) which have found age differences in children's performance on recognition tests. In addition, like the current study, Goodman et al. found that the subjects' performance on objective questions was superior for salient information about the actions of the person with whom they were directly involved than for the peripheral information about the room in which the event occurred.

The results of the present study and the Goodman et al. (1987) study are also consistent with research investigating the prose processing skills of children (Brown & Smiley, 1977). Brown and Smiley found that children demonstrated a "levels effect" in their recalls. In the levels effect individuals recall the main ideas of a story more frequently than the details. The levels effect is a rather robust finding in the prose processing literature and has been found in children (Brown & Smiley, 1977; McCartney & Nelson, 1981), younger and older adults (Petros, Tabor, Cooney, Chabot, 1983) and skilled and less skilled college readers (Hammes, 1986). The results of the Goodman et al. and the present studies suggest that children also demonstrate a

levels effect in their memories for live events in which they are active participants.

In the present study, developmental differences in the children's free recall were also found. As was hypothesized older children spontaneously recalled more total information about the man and the game than younger children. These results replicate several studies (Goodman & Reed, 1986; King, 1984; Marin et al., 1979; Saywitz, 1987) which have also found that younger children are less complete in their free recalls than older children and adults.

An analysis of the subjects' accuracy scores indicated that older children were more accurate in their free recalls than the younger children, although the number of incorrect items recalled did not vary between the two age groups. This result is inconsistent with those of Marin et al. (1979) who found that although the younger children produced a greater number of incorrect items, the proportion of correct to incorrect responses did not differ across age groups. It is difficult to compare the results of these two studies directly because the purpose and the timing of the free recalls were different in each experiment. In the Marin et al. experiment the free recalls were administered first and the purpose was to assess memory for the event. In the present study the free recalls were administered after the objective questionnaire and the purpose was to determine if the

children incorporated the suggested information into their free recalls. Therefore the conflicting results of these two studies may be due to the demand characteristics under which the children gave their free recalls.

The superior performance of the older children over the younger children on the recall and recognition measures needs to be qualified by several Age x Time interactions. The effect of a week's delay on the children's performance on the yes/no questionnaire confirmed the hypothesis that performance for both age groups would deteriorate after a week's delay. The effect of time appeared to have more of a deleterious impact on the older children than the younger children in that the only significant difference in performance between the two groups on the week's delayed test was for questions concerning the game.

The older children's overall performance on the objective questionnaire decreased from 85% on the immediate test to 70% on the week delayed test. The younger children's performance deteriorated from 69% to 62%. One possible reason for the greater decrease in performance by the older children is that they may have been exposed to more interfering tasks during the week in between the two tests. Another possible explanation is that the Simon Says was a more salient event for the younger children and therefore they retained the information better than the older children.



The effect of time on the free recall performance of the children did not confirm the stated hypothesis that the subjects would recall less information over time. Specifically both the younger and the older children recalled more information after a week's delay than in the immediate test. This was found for both the amount of correct and incorrect items recalled. However when the accuracy scores were analyzed the impact of time was not seen, i.e., the subjects' accuracy did not change from the immediate test to the week's delayed test. The only exception to this result was found in the accuracy scores computed for the game which indicated that subjects were more accurate in the immediate test than in the delayed test.

The implications of this finding indicate that the passage of time increased the amount of both accurate and inaccurate free recall information produced by the children. This is a rather unique finding in that most studies have found that although the amount of incorrect information may increase after a time delay, the amount of correct information usually does not increase.

One possible reason for the current findings is that the children may have been more anxious in the first testing session because they had just spent five minutes with an unknown man in a uniform and they were then required to spend approximately 20 minutes with an unknown female examiner. During the second testing session the children were exposed to less stress because

they only interacted with the female experimenter with whom they were already familiar. The increase in anxiety during the first test may have decreased the children's verbal output. The problem with this explanation is that it does not account for why possible higher anxiety levels during the first testing session would decrease free recall production but not decrease performance on the recognition test.

Another possible reason for increased verbal production during free recalls after a week's delay may have been that the rapport level was better during the second testing session because the children were being tested by the same female examiner who had tested them the prior week. It could be that adequate rapport may be an essential component to obtaining adequate narrative accounts from children but may not have an impact on their performance on an objective questionnaire. Obviously since this is a rather unique finding and one that could have important psycholegal implications, this phenomena warrants further investigation.

Developmental differences were also found on the photo identification task. Older children performed significantly better than the younger children on the photo identification task. These results replicate numerous other studies (Blaney & Winograd, 1978; Brigham et al., 1986; Carey et al., 1980; Diamond & Carey, 1977; Flin, 1980; Goodman & Reed, 1986; King, 1984)

which have found that photo identification increases with increases in age.

The present study also replicates the results of several studies (e.g., Buckhout et al., 1974; Clifford & Scott, 1978; Leippe, Wells, & Ostrom, 1978; Yarmey, 1979) which have found that a witness' stated confidence in eyewitness identification is not predictive of photo identification accuracy. In the current study, despite their inferior performance on the eyewitness identification task, the younger children were much more confident of their responses than the older children. The importance of this finding is that several studies (Lindsay et al., 1981; Wells et al., 1981) have found that jurors are more likely to believe confident eyewitnesses. Even the United States Supreme Court, in its 1972 *Neil v. Biggers* decision, deemed "the level of certainty demonstrated by the witness at the time of the confrontation" (as cited in Wells & Murray, 1983, p. 348) as one of its five factors in determining witness accuracy (see Appendix H for a listing of all five factors). The present results in addition to prior research suggest that such conclusions are unwarranted.

The effect of cross racial identification was not adequately addressed in the present study because of the small number of black subjects. Most researchers conclude that cross racial identifications are more problematic (Loftus, 1979; Wells 1978;

Yarmey, 1979) but Lindsay & Wells (1983) bring these conclusions into question. For example, they cite a study (Galper, 1973) in which white students enrolled in a black studies curriculum were more adept at identifying black faces than those of their own race.

Like most other eyewitness testimony factors perhaps race in and of itself is not an adequate variable to account for differences in identification accuracies. Exposure to and interaction with persons of other races may play an important role in cross racial identifications. In the present study the black children were an ethnic minority in a predominantly Caucasian community, therefore they presumably had numerous interactions with Caucasians which may have aided their identifications of the confederate. Of course the small number of black subjects in the current study make such conclusions problematic.

The results of the children's performance on measures of suggestibility were somewhat surprising. Overall, subjects who were exposed to leading questions in the present study did not differ in their performance on the measures of suggestibility than subjects who received only nonleading forms of the same questions. Specifically subjects who received the leading questions did not demonstrate inferior performance than subjects who received the nonleading forms of the questions on

the immediate test, nor did the two groups differ in their responses to the corresponding nonleading questions after a week's delay. The older children were less likely to agree with the misleading information in the immediate test than the younger children, but they did not differ in their responses to the nonleading forms of the questions after a weeks' delay.

A primary purpose of the present study was to determine the impact of various measures of individual differences on the children's eyewitness testimony skills. The present study is unique in that several variables were successful predictors of eyewitness skills. On the immediate, objective questionnaire the age of a subject accounted for the largest amount of variance. As age increased so did performance. A subject's Short Term Memory (STM) skills were also a significant predictor. Subjects' with superior auditory and visual STM skills performed better on the immediate objective questionnaire. It is not unusual that STM skills would be predictive of performance on a memory test given immediately after the event.

The subjects' performance on the immediate test was the best predictor of their performance on the week's delayed test. This result suggests that the study of individual differences is indeed warranted and important because subjects who perform well in one testing condition also perform well after a week's delay. Since many witnesses of crime are asked to relay their

testimonies repeatedly, the psycholegal implications of this result are very important.

Another significant predictor of performance on the week delayed objective questionnaire was the subjects' short term visual memory. As their short term visual memories decreased their performance on the delayed test increased. This result is counterintuitive and inconsistent with findings from the immediate test which found that global STM skills increased with increase in performance. Currently the implications of this finding are rather tenuous. Perhaps subjects with better visual memories allocated more of their resources to scanning the environment and incorporating peripheral information and therefore they missed important cues which decreased their performance on the delayed questionnaire. Some support for this hypothesis was found by Wells & Leippe (1981) who found that subjects who attended to peripheral objects in a room performed less well on eyewitness identification tasks. The problem with this explanation is that it does not explain why this phenomena would occur only after a week's delay. The importance of further investigating the relationship between poorer visual STM and impaired performance is that subject-jurors are less likely to believe eyewitnesses with inferior memories for peripheral details (Bell & Loftus, 1988; Wells & Leippe, 1981).

The only significant predictor of free recall accuracy in the

immediate test was age of the subjects. Free recall accuracy increased with increases in age. Performance on the immediate free recall task was the only significant predictor of the week delayed recall task.

For the suggestibility data, once again age and STM skills were predictive of performance. Older children and children with superior STM memory skills were better at resisting the misleading information. Gudjonsson (1983) also found that in adult poor memory recall correlated with suggestibility. He concluded that people who have inferior memories are less able to detect discrepancies between the original and misleading information because "... people who have poor memory and whose memory recall deteriorates quickly with time distrust their own judgments and learn to rely on cues provided by others. They may therefore be particularly vulnerable to suggestive influences" (p. 37).

In addition to poorer memory skills, inability to sustain attention was a significant predictor of suggestibility in the present study. Children who were not adept at attending to the original event were less able to resist the misleading information. Perhaps heightened suggestibility may occur for poor attenders because they have missed essential original information and therefore they are unable to detect inconsistencies between the original and misleading information.

This result confirms Yuille's (1980) hypothesis that attention may mediate many eyewitness skills.

Subjects who received the leading questions in the immediate test were tested with the nonleading form of the questionnaire after a week's delay to determine if exposure to the misleading information increased the number of false positive responses to the corresponding nonleading question one week later. Once again the only significant predictor of performance was performance on the immediate test.

