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An Attempt to Reduce Guessing Behavior in Children's and Adults' Eyewitness Identifications*

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The effects of age of witness, gender of witness, lineup presentation, and practice on eyewitness testimony were investigated. Ninety-six elementary-school children and 96 college students viewed a slide sequence of a crime, followed by target-present or target-absent photo identification in sequentially or simultaneously presented lineups. Prior to photo identification, half the subjects received a practice lineup. Children had a higher rate of choosing than adults, resulting in more foil identification errors in both target-present and target-absent lineups. Without prior practice, sequential presentation as compared to simultaneous presentation reduced errors in target-absent lineups for adult witnesses and showed a similar but nonsignificant reduction for child witnesses. With prior practice, sequential presentation lost the advantage over simultaneous presentation in target-absent error reduction. Practice reduced target-absent errors in simultaneous-presentation lineups for both age groups.

Recently, there has been an upsurge in research issues related to the child witness (e.g., Ceci, Toglia, & Ross, 1987; Perry & Wrightsman, 1991; Spencer & Flin, 1991). Studies have focused on the basic memory capacity as well as the suggestibility and motivation of the child witness. Most studies investigating the eyewitness identification capabilities of children have shown that children above 6 years of age perform as well as adults in the number of correct identifications (e.g., Davies, Stevenson-Robb, & Flin, 1988; Marin, Holmes, Guth, & Kovac, 1979;

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Parker, Haverfield, & Baker-Thomas, 1986). On the other hand, several studies (Goodman, Hirschman, Hepps, & Rudy, 1991; Goodman & Reed, 1986; Peters, 1987) have demonstrated an inferiority in correct identifications for preschoolers. When target-absent lineups as well as target-present lineups are examined, a different picture of child eyewitnesses emerges. Parker and Carranza (1989) observed that 9-year-old children showed a more relaxed criterion and a greater tendency to guess than adults in target-absent lineups. Likewise, King and Yuille (1987) observed that children between 8 and 11 years made false identifications on a target-absent lineup 74% of the time, even when instructed that the target person might not be present. Raskin and Yuille (1989) have suggested that the presentation of a lineup creates an implicit demand on the child to pick someone. Although children appear to have a strong propensity to make a choice in these situations, such guessing behavior might be moderated when identifying strangers seen for longer durations and/or when identifying significant individuals in children's lives. Likewise, children might be more cautious when asked to identify individuals from a real crime.

The present study proposed to reduce guessing behavior in children's identification of a briefly viewed stranger by manipulating two system variables (Wells, 1978). First, the effects of simultaneous and sequential presentation of lineups were investigated. Sequential presentation involves the presentation of one lineup member at a time followed by a witness decision after each member. Simultaneous presentation involves the presentation of all lineup members at once, followed by only one witness decision. With adult witnesses, several studies (Cutler & Penrod, 1988; Lindsay, Lea, & Fulford, 1991; Lindsay & Wells, 1985; Melara, DeWitt-Rickards, & O'Brien, 1989; Sporer, 1990) have observed that sequential as compared to simultaneous presentation reduces the number of false identifications without altering correct identifications. Lindsay and Wells (1985) reasoned that the increase in false identifications in simultaneous-presentation lineups is a function of the tendency for eyewitnesses to make relative judgments and thus choose the lineup member who most looks like the perpetrator, relative to other lineup members. On the other hand, with sequential presentation, the eyewitnesses are forced to compare each lineup member to their recollection of the perpetrator, using an absolute standard of recognition rather than considering who most resembles the perpetrator.

The present study investigated whether children would use the same strategies as adults and also show a reduction in guessing with sequential presentation. Two previous studies with children have not observed a reduction with guessing when approximations to the sequential-presentation procedure have been used. In Goodman and Reed's (1986) "individual" condition, each picture was presented separately before the subject made a judgment, but there was only one decision made and all pictures were visible at the time of decision. Likewise, in Dent and Stephenson's Experiment 3 (1979), an individual-parade condition allowed members to be viewed one by one and subjects were told that they could see the lineup members as often as they wished. In both of these previous studies, subjects still could use a relative-judgment strategy rather than an absolute-judgment strategy, which researchers have found to be effective in reducing false identifi-

cations in adults. Furthermore, these manipulations occurred only in target-present lineups.