For the photo identification data, age was the best predictor of performance. Accuracy increased as age increased. The presence or absence of the target photo in the lineup was also a significant predictor of photo identification performance. The children were more accurate when the confederate was present in the lineup than when he was absent. This result replicates the findings of the Peters (1987) and King and Yuille (1987) studies which have also found that photo identification accuracy decreases when the target photo is absent from the lineup.

In actual forensic cases the suspect is not always present in the lineup. The results of the present study and the Peters (1987) and King and Yuille (1987) research highlight the need for future investigations to include a target present/absent manipulation in order to render the findings more forensically relevant.



Poor reality contact as measured by the Burks' scales was also a significant predictor of photo identification accuracy. Children who demonstrated difficulty evaluating and responding appropriately to daily events were less accurate on this task. An analysis of the items on the poor reality contact scale indicated that children who received high ratings demonstrated behaviors such as "daydreaming" and "unaware of what is going on around him." Perhaps children who exhibit these behaviors were distracted and inattentive during the Simon Says game and therefore they were less accurate at identifying the confederate.

Several individual differences variables were not significant predictors of eyewitness performance. Like the Goetze (1980) and King (1984) experiments the present study did not find poor intellectuality or poor impulse control to be significant predictors of eyewitness skills. Unlike the Ward and Loftus (1986) and Gudjonsson (1983) findings with adults, poor self esteem, lack of self-confidence, and social desirability were not significant predictors of the children's performance.

In addition, the current experiment did not find excessive anxiety to be a significant predictor of eyewitness skills. This finding replicates the Goodman et al. (1987) study but is inconsistent with several other studies which have found anxiety to decrease performance (e.g., Buckhout et al., 1974; Peters, 1987; Siegel & Loftus, 1978). One problem in comparing the

results of the present study with these findings is that the present study employed only a trait measure of anxiety whereas the other experiments provided state measures. Furthermore the average parent ratings on the Burk's excessive anxiety subscale were very low and indicated that overall the parents viewed their children as being free from anxiety. Therefore the present study does not really offer much additional information about the impact of anxiety on eyewitness skills.

It has been notoriously difficult to find significant relationships between individual difference measures and eyewitness skills. The success of this endeavor in the present study may be due to several factors. First the present study was designed specifically to investigate the impact of individual differences on children's eyewitness skills. Several studies reviewed for this paper appeared to include individual differences measures as an additional variable, instead of a factor central to the design of the study. Secondly, several measures of individual differences were employed in this study instead of the usual one or two. The importance of this factor may be viewed in the following example. If IQ and impulse control were the only measures of individual differences included in the present study, no significant predictors would have been found. The lack of a relationship between eyewitness skills and IQ and impulse control is important because it

replicates other findings, but by including only these two variables, the impact of attention and short term memory skills would not have been found. Obviously many of the findings of the current study need to be replicated and further investigated but the implications of attention and STM impacting on eyewitness skills is very important.

A primary fault of the current study is that because of its original design many of the results are rather unique. In order to understand and appreciate the significance and implications of these findings, further research needs to be conducted employing similar methodology. Another limitation of the present study is the use of only parent ratings on the Burks' Scales. Although research on the Burks' Scales (Williams, 1968) indicates that parents and teachers rate children in a similar fashion, the use of both parent and teacher ratings would provide greater validity for the results. Also, in addition to using trait measures provided by the parents, various state measures of the behaviors could also be employed. For example, state measures of attention and anxiety could provide a more comprehensive understanding of how these factors mediate eyewitness performance.

Currently, a major criticism of eyewitness testimony research is that there is a paucity of theoretical implications of the results found. Yuille (1980) discusses the need to integrate

theory with the findings of eyewitness research,

The primary fault lies in the limited theoretical integration of the research findings. While the data that have been acquired provide a number of fascinating insights into how human beings perform in real life situations, our understanding of the process mediating this performance remains minimal (p. 335).

One possible avenue of investigation for experimenters to begin to integrate with eyewitness testimony research is the area of comprehension monitoring. Comprehension monitoring is a component of "metacognition" which refers to one's knowledge and control of his or her own cognitive processes (Flavell, Speer, Green, & August, 1981). When individuals successfully monitor their comprehension of verbal and visual materials they are able to differentiate between when they have adequately understood the materials and when they have not.

Developmental differences have been found in children's comprehension monitoring skills (Markman, 1977, 1979). Markman (1977) investigated the comprehension monitoring skills of children in first through third grades, and she found the older children were more adept at detecting failures in their comprehension than the younger children.

In the present study the application of the comprehension monitoring research indicates that perhaps one reason the younger children are more suggestible than the older children is because they are less adept at monitoring their comprehension.

Inferior comprehension monitoring skills make it less likely that the younger children will detect inconsistencies between the misleading and original event information.

Turtle & Wells (1987) suggest that another possible area of integration between theory and research could be realized in investigating children's metamemories, i.e., their knowledge of their own memory skills. The usefulness of this endeavor in the present study can be viewed in the photo identification skills of the younger children. On this task, the younger children demonstrated poor metamemory skills in that they were more confident in their identifications of the confederate than the older children despite the fact that they were less accurate. One possible reason for this false confidence could be that the younger children lack the necessary skills to evaluate adequately their memories for the confederate, and therefore they are not able to detect memory failures.

An important question that arises from the metacognition research is "If superior comprehension and memory monitoring skills improve performance can an individual learn these skills?" Recent research with adults suggests an affirmative answer to this question. Specifically, Greene, Flynn, & Loftus (1982) found that exposure to a warning prior to the subsequent presentation of misinformation slowed reading times and made readers slightly less susceptible to the misinformation. Furthermore,

subjects who were instructed to read slowly were made more resistant to the postevent information (Tousignant, Hall, & Loftus, 1986). It could be that by instructing the subjects to slow their reading time, the researchers were encouraging them to monitor more thoroughly their comprehension of the materials, so that they could detect inconsistent information.

The legal implications of the present results are hard to determine at the current time. Many of the findings represent a first step in beginning to understand how individual differences and time may mediate the impact of developmental differences on eyewitness testimony skills.

The legal applications of the findings are even more problematic. Presently, an extensive, unresolved, scholarly debate exists over the appropriateness of applying the results of the eyewitness testimony research to the court setting (Wells, 1986). On one side of the debate McCloskey and his colleagues (McCloskey & Egeth, 1983a, 1983b; McCloskey, Egeth, & McKenna, 1986) indicate that there is not a documented need that jurors require such testimony (see Deffenbacher & Loftus, 1982 for data that suggest that this is not true) and there is not enough strong empirical support to make conclusive statements about the factors which impact on eyewitness reliability.

Loftus and her colleagues represent the other side of the debate (Loftus, 1983, 1986a, 1986b; Goodman & Loftus, 1988)

and although she agrees that "a number of concrete dilemmas arise" (Loftus, 1986a, p.63), she supports the use of expert psychological testimony on eyewitness reliability in the courts using a "Darwinian (survival of the fittest expert) approach."

She explains this position,

In the courtroom, those who become overly caught up in the zeal of the advocate who employs them will not survive very long. Those who misrepresent facts or studies will eventually be discovered. Admittedly it may take the system some time to discover who these people are. But after this discovery, they will no longer be welcome in court. Some have gone so far as to suggest that any witness who manipulates testimony deliberately (sic)-through selection, exaggeration, deletion, or diminution- has committed perjury (Shofield, 1956, p. 6). Rejection by the legal system, a form of social engineering, will hopefully predispose psychologists to engage in more ethical kinds of behavior. (Loftus, 1986a, p. 77).

Hopefully researchers will soon be able to provide the legal system with stronger, conclusive data and the courts will begin to utilize this information. Currently there is a desperate need to begin to reform a process which is often hostile and very traumatic for the children involved. The need for such reforms is perhaps best summed up in a description of the end results of the McMartin Preschool case, which was presented at the beginning of this paper.

On January 18, 1990 (six and a half years after the original complaint was filed) a Los Angeles Superior Court jury acquitted Peggy McMartin Buckey, and Raymond Buckey on 52 criminal

counts and found themselves deadlocked on 13 counts against Mr. Buckey. After the trial seven jurors admitted that although they acquitted the defendants they felt that at least some of the preschoolers had been molested. The position of the jurors was presented in a recent news article.

'Some children were molested somewhere,' says juror Brenda Williams, 'but the prosecution never proved it was Ray.' Foreman (of the jury) Luis Chang agrees. 'What it all comes down to was the lack of a smoking gun,'...'we felt there was evidence of molestation in some cases, but that by and large we really don't know if the children's remarks were true or if they were being led by some adults. There's some truth in there somewhere, but we couldn't find it.' ( Schindehette et al., 1990, p.75).

The tragedy of the McMartin case and the need for legal system reforms was reported in a Time magazine article on the case,

If the McMartin children were not robbed of their innocence by sexual abuse, it was stolen from them by a legal system that took more than six years to bring this case to a conclusion. One child witness was four when the abuse allegedly occurred, seven when she first told a social worker about it, eight when she told her story to grand jury, ten when she told it to a judge and eleven when she finally told it to the jury that rendered its verdict last Thursday. Perhaps the only thing of value that has come out of this case is the determination to ensure that such a fiasco can never occur again (Carlson, 1990, pp. 26-27).



## APPENDICES

Appendix A

Whipple's Review of the European Literature on Eyewitness  
Reports as Reported in Psychological Bulletin  
Articles (1909-1917).

Whipple's Review of the European Literature on Eyewitness  
Reports as Reported in Psychological Bulletin  
Articles (1909-1917).