A second attempt to reduce guessing behavior in the present study involved the presentation of practice lineups so subjects could clearly see that sometimes the perpetrator was in the lineup and sometimes he was not. Prior to the photo-identification task, half the children and adults were presented two practice lineups, one containing and one not containing the interviewer's face. It was hypothesized that this practice task would make witnesses more comfortable with rejecting the photos in the identification task. Two previous studies with children (Davies et al., 1988; Goodman, Bottoms, Schwartz-Kenney, & Rudy, 1991) have found conflicting effects of practice on identification behavior. Goodman et al. found a reduction in false identifications with three practice trials but Davies et al. did not find a reduction with two practice trials. Practice in the Davies et al. experiment was similar to the present study, whereas practice in the Goodman et al. experiment incorporated two target-present lineups and one target-absent lineup. In Goodman et al.'s target-present lineups, children were asked to choose a familiar farm animal from a series of six animal pictures and the picture of the interviewer from a series of six women's pictures. In their target-absent lineup, children were asked to choose the picture of the child's mother from a series of six women's pictures. Age of children differed in the two studies, with Davies et al. examining 7- to 12-year-olds and Goodman et al. examining 3- to 7-year-olds. However, age cannot readily explain the difference in results across studies because it was the older, 5- to 7-year-olds in the Goodman et al. study who showed a significant improvement with practice, whereas the younger, 3- to 4-year-olds did not. Both studies introduced practice just prior to photo identification but either 2 weeks (Davies et al.) or 2 to 4 weeks (Goodman et al.) after the original event.

In an attempt to obtain the practice effect with the more efficient two trials, the present study used only two practice trials and accompanied these trials with substantial explanation and corrections to ensure that the subjects were aware of the implications of their choices. In the Davies et al. study, the children saw the experimenter remove her picture from the target-present lineup before the target-absent lineup was presented. In the present study, witnesses were not informed that the interviewer's picture would be removed from the second array. This latter procedure was more similar to the eventual lineup task which the witnesses would receive. In addition, practice was administered immediately after exposure to the crime rather than after 2- to 4-week delay. Finally, the present experiment investigated whether practice could be effective with 9-year-olds and also with more experienced adult subjects.

METHOD

Subjects and Design

Age of witness (child and adult) was factorially combined with practice (practice and control), type of lineup (target-present and target-absent), type of lineup

presentation (sequential and simultaneous), and gender of witness (male and female). All factors varied between subjects. Ninety-six college students from Florida International University (M = 24 years; range = 18 to 47 years) and 96 Miami, Florida, elementary school children (M = 9 years, 2 months; range = 8 years, 1 month to 11 years, 1 month) served as subjects. The subjects were assigned to conditions in blocks of 16, with one subject from each condition per block. The running order within blocks was determined by a table of random numbers with the restriction that the target-present and target-absent subjects of a particular condition be run simultaneously. The two subjects were separated by a portable screen so they could not see each other at the time of test.

Materials

Slide Sequences

Two slide sequences of 15 color slides each were constructed with three adult males and four adult females serving as actors (M = 24 years). Two additional males (21 and 26 years) served as the suspect in the crime, one for each slide sequence. In all slide sequences, the same scenario appeared. Basically, it involved a picnic scene at the park with young adults eating chips, drinking soda, and playing frisbee. On the 11th slide a male suspect enters and steals a radio from a blanket. The suspect is viewed in frontal view for three slides and in rear view for one.

Photograph Lineups

Lineups were composed of six 10.25 × 7.75 cm, black and white, head and shoulder, frontal-view photographs of the suspect or suspect-substitute and five distractors. Photographs were taken of 13 adult males (M = 24 years) who were chosen for their similarity in general appearance to one of the suspects. All were photographed in white T-shirts and with a serious expression. Eight adults rank-ordered the similarity of the distractors to one of the suspects and eight different adults did likewise for the remaining suspect. From these rankings, separate lineups were constructed for each suspect, with the middle level of similarity typically chosen. This resulted in four lineups: two lineups with different males as suspects and two lineups with different males as suspect-substitutes.

Practice lineups were composed of three 10.25 × 7.75 cm black and white, head and shoulder frontal-view photographs of the female interviewer or interviewer-substitute and two distractors. Three-person practice lineups were used instead of six-person lineups in order to equalize the retention interval from slide presentation to the bona fide photo identification, across lineup-presentation conditions. Pilot testing with six-person lineups showed that the retention interval in the sequential-presentation practice condition was longer than in the other conditions. Photographs were taken of adult females who were chosen for their similarity in age and general appearance to the interviewer. It was considered that the gender difference between practice lineups and actual lineups would help eliminate any potential interference. All were photographed in white T-shirts and with

a serious expression. Ten adults rank-ordered the similarity of the female distractors to the interviewer and two lineups were constructed, one with the interviewer present and one with the interviewer absent.