English

- Arnold, G. F. (1913). Psychology Applied to Legal Evidence.  
Calcutta: Thacker, Pink & Co., xi & 607.
- Cattell, J. (1895). Measurements of the accuracy of recollection.  
Science, N. S., 2, 761-766.
- Dallenbach, K. M. (1913). The Relation of Memory Error to Time-  
Interval. Psychol. Rev., 20, 323-337.
- DuBois, P. (1914). Some Observations on the Psychology of Jurors  
and Juries. Proc. Amer. Phil. Soc., 53, 307-322.
- Feingold, G. A. (1914). The Influence of Environment on  
Identification of Persons and Things. J. of Crim. Law and  
Criminol., 5, 39-51.
- Franklin, F. (1908). Should psychology supervise testimony? Pop.  
Sci. Mo., 72, May, 465-474.
- Lipmann, O. (1911). Pedagogical Psychology of Report. J. of Educ.  
Psychol., 2, 253-261.
- Menzerath, P. (1913). The Association Method in Criminal  
Procedure. Jour. Crim. Law and Criminology, 4, 58-66.
- Moore, C. (1908). Psychology in the Courts. Law Notes, 11, Jan.,  
185-187.
- Moore, C. (1907). Yellow Psychology. Law Notes, 11, Oct., 125-

127.

Münsterberg, H. (1908). On the Witness Stand. New York, 265.

Münsterberg, H. (1907). Yellow Psychology. Law Notes, 11, Nov., 145-146.

Wigmore, J. H. (1913). The Principles of Judicial Proof. Boston: Little, Brown & Co., xvi & 1179.

Winch, W. H. (1913). German 'Aussage' Experiments with English school children. First Intern. Cong. Pedology, 2, 344-354.

#### French

Binet, A., & Henri, V. (1894). Mémoire des phrases. L'Année Psych., 1, 24-60.

Binet, A. (1897). Psychologie individuelle. La description d'un objet. L'Année Psych., 3, 296-332.

Binet, A. (1900). La Suggestibilité, Paris, 391.

Binet, A. (1905). La science du témoignage. L'Année Psych., 11, 128-137.

Binet, A. (1911). Le bilan de la psychologie en 1910. Année psycho., 17, v-xi.

Borst, M. (1904). Recherches exp'tiles sur l'éducabilité et la fidélité du témoignage. Arch de Psych., 3.

Borst, M. & Claparède, E. (1904). La fidélité et l'éducabilité du témoignage. Arch. des sciences physiques et naturelles. Avril.

Claparède, E. (1906). Expériences sur le témoignage: témoignage simple; appréciation; confrontation. Arch. de Psych., 5, 344-

387.

Claperède, E. (1906). La psychologie judiciaire. L'Année Psych., 12, 275-302.

Duprée, E. (1910). Le témoignage: étude psychologique et médico-legale. Rev. d. deux Mondes. 55, 343-370.

Larguier des Bancel, J. (1906). La psychologie judiciaire: le témoignage. L'Année Psych., 12, 157-232.

Lelesz, H. (1914) L'orientation d'esprit dans le Témoignage. Arch. de Psych., 14, 113-157.

Phillippe, J. (1903). L'image mentale. Paris, 148.

Vardendonck, J. (1911). Les Témoignages d'Enfants dans un Procès Retentissant. Arch. de Psychol., 11, 129, 171.

#### German

Altmann. (1915). Zum Kapitel Zeugenaussagen, Arch. f. Krim.-Anthrop. u. Kriminalistik, 62, 178-179.

Baade, W. (1911). Aussage über physikalische Demonstrationen. (Mit besonderer Berücksichtigung der Frage der Erziehbarkeit der Aussage). 1 Abh. Die Methodik der Versuche u. die Inhalte der Textaussagen. Zsch. f. angew. Psychol., 4, 189-311.

Babinsky, A. (1910). Die Kinderaussage vor Gericht. Berlin, 41.

Basch, O. (1913). Von den Zeugen des mündlichen Testaments, ein Beitrag zur Psychologie de. Zeugenaussagen. Zsch. f. angew. Psychol., 7, 94-96.

Beneckendorff V. & Hindenburg, V. (1913). Ein Beitrag zur

- Psychologie der Zeugenaussagen. Recht und Wirtschaft, 2, 80-82.
- Bénussi, V. (1914). Die Atmungssymptome der Lüge. Arch. f. d. ges. Psychol., 31, 244-273.
- Boden, F. (1913). Die Psychologie der Aussage. Monats. f. Kriminalpsychol., 9, 668-693.
- Boden. (1914). Ein zivilprozessualer Aussageversuch. Arch. f. d. ges. Psychol., 32, 257-280.
- Dauber, J. (1912). Die Gleichförmigkeit des psychischen Geschehens und die Zeugenaussagen. Fortschr. d. Psychol., 1, 83-131.
- De Placzek. (1904). Exp. Untersuchungen über d. Zeugenaussagen Schwachsinniger. Gross' Archiv f. Kriminalanthropologie, 13, 22-63.
- Dürr-Borst, Marie. (1906). Die Erziehung der Aussage und Anschauung des Schulkindes. Die exp. Pädagogik, 3, 1-30.
- Franken, A. (1911). Ueber die Erziehbarkeit der Erinnerungsaussage bei Schulkindern. Zsch. f. päd. Psychol. u. exp. Pädag., 12, Hft. 12, 635-642.
- Franken, A. (1912). Aussageversuche nach der Methode der Entscheidungs- und Bestimmungsfrage bei Erwachsenen und Kindern. Zsch. f. angew. Psychol., 6, 174-253.
- Friedrich, J. (1914). Ein neuer Weg zur Fortbildung der Juristen. Zsch. f. angew. Psychol., 8, 370-373.

- Gerland, H. B. (1910). Zur Frage der Zeugenaussage. H. Gross' Archiv, 39, 116-119.
- Gmelin, J. G. (1909). Zur Psychologie der Aussage: ein Vortrag mit einem Anhang: Zur gesetzlichen Beseitigung des Zeugeneids. Hannover, 98.
- Gregor, A. (1910). Beiträge zur Psychologie der Aussage von Geisteskranken. Monats. f. Psychiatr. u. Neur., 28, 290-304, 428-473.
- Gross, H. (1897). Kriminalpsychologie. (2d ed., 1905), Leipzig.
- Gross, H. (1902). Das Wahrnehmungsproblem u. d. Zeuge im Strafprozess. Arch. f. Strafrecht u. Strafprozess, 49, Hft. 3-5.
- Gross, H. (1910). Zur Frage der Zeugenaussage. H. Gross' Archiv, 36, 372-382.
- Gross, H. (1915). Die "Zone des Schweigens." Arch. f. Krim.-Anthrop. u. Kriminalistik, 63, 241-245.
- Gross, H. (1915). Erhaltung gefährdeter flacher Gegenstände. Arch. f. Krim.-Anthrop. u. Kriminalistik, 63, 87-90.
- Gross, H. (1915). Vergleichen von gefärbten Flächen. Arch. f. Krim.-Anthrop. u. Kriminalistik, 63, 87.
- Hegge, T. G. (1912). Zur Frage der Bewertung von Aussagen bei Bildversuchen. Zsch. f. angew. Psychol., 6, 51-59.
- Heindl, R. (1909). Die Zuverlässigkeit von Signalamentaussagen. H. Gross' Archiv, 33, 109-132.
- Henning, H. (1914). Doppelassociation und Tatbestandsermittlung.

Arch. f. Krim.-Anthrop. u. Kriminalistik, 59, 75-83.

Kármán, E. v. (1913). Kriminalistische Beiträge. III. Kinder als Zeugen. H. Gross' Archiv, 50, 231-240.

Kármán, E. v. (1915). Ein Schema zur Psychologie der Zeugenaussage. Arch. f. Krim.-Anthrop. u. Kriminalistik, 61, 167-173.

Kobler. (1914). Ein rechtspsychologisches Experiment. Zsch. f. angew. Psychol., 8, 317-325.

Lipmann, O. (1911). Aussage über physikalische Demonstrationen. (Mit besonderer Berücksichtigung der Frage der Erziehbarkeit der Aussage). 2 Abh. Die Schätzungen u. d. Ergebnisse der Farben-, Lokalisations- u. Sukzessionsfragen. Zsch. f. angew. Psychol., 4, 312-334.

Lipmann, O. (1904). Neuere Arbeiten zur Psychologie der Aussage: Sammelbericht. Journ. f. Psych. u. Neurologie, 3, 245-249.

Lipmann, O. (1906). Die Wirkung der Suggestivfragen. Zeits. f. päd. Psych., 8, 89-96.

Lipmann, O. Praktische Ergebnisse der Aussageforschung. Zeits. f. päd. Psych., 97-103.

Lipmann, O. (1907-8). Die Wirkung v. Suggestivfragen. Zeits. f. angew. Psych., 1, 44-92, 382-415, 504-546.

Lobsien, M. (1904). Ueber Psych. der Aussage. Zeits. f. päd. Psych., 6, 161-209.

Lotz, K. (1915). Zur Aussagepsychologie. Zsch. f. angew. Psychol.,



9, 515-518.

Mach, V. (1913). Ein Beitrag zur Psychologie der Zeugenaussagen.

Arch. f. Krim.-Anthrop. u. Kriminalistik, 51, 273-280.

Marbe, K. (1913). Kinderaussagen in einem Sittlichkeitsprozess.

Fortschr. d. Psychol., 1, 375-396.

Marbe, K. (1913). Psychologische Gutachten zum Prozess wegen

des Müllheimer Eisnebahnunglücks. Fortschr. d. Psychol., 1, 339-374.

Maurer, L. (1903). Beobachtungen über das Anschauungsvermögen

der Kinder. Zeits. f. päd. Psych., 5, 62-85.

Mehl. (1912). Beitrag zur Psychologie der Kinderaussage. Arch. f.

Krim.-Anthrop. u. Kriminalistik, 49, 193.

Mothes, R. (1914). Zur Psychologie der bewusst unwahren

Zeugenaussage. H. Gross' Arch., 56, 242-245.

Näcke, P. (1911). Wert des Zeugnisses von Normalen. Arch. f.