Lineup Characteristics

Measures of functional and effective size were used to determine lineup fairness (Malpass & Devine, 1983). Responses of 339 mock witnesses (Florida International University undergraduates) were used to compute the functional and effective sizes of all four lineups. After receiving a general description of the crime scene, mock witnesses were given particular information regarding the age, race, and body-build of the suspect. Each mock witness then viewed two slides: one with a suspect (target-present) and one with a suspect-substitute (target-absent). As there were two suspects and two suspect-substitutes, subjects never were presented a suspect lineup with the corresponding suspect-substitute lineup. The presentation order of target-present and target-absent lineups was counterbalanced, as was the position in which the suspect or suspect-substitute was placed in the lineup (Position 2 or Position 4). Subjects were instructed to choose who they thought committed the crime, or if they thought the suspect was not present, to choose the none-of-the-above alternative. The mock witnesses were tested in groups ranging in size from 6 to 45.

Procedure

All subjects saw a 15-slide sequence of a simulated crime at a rate of 5 seconds per slide. They were instructed to determine what was happening in the story told by the slides. Half the students (practice condition) were then presented two practice lineups (interviewer-present followed by interviewer-absent) of female photos, while the remaining students (control condition) rank-ordered six female photos for age. Half the subjects in the practice condition received simultaneous-presentation lineups and half received sequential-presentation lineups. Subjects were asked to choose the photo of the interviewer and were advised that the interviewer's photo might or might not be present. After each lineup, the interviewer confirmed the choice, if correct, or pointed out the correct response, if the choice had been incorrect. Subjects were then presented the experimentally relevant target-present or target-absent lineups and were instructed that the suspect might or might not be in the lineup. Within each lineup type, half the subjects were shown all the lineup members simultaneously in a 2×3 array with identifying numbers under each photo and were asked to choose one of the photos or a none-of-the-above alternative. The remaining subjects viewed the lineup members in sequential order and made a yes–no decision after each member was presented. Each decision was recorded on a separate page of a six-page booklet. Subjects were not informed as to how many photos they would see but no attempt was made to disguise the number. For both lineup presentations, the position of the target or target-substitute was counterbalanced across subjects so that each position was equally represented. Presentation mode of practice lineups was con-

sistent with presentation mode of experimentally relevant lineups. After making a decision, all subjects rated the confidence of their choices on a 5-point scale ranging from *just guessing* to *very sure*. For simultaneous-presentation lineups only one confidence rating was made, but for sequential-presentation lineups a confidence rating was made after each of the six decisions.

RESULTS

Characteristics of Lineups

The effective (Malpass, 1981) and functional (Wells, Leippe, & Ostrom, 1979) sizes of all lineups were calculated separately for the target-present and target-absent lineups with the no-choice alternatives (49 of 339) excluded from calculations. The effective sizes of the four lineups ranged from 4.6 to 5.1. These effective size values are close to each lineup's nominal size of six and show the degree to which the lineups contain plausible foils. Malpass and Devine (1983) claim that the functional size of a lineup measures the index of bias toward the suspect rather than the number of good foils in the lineup. In the present study, the functional sizes (3.5, 5.5, 5.5, and 6.4) are all above the criterion of 3.0 which Brigham, Ready, and Spier (1990) claim is the criterion for meaningful bias.

Photo Identification

Overall, 32% of the children and 48% of the adults made the correct choice, namely, a correct identification in target-present lineups or a correct rejection in target-absent lineups. This age difference just missed statistical significance, $\chi^2(1,N = 192) = 3.60, p = .06$. The position of the suspect or suspect-substitute in the photographic array had no effect on the subject's choice, $\chi^2(5,N = 192) = 6.91, p > .05$.

Table 1 shows the frequencies and proportions of correct responses and errors as a function of age of witness, lineup presentation, and practice. Wells and Lindsay's (1985) designation of two types of correct responses (correct identifications in target-present lineups and correct rejections in target-absent lineups) and four types of errors (false rejections and foil identification α errors in target-present lineups and foil identification β errors and false identifications in target-absent lineups) was used. Foil identification α and β errors are both "known errors" in that the legal system knows in advance who the foils are (Wells & Turtle, 1986), whereas false identifications are "unknown errors." Because the data were categorical, separate log-linear analyses were carried out on each measure as a function of age of witness, gender of witness, lineup presentation, and practice.