Krim.-Anthrop. u. Kriminalistik, 45, 164.

Näcke, P. (1913). Glaubwürdigkeit der Aussagen Trunkener. H.

Gross' Arch., 55, 354-355.

Oppenheim, R. (1911). Zur Psychologie des Gerüchtes. Zsch. f.

angew. Psychol., 5, 344-355.

Petschek. (1912). Zum Kapitel "Auzenzeugen." Arch. f. Krim.-

Anthrop. u. Kriminalistik, 45, 164.

Pick, A. (1914). Pathologische Beiträge zur Psychologie der

Aussage. H. Gross' Arch., 57, 193-215.

- Reichel, H. (1910). Ueber forensische Psychologie. München: Bech, 64.
- Schneickert, H. (1911). Kinematographische Tatbestandsaufnahmen. Arch. f. Krim.-Anthrop. u. Kriminalistik, 41, 354-355.
- Schramm, F. (1911). Zur Aussagetreue der Geschlechter. Zsch. f. angew. Psychol., 5, 355-357.
- Schultz, G. (1913). Zur Aussagepsychologie. Zsch. f. angew. Psychol., 7, 547-574.
- Sommer. (1905). Die Forschungen zur Psych. d. Aussage. Halle.
- Stern, C. & W. (1909). Erinnerung u. Lüge in der ersten Kindheit. Leipzig: Barth, 160.
- Stern, L. W. (1902). Zur Psych. d. Aussage. Exp. Untersuchungen über Erinnerungstreue. Zeits. f. d. ges. Strafrechtswissenschaft, 22.
- Stern, L. W. (1907-8). Literatur zur Psych. d. Aussage. Zeits. f. angew. Psych., 1, 429-450.
- Stern, W. (1911). Bibliographie zur Psychologie der Aussage, 1908-1910. Zsch. f. angew. Psychol., 4, 378-381.
- Stern, W. (1913). Psychologie der Aussage, 1911-13. (Sammelbericht). Zsch. f. angew. Psychol., 7, 577-596.
- Stöhr, A. Psychologie der Aussage. (Bd. 9-10 der Sammlung "Das Recht," hrg. von F. Kobler.) Berlin: Puttkammer & Mühlbrecht.
- Storch, A. (1913). Aussageversuche als Beitrag zur Psychologie

manischer und depressiver Zustände. Zsch. f. Pathopsychol., 2, 382-444.

Sturm, F. Zur Lehre vom psychologischen Beweise im Civil- und Strafverfahren. Monat. f. Kriminalpsychol., 8, 566-581.

Sturm, F. (1913). Die juristische Beweislehre. H. Gross' Archiv., 51, 119-136.

Türkel, S. (1914). Kinderaussagen. H. Gross' Archiv., 56, 368.

Türkel, S. (1914). Ein Beitrag zur Psychologie der Zeugenaussage. H. Gross' Archiv., 57, 279-281.

Vos, H. B. L. (1911). Beiträge zur Psychologie der Aussage bei Schulkindern. Analyse d. Aussage über eine gehörte Erzählung. Amsterdam: dissertation.

Weber, L. W. (1913). Ueber normales und pathologisches Lügen. Zsch. f. päd. Psychol., 14, 18-29.

Wreschner, A. (1905). Zur Psych. d. Aussage. Arch f. d. ges. Psych., 1, 148-183.

#### Italian

Fiore, U. (1912). Saggio di psicologia della testimonianza. Psiche, 1, 337-362.

Fiore, U. (1913). Ricerche di psicologia giudiziaria. Riv. di Psicol., 9, 169-177.

Appendix B

List and Example of Stern's Classification System

Stern's Classification System as Cited in Whipple (1909, p. 158)

To illustrate suppose there was a picture of a dog but no cat:

1. Determinative question: Least suggestive form of the question and is introduced by a pronoun or interrogatory adverb, e.g., "What color is the dog?"
2. Completely disjunctive question: A question in which the subject is forced to choose between two specific alternatives, e.g., "Is there a dog in the picture?"
3. Incompletely disjunctive question: This offers the subjects a choice between two alternative, but it does not preclude other possibilities, e.g., "Is the dog white or black?" This does not preclude the possibility of the dog being brown or red.
4. Expectative question: A question used to induce "moderate" suggestion, e.g., "Was there not a dog in the picture?"
5. Implicative question: One which assumes or implies that an object or feature which was absent was present, e.g., "What color is the cat?"
6. Consecutive questions: Consecutive question which is used to add to the suggestion implied by the previous question.

Appendix C  
Simon Says Script

Child is taken from classroom and brought into the experimental room by the female experimenter. They are then introduced to the confederate by the female stating "This is a man with whom who are going to play a game, I'll be back to get you after you are finished."

\_\_\_ "Hi my name is Randy Akers."

\_\_\_ "What is your name?"

\_\_\_ "How old are you?"

\_\_\_ "What grade are you in?"

\_\_\_ "Today we are going to play a game called Simon Says. Have you ever played this game?"

\_\_\_ "Well let's go over the rules to make sure we both remember them."

\_\_\_ "I am going to tell you a lot of fun things to do. Sometimes I will tell you "Simon Says" touch your nose. Sometimes I will just say touch your nose. The only time you are to do what I tell you is when I start with Simon Says. Do understand?"

\_\_\_ "Well let's say I tell you that "Simon Says" jump up and down, you would do this because Simon told you to. But if I just said "Jump up and down." don't do it because it is a trick because Simon didn't tell you to do it. Remember only do things when Simon tells you to. O.K.? Now let's try one for practice."

\_\_\_ "Simon Says: Touch your nose." [If the child did this

correctly you would say "Yes You did that right. You touched your nose because Simon told you to." If the child did this incorrectly you would correct the problem by stating "You forgot to touch your nose when Simon told you to."]

\_\_\_ "Simon Says: Stick out your tongue." [Repeat procedures above for successes/failures]

\_\_\_ "Blink your eyes." [If the child did this correctly say "Very good. I couldn't trick you. You didn't blink your eyes because Simon didn't say so." If the child did this incorrectly you would say "Oops, I tricked you. You blinked your eyes but Simon didn't tell you to."]

\_\_\_ "Now we are ready to begin the game, do you have any questions? Are you ready? Remember only do what Simon tell you to do."

NOTE: WAIT 5 SECONDS BEFORE PROCEEDING ON TO NEXT ITEM.

\_\_\_ "Simon Says: Stand on one foot." 1,2,3,4,5 (count silently to self)

\_\_\_ "Simon Says: Clap your hands." 1,2,3,4,5

\_\_\_ "Touch your nose." 1,2,3,4,5

\_\_\_ "Simon Says: Jump as high as you can." 1,2,3,4,5

\_\_\_ "Shout your name." 1,2,3,4,5

\_\_\_ "Simon Says: Run around the room." 1,2,3,4,5



- \_\_\_ "Simon Says: Touch your toes." 1,2,3,4,5
- \_\_\_ "Simon Says: Sit on the floor." 1,2,3,4,5
- \_\_\_ "Stick out your tongue." 1,2,3,4,5
- \_\_\_ "Do this: (Put your index finger on your head, do not say anything just do this motion)." 1,2,3,4,5
- \_\_\_ "You are doing a great job! We are almost done."
- \_\_\_ "Simon Says: Go like this (move arm in circular motion)."  
1,2,3,4,5
- \_\_\_ "Do this: (touch chin, silently touch chin)." 1,2,3,4,5
- \_\_\_ "Do this: (pat head, silently pat head)." 1,2,3,4,5
- \_\_\_ "Simon Says: Kick your leg." 1,2,3,4,5
- \_\_\_ "Simon Says: Close your eyes." 1,2,3,4,5
- \_\_\_ "Simon Says: Touch your nose." 1,2,3,4,5
- \_\_\_ "Touch your hair." 1,2,3,4,5
- \_\_\_ "Sit on the floor." 1,2,3,4,5
- \_\_\_ "Simon Says: Touch your knee." 1,2,3,4,5
- \_\_\_ "Point to your eyes." 1,2,3,4,5

When the confederate finished the game he was instructed to sit silently and look at his script without talking to the child, to control for the amount of interaction each child had with him.

After exactly five minutes were up the female experimenter went and opened up the experimental room's door and asked the

children to come with her. She then closed the door and left to take the child to another room to give them the objective questionnaire and take their free recalls. The male confederate remained seated during this interaction between the female experimenter and the child.

Appendix D

Comparison of Leading and Nonleading Questions

And Rationale for Each Question

A comparison of leading and nonleading questions and an explanation and rationalization for the leading questions.

NL =Nonleading questions

L= leading questions

NL 1. Did the man wear glasses? NO

L 1. Did the man touch his glasses? NO

Explanation: The confederate was not wearing glasses during the game. The nonleading question assessed the children's memory for the presence or absence of glasses. The leading question presumed that the confederate was wearing glasses and asked the child if the man touched his glasses during the course of the game. Goodman and Reed (1986) included similar questions in their experiment. For example the confederate in their experiment was not wearing a watch, their nonleading question asked, " Was the man wearing a watch." Their leading question presumed the presence of watch by asking, "Was the man wearing a watch on his right or left hand" (p. 330).

NL 2. Was there a clock in the room? NO

L 2. Did you see the clock in the room? NO

Explanation: There was not a clock in the room. Loftus and Zanni (1974) found that questions containing the definite article (the) produced more suggestibility than questions containing the indefinite article. Other studies have found similar results (Dale

et al., 1978; Muscio, 1915). According to Loftus and Zanni the question "was there a clock in the room?" asks two questions: (1) was there a clock? and (2) if there was one, did you see it? Whereas the question "did you see the clock in the room" presumes there was a clock in the room and merely asks the subject if they happened to take notice of this item.

NL 3. Was the man nice? YES

L 3. The man was mean wasn't he? NO

Explanation: All of the children enjoyed the game and the confederate was very nice to them. The purpose of this question was to determine if the children's perception of the confederate and his actions could be changed by the experimenter suggesting information which was contrary to their experience of the confederate.

NL 4. Did you do this? (sit on the chair and move legs up and down) NO

L 4. The man had you do this didn't he? (sit on the chair and move legs up and down) NO

Explanation: The children did not perform the above action. The form of the above inquiry was based upon a similar question form used in the Goodman and Reed (1986) study. The purpose of this question was to assess the impact of nonverbal form of

questioning on the children.

NL 5. Was there a book on the table? NO

L 5. Was the book on the table big? NO

Explanation: There were not any books on the table. The rationale for this question is similar to the rationale provided for question number two. Specifically this question investigated the impact of varying the form of the article from the indefinite to the definite form. Also a specific detail about the nonexistent article (it was big) was also provided to further lead the subjects. Goodman and Reed (1986) employed similar questions in their experiment.

NL 6. Was the man's name Roger? NO

L 6. Did Roger tell you how old he was? NO

Explanation: The confederate's name was Randy not Roger. The nonleading form of the question assessed if the name of the confederate was Roger. The leading form of the question assumed that the confederate's name was Roger and it asked the children if Roger told them his age. The purpose of the leading question was to determine if children who were told that the man's name was Roger on the immediate objective test were more likely to affirm the nonleading form of the question ( Was the man's name Roger?) given after a week's delay than the

children who were given only the nonleading form of the questionnaire on both the immediate and delayed test.

NL 7. Did the man close the door as he left the room? NO

L 7. Did the man slam the door as he left the room? NO

Explanation: The confederate did not go anywhere near the door as the children left the room. He remained seated while the female experimenter assisted the subjects from the room and she shut the door. Loftus and Palmer (1974) found that changes in verbs systematically affected witness's ability to resist suggested misleading information. They found that when they asked witnesses who viewed a film of an automobile accident to estimate the speed of the cars that the verb "smashed" produced higher estimations of speed than the verbs "collided, bumped, contacted or hit." They also found that subjects who received the smashed verb were more likely to affirm seeing nonexistent broken glass than subjects who received the other verbs. The Marin et al. (1979) study employed the same question form as the one described in the current study.

NL 8. Did you do this? (make a sad face) NO

L 8. The man had you do this, didn't he? (make a sad face) NO

Explanation: The children did not make a sad face. The rationale for this question is the same as the rationale provided for

question number four.

NL 9. Did you stomp your feet? NO

L 9. You didn't get a chance to stomp your feet, did you? NO

Explanation: The children did not stomp their feet. So the leading question actually provided correct information. This question was developed to assess the children's degree of oppositional behavior. If the children were oppositional they may have disagreed with the leading question, despite the correct information that this question provided.

Goodman and Reed (1986) also used a similar question form to determine if the subjects developed a response bias and automatically contradicted any information provided by leading questions (i.e., subjects would disagree with the leading question and state that they did stomp their feet just because they were accustomed to resisting the misleading information provided by the experimenter). They hypothesized that subjects may develop a bias to answer suggestive questions contrary to the suggestion.

G 10. Did you do this? (move arms in a circular motion?) YES

G 10. You didn't have a chance to do this, did you? (move arms in a circular motion?) YES

Explanation: The children did perform the above action. The



leading question suggests to the children that they did not perform an action that in reality they did. The rationale for this question is similar to the rationale provided for question four and eight. Unlike questions four eight the present leading question is different because it asks the children to agree that they did not perform a real activity instead of agreeing that they performed an imaginary activity.

Appendix E

Nonleading Form of Yes/No Questionnaire

Practice Questions

"Now I am going to ask you some questions about the game you just played.

I want you to try to answer the questions as best you can. Take your time

and think before you answer me. Let's try a few questions for practice."

1. Are you a boy?
2. Are you a girl?
3. Am I a boy?
4. Am I a girl?
5. Am I your teacher?

"Very good, those are the types of questions you will be answering. Remember to try to do your very best."

Questions with Correct Answers

M= questions pertaining to the man with whom the children played the game (N=7).

G= questions concerning the game (N=8).

R= questions pertaining to the experimental room (N=6).

- M 1. Did the man wear glasses? NO
- R 2. Was there a clock in the room? NO
- M 3. Was the man nice? YES
- G 4. Did you do this? (sit on the chair and move legs up and

down) NO

R 5. Was there a book on the table? NO

M 6. Was the man's name Roger? NO

M 7. Did the man close the door as he left the room? NO

G 8. Did you do this? (make a sad face) NO

G 9. Did you stomp your feet? NO

G 10. Did you do this? (move arms in a circular motion?) YES

G 11. Was the game you played called "Simon Says?" YES

M 12. Did the man have brown hair? YES

M 13. Was the man wearing blue jeans? NO

M 14. Did the man have black shiny shoes on? YES

R 15. Were the curtains/windows in the room closed/open? YES

G 16. Did you do this? (put index finger to head and hold it) NO

R 17. Was there a radio in the room? NO

R 18. Was the chair in the room \_\_\_\_ (correct color varied)?

YES

G 19. Did you touch your nose? YES

G 20. Did you clap your hands? YES

"Now try and tell me anything else that you can remember about the game you just played."

Appendix F

Leading Form of Yes/No Questionnaire

Practice Questions

"Now I am going to ask you some questions about the game you just played.

I want you to try to answer the questions as best you can. Take your time

and think before you answer me. Let's try a few questions for practice."

1. Are you a boy?
2. Are you a girl?
3. Am I a boy?
4. Am I a girl?
5. Am I your teacher?

"Very good, those are the types of questions you will be answering. Remember to try to do your very best."

Questions with Correct Answers

M= questions pertaining to the man with whom the children played the game (N=7).

G= questions concerning the game (N=8).

R= questions pertaining to the experimental room (N=6).

Questions 1-10 are leading.

- M 1. Did the man touch his glasses? NO
- R 2. Did you see the clock in the room? NO
- M 3. The man was mean wasn't he? NO
- G 4. The man had you do this didn't he? (sit on the chair and

- move legs up and down) NO
- R 5. Was the book on the table big? NO
- M 6. Did Roger tell you how old he was? NO
- M 7. Did the man slam the door as he left the room? NO
- G 8. The man had you do this, didn't he? (make a sad face) NO
- G 9. You didn't get a chance to stomp your feet, did you? NO
- G 10. You didn't have a chance to do this, did you? (move arms in a circular motion?) YES
- G 11. Was the game you played called "Simon Says?" YES
- M 12. Did the man have brown hair? YES
- M 13. Was the man wearing blue jeans? NO
- M 14. Did the man have black shiny shoes on? YES
- R 15. Were the curtains/windows in the room closed/open? YES
- G 16. Did you do this? (put index finger to head and hold it) NO
- R 17. Was there a radio in the room? NO
- R 18. Was the chair in the room \_\_\_\_\_ (correct color varied)?  
YES
- G 19. Did you touch your nose? YES
- G 20. Did you clap your hands? YES

"Now try and tell me anything else that you can remember about the game you just played."

Appendix G

Scoring Criteria for the Confederate



Coding Scheme for Information about the Confederate

1. Age: 28
2. Height: 6 feet 2 inches
3. Weight: 210
4. Eye color: bright blue
5. Hair color: light to medium brown
6. Length of hair: very short
7. Hair style: parted on the left side
8. Voice: deep and loud
9. Accent: very southern
10. Teeth: slightly misaligned
11. Special identifiers on face: mole below and slightly to the right of nose.
12. Watch: gold with round face worn on left hand
13. Rings: none
14. Sweater: dark blue, long sleeves, double knit, v-neck, dark blue patches on the elbows and shoulders.
15. Shirt: worn under sweater, light blue, short sleeves, button up the front, white buttons, first one was unbuttoned.
16. Tie: none
17. Pants: dark blue dress pants, double knit.
18. Belt: dark blue with a silver buckle.
19. Socks: black.
20. Shoes: size 12, black patent leather with a high gloss.

21. Shoe strings: black and normal length.

Appendix H

Five Factors the United States Supreme Court  
Uses to Determine the Reliability of Eyewitness  
Identifications as per the *Neil v. Biggers* Case

*Neil v. Biggers* Criteria as cited in Wells and Murray (1983, p. 348).

- 1). The opportunity of the witness to view the criminal, at the time of the crime.
- 2). The witness' degree of attention.
- 3). The accuracy of the witness' prior description of the criminal.
- 4). The level of certainty demonstrated by the witness at the time of the confrontation.
- 5). The length of time between the crime and the confrontation.

[*Neil v. Biggers*, 409 U.S. 188 (1972), p.199].