In target-present lineups there were no main effects in correct identifications but there was a main effect of age in foil identification α errors, $\chi^2(1,N = 96) = 4.81, p < .05$ and false rejections, $\chi^2(1,N = 96) = 5.67, p < .05$. Child witnesses made more foil identification α errors than adult witnesses but fewer false rejec-

Table 1. Proportion Correct Responses and Errors as a Function of Age, Lineup Presentation, and Practice

Identification decision	Control				Practice			
	Child witness		Adult witness		Child witness		Adult witness	
	Simultaneous	Sequential	Simultaneous	Sequential	Simultaneous	Sequential	Simultaneous	Sequential
Target present								
Correct identifications	.42 (5)	.25 (3)	.42 (5)	.08 (1)	.42 (5)	.33 (4)	.33 (4)	.50 (6)
Foil identifications α	.33 (4)	.58 (7)	.17 (2)	.17 (2)	.33 (4)	.50 (6)	.17 (2)	.33 (4)
False rejections	.25 (3)	.17 (2)	.42 (5)	.75 (9)	.25 (3)	.17 (2)	.50 (6)	.17 (2)
Target absent								
Correct rejections	.17 (2)	.33 (4)	.42 (5)	.75 (9)	.50 (6)	.25 (3)	.75 (9)	.58 (7)
Foil identifications β	.67 (8)	.67 (8)	.33 (4)	.17 (2)	.33 (4)	.58 (7)	.25 (3)	.42 (5)
False identifications	.17 (2)	.00 (0)	.25 (3)	.08 (1)	.17 (2)	.17 (2)	.00 (0)	.00 (0)

Note. Frequencies are in parentheses.

tion errors than adult witnesses. There was also a main effect of gender in foil identification α errors, $\chi^2(1,N = 96) = 6.74, p < .01$, reflecting that males made more of such errors than females (.46 vs. .19). There were no two-way interactions for any of the response measures examined in target-present lineups.

The results of greatest interest in this study involve the errors in target-absent lineups. There was a main effect of age in foil identification β errors, $\chi^2(1,N = 96) = 6.19, p < .01$ with more errors made by young witnesses. Because the frequency of false identifications was so low and there were no main effects in the analysis of false identifications, an analysis was carried out on all errors in target-absent lineups (foil identification β errors and/or false identification errors). This also yielded a main effect of age, $\chi^2(1,N = 96) = 8.16, p < .01$, showing that child witnesses made more target-absent errors than adult witnesses. In addition, there was a Practice × Lineup-Presentation interaction, $\chi^2(1,N = 96) = 4.41, p < .05$. Practice reduced errors for simultaneous presentation, $z = 2.43, p < .05$, but not for sequential presentation, $p > .05$. A comparison of simultaneous versus sequential presentation in the control condition revealed the expected superiority of sequential over simultaneous presentation, $z = 1.82, p < .05$, one-tailed. A similar comparison in the practice condition failed to reveal a difference as a function of lineup presentation, $z = 1.42, p > .05$.

There was no evidence of an Age × Practice × Lineup-Presentation interaction in the analysis of target-absent errors, but in order to compare the results of this study with the existing adult literature, it seemed appropriate to examine the Practice × Lineup-Presentation interaction for child and adult witnesses separately. In the control condition, the differences between lineup presentations were in the expected direction of more errors for simultaneous than sequential presentation for both age groups (.17 for child and .33 for adult), but only the difference for adult witnesses reached significance, $z = 1.75, p < .05$, one-tailed. In the practice condition, the differences between lineup presentations reversed with fewer errors for simultaneous-presentation lineups for both age groups (.25 for child and .17 for adult), but neither comparison reached significance. With simultaneous presentation, there was a reduction in errors from control to practice conditions for both adults and children, z's = 1.75 and 1.83, p's < .05, one tailed, respectively. With sequential presentation there was a nonsignificant increase in errors from control to practice conditions for both adults and children, p's > .05. Finally, there was an interaction of Gender of Witness × Age of Witness, $\chi^2(1,N = 96) = 4.63, p < .05$, showing that adult male witnesses made fewer errors than adult female witnesses (.21 vs. .54), $z = 2.50, p < .05$, but there were no gender differences for child witnesses (male = .75, female = .62), $p > .05$. The analysis of correct rejections in target-absent lineups necessarily mirrors the results obtained for the target-absent errors, so these results will not be repeated.