Appendix I

Summary ANOVA Tables for the

Recall and Recognition Data

Table 20Summary ANOVA for the Mean Scoreson the Recognition Test for All Subjects

<u>Source</u>	<u>Sum of Squares</u>	<u>DF</u>	<u>Mean Square</u>	<u>F-Test</u>	<u>p</u>
Questionnaire Form (QF)	.88	1	.88	.15	.702
Age Group	165.17	1	165.17	27.79	under .001
QF x AG	2.45	1	2.45	.41	.523
WC Error	332.79	56	5.94		
Time	156.00	1	156.00	79.23	under .001
QF x Time	3.45	1	3.45	1.75	.191
AG x Time	18.41	1	18.41	9.35	.003
QF x AG x Time	.00	1	.00	.00	.968
WC Error	110.26	56	1.97		

Table 21

Summary ANOVA for the Mean Scores on the Recognition Test  
For Questions Pertaining to the Man With Whom  
the Simon Says Game Was Played for All Subjects

Source	Sum of Squares	DF	Mean Square	F-Test	p
Questionnaire Form (QF)	5.86	1	5.86	4.59	.037
Age Group	37.13	1	37.13	29.05	under .001
QF x AG	.98	1	.98	.77	.385
WC Error	71.57	56	1.28		
Time	11.41	1	11.41	22.71	under .001
QF x Time	2.59	1	2.59	5.16	.027
AG x Time	.03	1	.03	.06	.805
QF x AG x Time	.85	1	.85	1.69	.199
WC Error	28.15	56	.50		

Table 22Summary ANOVA for the Mean Scores on the Recognition TestFor Questions Pertaining to Simon Says Gamefor All Subjects

Source	Sum of Squares	DF	Mean Square	F-Test	p
Questionnaire Form (QF)	2.30	1	2.30	1.65	.205
Age Group	45.26	1	45.26	32.47	under .001
QF x AG	.55	1	.55	.40	.531
WC Error	78.05	56	1.39		
Time	51.01	1	51.01	76.51	under .001
QF x Time	.27	1	.27	.40	.529
AG x Time	5.19	1	5.19	7.79	.007
QF x AG x Time	.00	1	.00	.01	.935
WC Error	37.34	56	.67		



Table 23

Summary ANOVA for the Mean Scores on the Recognition Test  
For Questions Pertaining to the Room in which the Simon Says  
Game Was Played for All Subjects

Source	Sum of Squares	DF	Mean Square	F-Test	p
Questionnaire Form (QF)	.00	1	.00	.00	.980
Age Group	.00	1	.00	.00	.980
QF x AG	3.28	1	3.28	2.12	.151
WC Error	86.83	56	1.55		
Time	3.88	1	3.88	7.38	.009
QF x Time	.59	1	.59	1.11	.296
AG x Time	3.37	1	3.37	6.41	.014
QF x AG x Time	1.09	1	1.09	2.08	.155
WC Error	29.43	56	.53		

Table 24

Summary ANOVA for the Mean Scores on the First Ten Questions  
of the Recognition Test for All Subjects

<u>Source</u>	<u>Sum of Squares</u>	<u>DF</u>	<u>Mean Square</u>	<u>F-Test</u>	<u>p</u>
Questionnaire Form (QF)	.47	1	.47	.17	.682
Age Group	42.86	1	42.86	15.40	under .001
QF x AG	1.36	1	1.36	.49	.488
WC Error	155.90	56	2.78		
Time	96.03	1	96.03	70.35	under .001
QF x Time	4.81	1	4.81	3.52	.066
AG x Time	8.68	1	8.68	6.36	.015
QF x AG x Time	4.17	1	4.17	3.06	.086
WC Error	76.43	56	1.36		

Table 25

Summary ANOVA for the Mean Amount of Correct Information  
Recalled About the Man With Whom the Game Was Played  
for All Subjects

<u>Source</u>	<u>Sum of Squares</u>	<u>DF</u>	<u>Mean Square</u>	<u>F-Test</u>	<u>p</u>
Questionnaire Form (QF)	1.75	1	1.75	.42	.518
Age Group	113.72	1	113.72	27.50	under .000
QF x AG	.17	1	.17	.04	.840
WC Error	231.55	56	4.13		
Time	24.71	1	24.71	13.61	.001
QF x Time	1.43	1	1.43	.79	.379
AG x Time	5.89	1	5.89	3.25	.077
QF x AG x Time	4.52	1	4.52	2.49	.120
WC Error	101.66	56	1.82		

Table 26Summary ANOVA for the Mean Amount of Correct InformationRecalled About the Simon Says Game for All Subjects

<u>Source</u>	<u>Sum of Squares</u>	<u>DF</u>	<u>Mean Square</u>	<u>F-Test</u>	<u>p</u>
Questionnaire Form (QF)	3.90	1	3.90	1.23	.272
Age Group	2.21	1	2.21	.70	.407
QF x AG	13.66	1	13.66	4.31	.043
WC Error	177.69	56	3.17		
Time	10.58	1	10.58	3.51	.066
QF x Time	.78	1	.78	.26	.612
AG x Time	1.88	1	1.88	.62	.433
QF x AG x Time	17.04	1	17.04	5.66	.021
WC Error	168.59	56	3.01		

Table 27

Summary ANOVA for the Mean Amount of Total Correct  
Information Recalled for All Subjects

<u>Source</u>	<u>Sum of Squares</u>	<u>DF</u>	<u>Mean Square</u>	<u>F-Test</u>	<u>p</u>
Questionnaire Form (QF)	.00	1	.00	.00	.981
Age Group	162.20	1	162.20	20.96	.000
QF x AG	7.29	1	7.29	.94	.336
WC Error	433.42	56	7.74		
Time	58.38	1	58.38	11.84	.001
QF x Time	7.09	1	7.09	1.44	.235
AG x Time	2.69	1	2.69	.55	.463
QF x AG x Time	46.76	1	46.76	9.49	.003
WC Error	276.04	56	4.93		

Table 28Summary ANOVA for the Mean Amount of False InformationRecalled for All Subjects

<u>Source</u>	<u>Sum of Squares</u>	<u>DF</u>	<u>Mean Square</u>	<u>F-Test</u>	<u>p</u>
Questionnaire Form (QF)	.07	1	.07	.03	.871
Age Group	9.22	1	9.22	3.49	.067
QF x AG	6.19	1	6.19	2.34	.132
WC Error	148.05	56	2.64		
Time	21.52	1	21.52	13.05	.001
QF x Time	.02	1	.02	.01	.905
AG x Time	.75	1	.75	.46	.502
QF x AG x Time	13.09	1	13.09	7.93	.007
WC Error	92.35	56	1.65		

Table 29Summary ANOVA for the Mean Amount of Correct InformationRecalled About the Man With Whom the Game Was Playedfor All Subjects With a Correction for Accuracy

<u>Source</u>	<u>Sum of Squares</u>	<u>DF</u>	<u>Mean Square</u>	<u>F-Test</u>	<u>p</u>
Questionnaire Form (QF)	.11	1	.11	1.01	.321
Age Group	1.80	1	1.80	16.63	under .000
QF x AG	.01	1	.01	.12	.735
WC Error	4.66	43	.11		
Time	.00	1	.00	.00	.967
QF x Time	.23	1	.23	3.62	.064
AG x Time	.01	1	.01	.11	.741
QF x AG x Time	.01	1	.01	.21	.646
WC Error	2.70	43	.06		

Table 30Summary ANOVA for the Mean Amount of Correct InformationRecalled About the Simon Says Game for All SubjectsWith a Correction for Accuracy

<u>Source</u>	<u>Sum of Squares</u>	<u>DF</u>	<u>Mean Square</u>	<u>F-Test</u>	<u>p</u>
Questionnaire Form (QF)	.03	1	.03	1.09	.302
Age Group	.22	1	.22	6.94	.011
QF x AG	.05	1	.05	1.69	.198
WC Error	1.76	56	.03		
Time	.12	1	.12	6.17	.016
QF x Time	.00	1	.00	.08	.782
AG x Time	.00	1	.00	.00	.962
QF x AG x Time	.00	1	.00	.00	.961
WC Error	1.12	56	.02		



Table 31Summary ANOVA for the Mean Amount of Total CorrectInformation Recalled for All Subjects With a Correction forAccuracy

<u>Source</u>	<u>Sum of Squares</u>	<u>DF</u>	<u>Mean Square</u>	<u>F-Test</u>	<u>p</u>
Questionnaire Form (QF)	.00	1	.00	.00	.958
Age Group	.32	1	.32	8.07	.006
QF x AG	.06	1	.06	1.57	.215
WC Error	2.17	55	.04		
Time	.06	1	.06	2.48	.121
QF x Time	.00	1	.00	.02	.891
AG x Time	.02	1	.02	.66	.418
QF x AG x Time	.01	1	.01	.48	.489
WC Error	1.25	55	.02		

## REFERENCES

## References

- Bell, B.E., & Loftus, E.F. (1988). Degree of detail of eyewitness testimony and mock juror judgments. Journal of Applied Social Psychology, 18, 1171-1192.
- Bekerian, D.A., & Bowers, J.M. (1983). Eyewitness testimony: Were we misled? Journal of Experimental Psychology: Learning, Memory and Cognition, 9, 139-145.
- Berliner, L., & Barbieri, M.K. (1984). The testimony of the child victim of sexual assault. Journal of Social Issues, 40, 125-137.
- Binet, A. (1900). La Suggestibilite. Paris: Schleischer-Freres.
- Blaney, R.L., & Winograd, E. (1978). Developmental differences in children's recognition memory for faces. Developmental Psychology, 14, 441-442.
- Bowers, J.M., & Berkian, D.A. (1984). When will postevent information distort eyewitness testimony? Journal of Applied Psychology, 69, 466-472.
- Briggs, K.C., & Myers, I.B. (1976). Myers-Briggs Type Indicator Form E. Palo Alto: Consulting Psychologists Press.
- Brigham, J.C., Van Verst, M., & Bothwell, R.K. (1986). Accuracy of children's eyewitness identifications in a field setting. Basic and Applied Social Psychology, 7, 295-306.
- Brown, A.L., & Smiley, S.S. (1977). Rating the importance of

- structural units of prose passages: A problem of metacognitive development. Child Development, 48, 1-8.
- Buckhout, R., Alper, A. Chern, S. , Silverberg, G., & Slomovits, M. (1974). Determinants of eyewitness performance on a lineup. Bulletin of the Psychonomic Society, 4, 191-192.
- Burks, H.F. (1977). Burks' Behavior Rating Scales. Los Angeles: Western Psychological Services.
- Carlson, M. (1990). Six years of trial by torture: Children, defendants, jurors and judge were all abused in the wasteful McMartin case. Time, 135, 26-27.
- Carey, S., Diamond, R., & Woods, B. (1980). Development of face recognition -a maturational component? Developmental Psychology, 16, 257-269.
- Ceci, S.J., Ross, D.F., & Toglia, M.P. (1987a). Age differences in suggestibility: Narrowing the uncertainties. In S.J. Ceci, M.P. Toglia & D.F. Ross (Eds.), Children's Eyewitness Memory. New York: Springer-Verlag.
- Ceci, S.J., Ross, D.F., & Toglia, M.P. (1987b). Suggestibility of children's memory: Psycho-legal implications. Journal of Experimental Psychology: General, 116, 38-49.
- Chance, J.E., & Goldstein, A.G. (1984). Face-recognition memory: Implications for children's eyewitness testimony. Journal of Social Issues, 40, 69-85.
- Chance, J.E., Turner, A.L., & Goldstein, A.G. (1982). Development

of differential recognition for own- and other-race faces. Journal of Psychology, 112, 29-37.