Multiple Responding

In sequential-presentation lineups, there was an opportunity to choose more than one lineup member even though subjects were specifically instructed to make

only one choice. In the prior analyses, if more than one choice was made, the choice was designated a foil identification α error in target-present lineups or a foil identification β error in target-absent lineups. In other words, any witness who selected more than one photo from a lineup was known to be in error and was not considered to be a probative source of evidence. Table 2 shows the frequencies and proportions of multiple responses as a function of age of witness, gender of witness, and practice. A log-linear analysis of multiple responding was carried out as a function of age of witness, gender of witness, presence of target, lineup presentation, and practice. This analysis revealed a main effect of age of witness, $\chi^2(1,N = 192) = 9.58, p < .01$, and gender of witness, $\chi^2(1,N = 192) = 7.15, p < .01$. Child witnesses made more multiple choices than adult witnesses and males made more multiple choices than females. There were no other main effects or interactions.

Overall Choice Responses

Choice behavior was examined because it reflects the response biases of eyewitnesses. Choices are defined as the total number of lineup members chosen, whether they are correct identifications or not. Thus, they include correct identifications, foil identification α and β errors, false identifications, but not correct or false rejections. An Age of Witness × Gender of Witness × Presence of Target × Lineup-Presentation × Practice log-linear analysis on choice behavior revealed a main effect of age of witness, $\chi^2(1,N = 192) = 13.56, p < .01$, showing that child witnesses made more choices than adult witnesses (.74 vs. .46). There were no other main effects, but there was a Lineup-Presentation × Practice interaction, $\chi^2(1,N = 192) = 6.68, p < .01$. A breakdown of the interaction revealed that more choice responses were made in the practice than the control condition for sequential presentation, (.71 vs. .50), $z = 2.16, p < .05$, but fewer choices were made in the practice than the control condition for simultaneous presentation (.50 vs. .69), $z = 1.94, p < .05$, one tailed.

Confidence Ratings

Confidence in simultaneous lineups was assessed as a single estimate after the identification decision was made, whereas in sequential lineups confidence was assessed by using the confidence ratings of the target or target-substitute

Table 2. Proportion Multiple Responses as a Function of Age, Gender, and Practice

	Child witness		Adult witness	
Gender	Control	Practice	Control	Practice
Male	.67 (8)	.58 (7)	.08 (1)	.33 (4)
Female	.25 (3)	.25 (3)	.00 (0)	.08 (1)

Note. Frequencies are in parentheses.

rather than averaging the ratings of all six photos.[1] It should be recognized that neither way of assessing confidence in sequential-presentation lineups is directly comparable to the method of assessment in simultaneous-presentation lineups. An Age of Witness × Lineup-Presentation × Practice × Gender of Witness × Presence of Target analysis of variance on confidence ratings was carried out to determine if absolute levels of confidence differed. There were no differences in rated confidence as a function of age, but there was a main effect of lineup presentation such that higher confidence ratings were consistently made with sequential compared to simultaneous presentation regardless of age ($M = 2.20$ vs. $M = 2.80$, respectively),[2] $F(1,N = 192) = 23.29$, $p < .001$. There were no other main effects or interactions. Analyses of confidence ratings were then carried out separately for accurate responses (correct identifications and correct rejections) and inaccurate responses (foil identification α and β errors, false identifications, and false rejections). For inaccurate responses, there was a main effect of age, $F(1,98) = 4.67$, $p < .05$, with child witnesses showing greater confidence than adult witnesses ($M = 2.92$ vs. $M = 2.36$, respectively), and a main effect of lineup presentation, $F(1,98) = 19.54$, $p < .001$, with sequential presentation resulting in higher levels of confidence than simultaneous presentation ($M = 2.14$ vs. $M = 3.11$, respectively). With accurate responses, there were no main effects but the Lineup-Presentation × Age interaction approached significance, $F(1,62) = 3.80$, $p < .056$, reflecting higher levels of confidence for sequential versus simultaneous presentation for children ($M = 2.20$ vs. $M = 3.22$, respectively), but no difference as a function of lineup presentation for adults.

In order to determine the forensic value of confidence ratings, correlations of confidence and accuracy were carried out on identification accuracy and confidence level. The same assessment of confidence was used as had been used earlier in the analyses of absolute confidence. Wells and Lindsay (1985) have pointed out that overall correlations of accuracy and confidence are of little forensic value. They recommend that foil identifications be removed from these analyses as they are known errors. In other words, if police are aware that the foils are innocent, the degree of confidence of an eyewitness's identification of a foil is irrelevant. Thus, two separate correlations were carried out in this study: an analysis of whether correct identifications are made more confidently than false identifications and an analysis of whether correct rejections are made more confidently than false rejections. Point biserial correlations conducted on accuracy (correct or false identifications) with confidence failed to show any overall correlation, $r = .22$, $p > .05$, but there was a borderline within-cell correlation for adult witnesses, $r = .43$, $p < .056$, and a significant within-cell correlation for adult witnesses receiving simultaneous presentation, $r = .61$, $p < .05$. Point biserial correlations conducted on accuracy (correct or false rejections) with confidence also failed to reveal any overall correlation, $r = -.03$, $p > .05$, but there was a significant

[1] R. C. L. Lindsay (personal communication, January, 1989) has suggested that such an assessment provides a more realistic test of the ability of the eyewitness to identify the accused or target person.

[2] Higher levels of confidence are actually reflected in lower mean scores because the confidence scores ranged from *Very Sure* (1) to *Just Guessing* (5).

within-cell correlation of female witnesses receiving simultaneous presentation, $r = .53, p < .05$. On the other hand, for male child witnesses there was a within-cell correlation showing a negative relationship between confidence and correct rejections, $r = -.65, p < .05$.

DISCUSSION

The present study confirms the age-related differences in photo identification that have been observed in the literature. Child witnesses once again made more overall choices than adult witnesses, indicating a more lax choice criterion and a greater guessing tendency (see Parker & Carranza, 1989). The fact that child witnesses were also more likely to make multiple choices in sequential-presentation lineups suggests further evidence for this guessing propensity. This is particularly noteworthy because multiple responding has not been an issue in most previous studies using sequential-presentation lineups. In Lindsay and Wells's (1985) study, 2.5% of the subjects made multiple responses and in the target-absent lineups of Lindsay, Lea, and Fulford's Experiment 1 (1991), 6.7% of the witnesses made multiple responses. Cutler and Penrod (1988) did not report any multiple responding and Sporer (1990) reported only that several subjects attempted to recant an earlier decision. However, Melara et al. (1989) observed in their Experiment 2A that adult subjects made a large proportion (31%) of multiple responses (both correct identifications and foil identification α errors) in the auditory target-present sequential-presentation lineups. Melara et al. suggest that a low criterion may be characteristic of witnesses exposed to auditory lineups because both their study and Bull and Clifford's (1984) study with auditory lineups found high levels of false positives. Perhaps, then, whenever a low criterion is operative (such as with witnesses exposed to auditory lineups or with child witnesses), multiple responding will be more prevalent in sequential-presentation lineups.

An examination of the accuracy data allows us to determine how the choice responses were distributed. In the target-present situation, results confirmed earlier studies showing comparable levels of correct identifications across age but greater foil identification α errors and fewer false rejections for child than adult witnesses (e.g., Goodman & Reed, 1986; Parker & Carranza, 1989). Age-related differences in target-absent lineups were also consistent with the literature. Older witnesses made more correct rejections than younger witnesses but fewer foil identification β errors (e.g., Davies et al., 1988; Parker & Carranza, 1989). Thus, it appears that the increased guessing propensity of child witnesses is mainly channeled into foil identification α and β errors. These "known errors" of commission are not considered as legally dangerous as false identification commission errors, which were low for both age groups, or false rejection errors of omission, which were actually higher for adult witnesses.

It is now of particular interest to examine the two variables that were manipulated to reduce guessing. An initial inspection of the mode of presentation variable might suggest that the typical beneficial effect of sequential presentation

was not evident in the present study—namely, a reduction in false identification or foil identification β errors. Although there were no main effects of lineup presentation, when the particular conditions (sequential versus simultaneous presentation in the control condition) that are comparable to earlier adult studies were examined, the beneficial effect of sequential presentation in the reduction of target-absent errors (foil identification β or false identification errors) was still evident. As Table 1 shows, there were fewer errors for sequential- than simultaneous-presentation lineups in the control condition.

This critical finding of a reduction in guessing behavior was present for both ages but statistically significant only for adult witnesses. Even with adult witnesses, sequential presentation does not appear to produce as robust an effect as in earlier studies (Cutler & Penrod, 1988; Lindsay & Wells, 1985). Although sequential presentation produced a decrease in target-absent errors, it also produced a nonsignificant decrease in correct identifications. In order to make comparisons with previous studies, the interaction of presentation mode with target presence for correct and false identifications was tested for adult witnesses in the control condition. This interaction failed to reach significance, $p > .05$ (the same results were obtained when total target-absent errors were substituted for false identifications in the analysis). However, Lindsay and Wells (1985) did observe a significant interaction of lineup presentation by target presence. This interaction reflected more false identifications for simultaneous than sequential presentation in target-absent lineups but no difference in correct identifications in target-present lineups as a function of lineup presentation.