Christiaansen, R.E., & Ochalek, K. (1983). Editing misleading information from memory: Evidence for the coexistence of original and postevent information. Memory and Cognition, 11, 467-475.

Christiaansen, R.E., Ochalek, K., & Sweeney, J. (1984). Individual differences in eyewitness memory and confidence judgments. The Journal of General Psychology, 110, 47-52.

Christiaansen, R.E., Sweeney, J. D., & Ochalek, K. (1983). Influencing eyewitness descriptions. Law and Human Behavior, 7, 59-65.

Clifford, B.R., & Scott, J. (1978). Individual and situational factors in eyewitness testimony. Journal of Applied Psychology, 63, 352-359.

Cohen, R.L., & Harnick, M.A. (1980). The susceptibility of child witnesses to suggestion. Law and Human Behavior, 4, 201-210.

Cole, C.B., & Loftus, E.F. (1987). The memory of children. In S.J. Ceci, M.P. Toglie & D.F. Ross (Eds.), Children's Eyewitness Memory. New York: Springer-Verlag.

Cross, J.F., Cross, J., & Daly, J. (1971). Sex, race, age, and beauty as factors in facial recognition. Perception and Psychophysics, 10, 393-396.

- Cunningham, J.L. (1988). Contributions to the history of psychology: XLVI. The pioneer work of Alfred Binet on children as eyewitnesses. Psychological Reports, 62, 271-277.
- Dale, P.S., Loftus, E.F., & Rathbun, L. (1978). The influence of the form of the question on the eyewitness testimony of preschool children. Journal of Psycholinguistic Research, 7, 269-277.
- Deffenbacher, K.A. (1980). Eyewitness accuracy and confidence: Can we infer anything about their relationship? Law and Human Behavior, 4, 243-260.
- Deffenbacher, K.A. (1983). The influence of arousal on reliability of testimony. In S.M.A. Lloyd-Bostock, and B.R. Clifford (Eds.), Evaluating Witness Evidence: Recent Psychological Research and New Perspectives. Chichester: John Wiley & Sons Ltd.
- Deffenbacher, K.A., Brown, E.L., & Sturgill, W. (1975). Some predictors of eyewitness memory accuracy. In M.M. Gruneberg, P.E. Morris, & R.N. Sykes (Eds.), Practical Aspects of Memory. London: Academic Press.
- Defferbacher, K.A., & Loftus, E.F. (1982). Do jurors share a common understanding concerning eyewitness behavior? Law and Human Behavior, 6, 15-30.
- Dent, H.R., & Stephenson, G.M. (1979). An experimental study of the effectiveness of different techniques of questioning child witnesses. British Journal of Social and Clinical Psychology, 18, 41-51.

- Diamond, R., & Carey, S. (1977). Developmental changes in the representation of faces. Journal of Experimental Child Psychology, 23, 1-22.
- Duncan, E.M., Whitney, P., & Kunen, S. (1982). Integration of visual and verbal information in children's memories. Child Development, 53, 1215-1223.
- Estabrooks, G.H. (1929). Experimental studies in suggestion. Journal of Genetic Psychology, 36, 120-139.
- Eysenck, H.J., & Eysenck, S.B.G. (1968). The Eysenck Personality Inventory. San Diego: Educational and Industrial Testing Services.
- Flavell, J.H., Speer, J.R., Green, F.L., & August, D.L. (1981). The development of comprehension monitoring and knowledge about communication. Monographs of the Society for Research in Child Development, 46, (Serial No. 192).
- Flin, R.H. (1980). Age effects in children's memory for unfamiliar faces. Developmental Psychology, 16, 373-374.
- Galper, R.E. (1973). 'Functional race membership' and recognition of faces. Perceptual and Motor Skills, 37, 455-462.
- Goetze, H.J. (1980). The effect of age and method of interview on the accuracy and completeness of eyewitness accounts. Unpublished doctoral dissertation, Hofstra University, Hempstead, N.Y.
- Goodman, G.S. (1984). Children's testimony in historical

- perspective. Journal of Social Issues, 40, 9-32.
- Goodman, G.S., Aman, C., & Hirschman, J. (1987). Child sexual and physical abuse: Children's testimony. In S.J. Ceci, M.P. Toglie & D.F. Ross (Eds.), Children's Eyewitness Memory. New York: Springer-Verlag.
- Goodman, G.S., & Loftus, E.F. (1988). The relevance of expert testimony on eyewitness memory. Journal of Interpersonal Violence, 3, 115-121.
- Goodman, G.S., & Reed, R.S. (1986). Age differences in eyewitness testimony. Law and Human Behavior, 10, 317-332.
- Greene, E., Flynn, M.S., & Loftus, E.F. (1982). Inducing resistance to misleading information. Journal of Verbal Learning and Verbal Behavior, 21, 207-219.
- Gudjonsson, G.H. (1983). Suggestibility, intelligence, memory recall and personality: An experimental study. British Journal of Psychiatry, 142, 35-37.
- Gudjonsson, G.H. (1984). A new scale of interrogative suggestibility. Personality and Individual Differences, 5, 303-314.
- Gudjonsson, G.H., and Clark, N.K. (1986). A theoretical model of interrogative suggestibility. Social Behaviour, 1, 83-104.
- Hammes, K.M. (1986). The effects of text structure and reading ability on the spontaneous text lookbacks of college students. Unpublished master's thesis, University of North Dakota, Grand



Forks.

- Johnson, M.K., & Foley, M.A. (1984). Differentiating fact from fantasy: The reliability of children's memory. Journal of Social Issues, 40, 33-50.
- Kagan, J. (1965). Impulsive and reflective children: Significance of conceptual tempo. In J. Krumboltz (Ed.), Learning and the Educational Process. Chicago: Chicago Press.
- Kagan, J. (1966). Reflection-impulsivity. The generality and dynamics of conceptual tempo. Journal of Abnormal Psychology, 71, 17-24.
- King, M.A. (1984). An investigation of the eyewitness abilities of children. Unpublished doctoral dissertation, University of British Columbia, Vancouver, Canada.
- King, M.A., & Yuille, J.C. (1987). Suggestibility and the child witness. In S.J. Ceci, M.P. Toglie & D.F. Ross (Eds.), Children's Eyewitness Memory. New York: Springer-Verlag.
- Knight, G.P. (1984). A survey of some important techniques and issues in multiple regression. In D.E. Kieras & M.A. Just (Eds.), New Methods in Reading Comprehension Research. Hillsdale, NJ: Lawrence Erlbaum, 13-29.
- Lacayo, R. (1986). Hollywood tapes and testimony. Time, 128:24, 64.
- Leippe, M.R. (1980). Effects of integrative and memorial and cognitive processes on the correspondence of eyewitness

- accuracy and confidence. Law and Human Behavior, 4, 261-274.
- Leippe, M.R., Wells, G.L., & Ostrom, T.M. (1978). Crime seriousness as a determinant of eyewitness accuracy. Journal of Applied Psychology, 63, 345-351.
- Lindsay, R.C.L., & Wells, G.L. (1983). What do we really know about cross-race eyewitness identification? In S.M.A. Lloyd-Bostock, and B.R. Clifford (Eds.), Evaluating Witness Evidence: Recent Psychological Research and New Perspectives. Chichester: John Wiley & Sons Ltd.
- Lindsay, R.C.L., Wells, G.L., & Rumpel, C. (1981). Can people detect eyewitness identification accuracy within and across situations? Journal of Applied Psychology, 66, 79-89.
- Loftus, E.F. (1974). Reconstructing memory: The incredible eyewitness. Psychology Today, 8, 116-119.
- Loftus, E.F. (1975). Leading questions and the eyewitness report. Cognitive Psychology, 7, 560-572.
- Loftus, E.F. (1977). Shifting human color memory. Memory and Cognition, 5, 696-699.
- Loftus, E.F. (1978). Reconstructive memory processes in eyewitness testimony. In B.D. Sales (Ed.), Perspectives in Law and Psychology. New York: Plenum.
- Loftus, E.F. (1979). Eyewitness Testimony. Cambridge: Harvard University Press.
- Loftus, E.F. (1983). Silence is not golden. American

Psychologist, 38, 564-572.

Loftus, E.F. (1986a). Experimental psychologist as advocate or impartial educator. Law and Human Behavior, 10, 63-78.

Loftus, E.F. (1986b). Ten years in the life of an expert witness. Law and Human Behavior, 10, 241-263.

Loftus, E.F., & Davies, G.M. (1984). Distortions in the memory of children. Journal of Social Issues, 40, 51-67.

Loftus, E.F., & Greene, E. (1980). Warning: Even memory for faces may be contagious. Law and Human Behavior, 4, 323-334.

Loftus, E.F., Miller, D.G., & Burns, H.J. (1978). Semantic integration of verbal information into a visual memory. Journal of Experimental Psychology: Human Learning and Memory, 4, 19-31.

Loftus, E.F., & Palmer, J.C. (1974). Reconstruction of automobile destruction: An example of the interaction between language and memory. Journal of Verbal Learning and Verbal Behavior, 13, 585-589.

Loftus, E.F., Schooler, J.W., & Wagenaar, W. (1985). The fate of memory: Comment on McCloskey & Zaragoza. Journal of Experimental Psychology: General, 114, 375-380.