Variation in methodology imposed on the sequential lineup may have reduced the potency of the sequential-presentation effect in the present study. Although not specifically informed of lineup size, witnesses could readily deduce when the last photo was being presented. On the other hand, Lindsay and Wells (1985), Melara et al. (1989), and Sporer (1990) tested witnesses who, they claim, were not cognizant of lineup size and found evidence for fewer target-absent errors with sequential than simultaneous presentation. Neither the Melara et al. nor the Sporer study reported whether there was an interaction of lineup presentation by target presence. In Cutler and Penrod's Experiment 2 (1988), where witnesses were not informed of lineup size, there was a marginally significant interaction of lineup presentation by target presence ($p < .07$). In Experiment 1, where witnesses were informed of lineup size, the differences were in the predicted direction but the interaction was not significant. A recent study by Lindsay et al. (Experiment 3, 1991) confirmed that witnesses' knowledge of lineup size in sequential-presentation present lineups definitely results in more false identifications than when witnesses have no knowledge of lineup size. However, their study also showed that there were still significantly fewer false identifications for sequential- than for simultaneous-presentation lineups even when the witnesses had knowledge of lineup size. Apparently, the most effective procedure for sequential presentation is to prevent witnesses from knowing the lineup size, but benefits can be obtained even with knowledge of lineup size.

The effects of practice on simultaneous-presentation lineups are fairly consistent with the child literature. In the present study, practice decreased overall choice responses and hence increased correct rejections and decreased foil iden-

tifications in target-absent lineups. Goodman et al. (1991) likewise observed, in children of 5 to 7 years, an increase in correct rejections even after a 2 to 4 week retention interval. Although Davies et al. (1988) did not find a significant improvement with practice, there was, nevertheless, a 13% increase in correct rejections. It will be recalled that the witnesses in the present study had not been previously informed that the interviewer's face would be removed from the second lineup, whereas witnesses in Davies et al.'s study had been so informed. This procedural change may have contributed to the significant positive effects of practice in the simultaneous-presentation target-absent lineups of the present study. In target-present lineups, there was no change in accuracy with practice, thus confirming Davies et al., the only other study to examine the effects of practice in target-present lineups. Both previous studies investigating practice effects on eyewitness identification have been restricted to child witnesses. It is noteworthy that the present study clearly observed positive effects of practice in simultaneous-presentation lineups for *adult* witnesses as well as child witnesses.

The effects of practice on sequential-presentation lineups were somewhat surprising. There was an increase in overall choice responses, which resulted in a nonsignificant increase in target-present correct identifications and target-absent errors for both age groups. In fact, the superiority of sequential presentation over simultaneous presentation, evident in the control target-absent lineups, washed out with practice. The fact that practice with sequential presentation encouraged increased choice responses warrants discussion. As pointed out earlier, Lindsay et al. (1991) observed that the number of false identifications increased when witnesses had knowledge of lineup size over no knowledge. In the present study, witnesses in both the practice and the control conditions were not informed of lineup size but perhaps could deduce it. But witnesses in the practice conditions were further exposed to two lineups of only three alternatives. The combination of the prior training on 3-item lineups and the failure to disguise lineup size in the bona fide lineups may have exerted an increased pressure on the witness to make a choice as the sequentially presented lineup came to an end (Lindsay et al.). Future experimentation would suggest that practice with lineups of varying or unknown size be used so that witnesses do not anticipate lineup size in the bona fide lineup. In addition, it is possible that two trials of training is not sufficient to produce a positive effect in sequential-presentation lineups. Likewise, a longer retention interval might allow practice to be more effective in sequential-presentation lineups, although a comparison of the results of Goodman et al. (1991) and the present study shows that retention interval did not alter the effects of practice on simultaneous-presentation lineups. At present, the results of the current experiment suggest that one can reduce choosing in target-absent lineups by using sequential-presentation lineups *or* by including practice prior to simultaneous-presentation lineups.

Another variable that proved of import in the present study was gender of witness. Male identification behavior reflected a guessing propensity evident in more foil identification α errors than females regardless of lineup presentation, and more multiple responses in sequential-presentation lineups than females. Shapiro and Penrod's (1986) meta-analysis of facial identification studies is consistent with these findings in that female witnesses had higher accuracy rates than males.

However, Shapiro and Penrod report differences in correct identifications whereas the present study found differences in foil identifications. On the other hand, adult males appear to eschew guessing in target-absent lineups (greater correct rejections). Shapiro and Penrod's study was almost completely restricted to target-present lineups so that the meta-analysis does not address the target-absent results of the present study. Further research with gender of witness and gender of suspect manipulated in both target-present and target-absent lineups may clarify some of these findings.

Confidence ratings were examined initially to determine if there were any differences in absolute levels of confidence. Consistent with our earlier studies (Parker & Carranza, 1989; Parker, Haverfield, & Baker-Thomas, 1986) there were no differences in confidence as a function of age. However, when accurate and inaccurate responses were analyzed separately, there was a small but significant tendency for children to be more confident than adults that their choices were correct, when, in fact, they were inaccurate. This appears to be another indication of child eyewitnesses' lax criteria.

Although there was no main effect of age in the overall analysis of absolute confidence, there was a main effect of lineup presentation, showing that sequential presentation produced higher levels of confidence than simultaneous presentation, consistent with Melara et al. (1989) and Sporer (1990). In the present study, when confidence was analyzed separately for accurate and inaccurate responses, sequential presentation again produced higher levels of confidence for inaccurate responses. For accurate responses there was a tendency for young witnesses to be more confident with sequential presentation than simultaneous presentation although there were no differences in confidence as a function of lineup presentation for adult witnesses. Across a number of studies, sequential presentation provides a greater degree of certainty for eyewitnesses. However, we do not know if this is false confidence until confidence/accuracy correlations are examined.

An examination of confidence/accuracy correlations in the present study revealed no overall correlations, but there was a within-cell correlation of correct identifications and confidence for adult witnesses receiving simultaneous presentation. Consistent with this finding, Sporer (1990) found higher correlations for identification accuracy and confidence in simultaneous-presentation lineups than sequential-presentation lineups. On the other hand, Cutler and Penrod (1988) found significant confidence-accuracy correlations for both sequential and simultaneous presentation, with slightly higher correlations for sequential than simultaneous presentation. Lindsay and Wells (1985) reported no influence of lineup presentation on eyewitness confidence. Although this issue is not as yet resolved, we can state that the high levels of certainty evident in sequential-presentation lineups may be unwarranted because they do not necessarily indicate concomitantly high levels of accuracy.

In summary, the effects of age on eyewitness identification and choice behavior have been clearly replicated—namely, a pronounced guessing propensity in child witnesses. The two manipulations of lineup presentation and practice that were introduced to reduce guessing behavior met with mixed results. The positive effects of sequential presentation were present, once more, with adult witnesses

but less evident for child witnesses. Future research on mode of lineup presentation should investigate whether children use different cognitive heuristics from adults thereby preventing them from utilizing the positive characteristics inherent in sequential presentation. Furthermore, in light of Lindsay et al.'s (1991) findings, studies using sequential presentation should keep witnesses uninformed of lineup size in order to maximize the positive effects. Consistent with the literature, child witnesses benefited from practice in simultaneous-presentation lineups but the present study is the first to demonstrate that adult witnesses can also benefit from practice in simultaneous-presentation lineups. Future research on the effects of practice should focus on sequential presentation where no beneficial effects from practice were evident in target-absent lineups even though there was a nonsignificant increase in target-present correct identifications.

It should be pointed out that the results of the present study, where witnesses were briefly exposed to a stranger rather than to a familiar adult for an extended time period, are more relevant to identification of a criminal in a robbery situation than to a child abuse situation. Furthermore, the generalizability of the present study to the relevant forensic context may be limited by the slide presentation of the simulated crime, short retention intervals between crime exposure and identification, and the fact that subjects were not led to believe that they were actual witnesses to a real crime. These deviations from reality allow the researcher more control over exposure time, exposure angle, activity during retention interval, and so forth, but necessarily reduce the applicability of the findings to the legal situation. For example, if children thought that their choices in the lineups would impact upon someone's life, they might be less hesitant to guess, and if longer retention intervals were used, practice might have a more potent effect on identification. Nevertheless, the major pattern of results involving high levels of guessing by child witnesses is similar to other studies where live events were witnessed (King & Yuille, 1987), and longer retention intervals were used (Goodman et al., 1991).

The present study shows that the increased guessing behavior of child witnesses was typically channeled into "known errors" and so is not of grave concern. However, this irrelevant responding does make child witnesses appear less credible in a court of law. To reduce guessing, the data suggest the use of sequential-presentation lineups or simultaneous-presentation lineups in conjunction with prior training on lineup identification.

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