Loftus, E.F., & Zanni G. (1975). Eyewitness testimony: The influence of the wording of a question. Bulletin of the Psychonomic Society, 5, 86-88.

Malpass, R.S., & Devine, P.G. (1984). Research on suggestion in

- lineups and photospreads. In G.L. Wells & E.F. Loftus (Eds.), Eyewitness Testimony. New York: Cambridge University Press.
- Marin, B. V., Holmes, D., Guth, M., & Kovac, P. (1979). The potential of children as eyewitnesses. Law and Human Behavior, 3, 295-306.
- Markman, E. (1977). Realizing that you don't understand: A preliminary investigation. Child Development, 48, 986-992.
- Markman, E. (1979). Realizing that you don't understand: Elementary school children's awareness of inconsistencies. Child Development, 50, 643-655.
- Marquis, K.H., Marshall, J., & Oskamp, S. (1972). Testimony as a function of question form, atmosphere, and item difficulty. Journal of Applied Social Psychology, 2, 167-186.
- McCartney, K.A., & Nelson, K. (1981). Children's use of scripts in story recall. Discourse Processes, 4, 59-70.
- McCloskey, M., & Egeth, H.E. (1983a). Eyewitness identification: What can a psychologist tell a jury? American Psychologist, 38, 550-563.
- McCloskey, M., & Egeth, H.E. (1983b). A time to speak, or a time to keep silence? American Psychologist, 38, 573-575.
- McCloskey, M., Egeth, H.E., & McKenna, J. (1986). The experimental psychologist in court: The ethics of expert testimony. Law and Human Behavior, 10, 1-13.
- McCloskey, M., & Zaragoza, M. (1985a). Misleading postevent

- information and memory for events: Arguments and evidence against memory impairment hypothesis. Journal of Experimental Psychology: General, 114, 1-16.
- McCloskey, M., & Zaragoza, M. (1985b). Post event information and memory: Reply to Loftus, Schooler, and Wagenaar. Journal of Experimental Psychology: General, 114, 381-387.
- Messerschmidt, R. (1933). The suggestibility of boys and girls between the ages of six and sixteen years. Journal of Genetic Psychology, 43, 422-437.
- Muscio, B. (1915). The influence of the form of the question. British Journal of Psychology, 8, 351-389.
- Nie, N.H., Hull C.H., Jenkins, J.G., Steinbrenner, K., & Bent, D.H. (1975). Statistical Packages for the Social Sciences (2nd Edition). New York: McGraw-Hill.
- Pear, T.H., & Wyatt, S. (1914). The testimony of normal and mentally defective children. British Journal of Psychology, 3, 388-419.
- Peters, D.P. (1987). The impact of naturally occurring stress on children's memory. In S.J. Ceci, M.P. Toglie & D.F. Ross (Eds.), Children's Eyewitness Memory. New York: Springer-Verlag.
- Petros, T., Tabor, L., Cooney, T., & Chabot, R.J. (1983). Adult age differences in sensitivity to semantic structure of prose. Developmental Psychology, 19, 907-914.
- Powers, P.A., Andriks, J.L., & Loftus, E.F. (1979). Eyewitness

- accounts of females and males. Journal of Applied Psychology, 64, 339-347.
- Rosenthal, R., & Rosnow, R.L. (1984). Essential of Behavioral Research: Methods and Data Analysis. New York: McGraw-Hill.
- Rosenthal, R., & Rubin, D.B. (1989). Effect size estimation for one-sample multiple-choice-type data: Design, analysis, and meta-analysis. Psychological Bulletin, 106, 332-337.
- Rosnow, R.L., & Rosenthal, R. (1989). Statistical procedures and the justification of knowledge in psychological science. American Psychologist, 44, 1276-1284.
- Rotter, J.B. (1966). Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs: General and Applied, 80, 1-28.
- Sah, A.P. (1973). Perceptual suggestibility as a function of age, sex and education. Indian Journal of Experimental Psychology, 7, 21-25.
- Sarason, I.G., & Stoops, R. (1978). Test anxiety and the passage of time. Journal of Consulting and Clinical Psychology, 46, 102-109.
- Saywitz, M.S. (1977). Children's testimony: Age related patterns of memory errors. In S.J. Ceci, M.P. Toglie & D.F. Ross (Eds.), Children's Eyewitness Memory. New York: Springer-Verlag.
- Schindehette, S., Kelley, J., Bacon, D., Wohlfert, L., Micheli, R., & Tamarkin, C. (1990). After the verdict, solace for none:

- California's notorious McMartin case ends in acquittals, leaving a legacy of anger and anguish. People Weekly, 33, 70-80.
- Schooler, J.W., & Loftus, E.F. (1986). Individual differences and experimentation: Complementary approaches to interrogative suggestibility. Social Behaviour, 1, 105-112.
- Shapiro, P.N., & Penrod, S. (1986). Meta-analysis of facial identification studies. Psychological Bulletin, 100, 139-156.
- Siegel, J.M., & Loftus, E.F. (1978). Impact of anxiety and life stress upon eyewitness testimony. Bulletin of the Psychonomic Society, 12, 479-480.
- Small, M.H. (1896). The suggestibility of children. Pedagogical Seminary, 4, 176-220.
- Stern, W. (1910). Abstracts of lectures on the psychology of testimony and on the study of individuality. The American Journal of Psychology, 21, 270-282.
- Stern, W. (1939). The psychology of testimony. The Journal of Abnormal and Social Psychology, 34, 3-20.
- Thorndike, R.L., Hagen, E.P., & Sattler, J.H. (1986). The Stanford Binet Intelligence Scale-Fourth Edition. Chicago: Riverside Publishing Company.
- Tousignant, J.P., Hall, D., & Loftus, E.F. (1986). Discrepancy detection and vulnerability to misleading postevent information. Memory and Cognition, 14, 329-338.
- Turtle, J.W., & Wells, G.L. (1987). Setting the stage for

- psychological research on the child eyewitness. In S.J. Ceci, M.P. Toglia & D.F. Ross (Eds.), Children's Eyewitness Memory. New York: Springer-Verlag.
- Ward, R.A., & Loftus, E.F. (1986). Eyewitness performance in different psychological types. The Journal of General Psychology, 112, 191-200.
- Weinberg, H.I., Wadsworth, J., & Baron, R.S. (1983). Demand and the impact of leading questions on eyewitness testimony. Memory and Cognition, 11, 101-104.
- Wells, G.L. (1978). Applied eyewitness-testimony research: System variables and estimator variables. Journal of Personality and Social Psychology, 36, 1545-1557.
- Wells, G.L. (1984). The psychology of lineup identifications. Journal of Applied Social Psychology, 14, 89-103.
- Wells, G.L. (1986). Expert psychological testimony: Empirical and conceptual analyses of effects. Law and Human Behavior, 10, 83-95.
- Wells, G.L., Ferguson, T.J., & Lindsay, R.C.L. (1981). The tractability of eyewitness confidence and its implications for the triers of fact. Journal of Applied Psychology, 66, 688-696.
- Wells, G.L., & Leippe, M.R. (1981). How do the triers of fact infer the accuracy of eyewitness identifications? Using memory for peripheral details can be misleading. Journal of Applied Psychology, 66, 682-687.



- Wells, G.L., & Lindsay, R.C.L. (1980). On estimating the diagnosticity of eyewitness nonidentifications. Psychological Bulletin, 88, 776-784.
- Wells, G.L., & Murray, D.M. (1983). What can psychology say about Neil v. Biggers criteria for judging eyewitness accuracy? Journal of Applied Psychology, 68, 347-362.
- Wells, G.L., & Murray, D.M. (1984). Eyewitness confidence. In G.L. Wells, & E.F. Loftus (Eds.), Eyewitness Testimony: Psychological Perspectives. Cambridge: Cambridge University Press.
- Wells, G.L., & Turtle, J.W. (1987). Eyewitness testimony research: Current knowledge and emergent controversies. Canadian Journal of Behavioral Science, 19, 363-388.
- Whipple, G.M. (1909). The observer as reporter: A survey of the psychology of testimony. Psychological Bulletin, 6, 153-170.
- Whipple, G.M. (1911). The psychology of testimony. Psychological Bulletin, 8, 307-309.
- Whipple, G.M. (1912). Psychology of testimony and report. Psychological Bulletin, 9, 264-269.
- Whipple, G.M. (1913). Psychology of testimony and report. Psychological Bulletin, 10, 264-268.
- Whipple, G.M. (1914). Psychology of testimony and report. Psychological Bulletin, 11, 245-250.
- Whipple, G.M. (1915). Psychology of testimony. Psychological

Bulletin, 12, 221-224.

Whipple, G.M. (1917). Psychology of testimony. Psychological Bulletin, 14, 234-236.

Williams, M. (1968). A study of structure of intellect factors as determined by the Stanford-Binet and the ratings of kindergarten boys' behavior by parents and teachers on the Burks' Behavior Rating Scale. Unpublished master's thesis, University of Southern California.

Witkin, H.A., Oltman, P.K., Raskin, E., & Karp, S.A. (1971). A Manual for the Embedded Figures Test. Palo Alto: Consulting Psychologists Press.

Yarmey, A.D. (1979). The Psychology of Eyewitness Testimony. New York: Free Press.

Yuille, J.C. (1980). A critical examination of the psychological and practical implications of eyewitness research. Law and Human Behavior, 4, 335-345.

Zaragoza, M.S., McCloskey, M., & Jamis, M. (1987). Misleading postevent information and recall of the original event: Further evidence against the memory impairment hypothesis. Journal of Experimental Psychology: Learning, Memory, and Cognition, 13, 36-44.

Zuckerman, M., & Lubin, B. (1965). Manual for the Multiple Affect Adjective Checklist. San Diego: Educational and Industrial Testing Service.