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RESEARCH REPORTS

Improving the Identification Accuracy of Senior Witnesses: Do Prelineup Questions and Sequential Testing Help?

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Eyewitness research has identified sequential lineup testing as a way of reducing false lineup choices while maintaining accurate identifications. The authors examined the usefulness of this procedure for reducing false choices in older adults. Young and senior witnesses viewed a crime video and were later presented with target present or absent lineups in a simultaneous or sequential format. In addition, some participants received prelineup questions about their memory for a perpetrator's face and about their confidence in their ability to identify the culprit or to correctly reject the lineup. The sequential lineup reduced false choosing rates among young and older adults in target-absent conditions. In target-present conditions, sequential testing significantly reduced the correct identification rate in both age groups.

Much eyewitness research has been devoted to the development of techniques or procedures for reducing eyewitness error. In a conventional simultaneous lineup, all faces are viewed at the same time; thus there is a tendency to select the member of the lineup who most resembles the eyewitness's memory of the culprit relative to other members of the lineup (Wells & Seelau, 1995). In a sequential lineup, members are presented one at a time followed by a witness decision after each face is viewed. This simple variant of the traditional lineup testing procedure reduces the likelihood of false identifications in those situations in which the police do not have the perpetrator (Lindsay & Wells, 1985). In 1999, the U.S. Justice Department published guidelines that included recommendations for lineups and photospreads (see Wells et al., 1998). Although sequential testing is not one of the recommended rules, it features prominently in the guidelines. Moreover, a recent survey of eyewitness experts indicated that sequential testing reduces the likelihood of misidentifications (Kassin, Tubb, Hosch, & Memon, 2001). Sequential testing is advocated because of its potential to reduce identifications of innocent suspects. There is one group that is especially vulnerable to false identifications of this kind and that group is older adults (Memon & Bartlett, 2002; Searcy, Bartlett, & Memon, 1999; 2000; Searcy, Bartlett, Memon, & Swanson, 2001). The current research sets out to see if sequential lineups together with some simple prelineup questions (Dysart & Lindsay, 2001) can increase the accuracy of the identification of older witnesses.

"Normal" aging results in qualitative changes in recognition memory performance. Although hit rates remain fairly stable, false alarms have been found to increase with aging, especially when the foils are selected to physically or conceptually resemble the target faces (see Searcy, Bartlett, & Memon, 1999, for a review of the literature). In an eyewitness identification context, older adults (ages 60 years and above) are more prone to making false choices whether it is the choice of a foil in a target-present lineup or the failure to correctly reject faces from a target-absent lineup (Memon & Bartlett, 2002; Rose, Bull, & Vrij, 2001; Searcy et al., 1999, 2000, 2001). For example, Searcy et al. (1999) found older adults made more erroneous foil choices regardless of whether the target was present or absent. Older adults were also significantly less likely to make correct target choices, but this effect was only observed for one of the two events used in the study. Searcy et al. (1999) drew on the dual process framework to explain the age-related increases in false recognition. Dual process models of recognition memory postulate two independent retrieval processes: an automatic familiarity process that requires minimal attentional resources and a conscious effortful recollection process (Jacoby, 1999; Mandler, 1980). Several lines of evidence have suggested that older adults are less efficient at consciously recollecting contextual details surrounding an event and, as a result, are prone to decisions based on context-free familiarity (Bartlett & Fulton, 1991; Jacoby, 1999; Jennings & Jacoby, 1997; Searcy et al., 1999, 2000, 2001). Older adults also make more source monitoring errors (see Spencer & Raz, 1995, for a review), especially when there is a similarity in the potential sources of memory (see Henkel, Johnson, & DeLeonardis, 1998, for examples). Finally, older adults are more likely to encode gist-like as opposed to distinctive details (e.g., Koutstaal & Schacter, 1997; Schacter, Norman, & Koutstaal, 1998; Tun, Wingfield, Rosen, & Blanchard, 1998). This is also consistent with an increase in errors in lineup situations (in which the foils resemble one another), an effect that may not be alleviated by changing the mode of testing.

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In considering whether sequential lineups will benefit older witnesses, it is necessary to understand how sequential lineups work. A witness presented with a lineup of faces will inevitably compare the faces with one another. This relative judgment strategy is more error prone than a strategy in which a witness compares each lineup member with his or her memory of the perpetrator and then uses some type of criterion threshold to decide whether the person is actually the culprit (Lindsay & Wells, 1985). It is believed that sequential lineups facilitate accurate face recognition through the use of an absolute judgment strategy (e.g., Dysart & Lindsay, 2001; Kneller, Memon, & Stevenage, 2001; Lindsay, Lea, & Fulford, 1991). More recently, it has been suggested that witnesses employ an absolute judgment in both sequential and simultaneous procedures but set a higher criterion match between their recollection of the culprit and the faces in the sequential lineup (Ebbesen & Flowe, 2002). This suggests that sequential testing may work by shifting criterion. Thus, one way in which sequential test conditions may aid older adults is by forcing them to use a strategy that makes them adopt a relatively strict (yes or no) decision to each face. Hence, older adults may not simply rely on familiarity in making their judgments but instead take into account other types of information, such as contextual details.[1] Prior studies have shown that procedures that encourage older adults to adopt relatively strict decision criterion can reduce age differences in eyewitness performance (e.g., Memon, Hope, Bartlett, & Bull, 2002; Multhaup, De Leonardis, & Johnson, 1999). However, the fact that age differences remain even under these conditions suggests that sequential testing will not eliminate age-related false choosing by a shift in decision criterion alone.

The literature on aging and inhibition deficits has suggested that older adults may fare worse in sequential test conditions. Age-related deficits in cognitive performance may arise from a decreased efficiency in the ability to inhibit information that is partially active but irrelevant to task demands (Hasher, Stoltzfus, Zacks, & Rypma, 1991; Park, 2000). For example, older adults are more susceptible to distraction from irrelevant information (Connelly, Hasher, & Zacks, 1991) and tend to retain irrelevant information in memory (Hamm & Hasher, 1992). If age-related increases in false choosing reflect this kind of deficit, they will not be able to inhibit responses to a familiar face. This result will be a false positive response to a moderately familiar face in both simultaneous and sequential conditions. Under simultaneous test conditions, an inhibition problem will hurt older witnesses primarily in the target-absent (TA) condition in which there is a risk of an innocent person being identified. This effect may be exaggerated in sequential conditions. In the target-present (TP) condition, assuming the most familiar face is the target, we would not expect age differences.[2] We have some data to support the hypothesis that there are no age differences in target choices (Searcy et al., 1999, Lineup 1). The inhibition hypothesis leads us to a somewhat different prediction for young and older witnesses under sequential conditions. Older witnesses may not be able to inhibit a response to a familiar foil that precedes the actual target face in sequential test conditions. This may increase foil choices and reduce the probability that the target will be picked by the older witnesses. Note that in a sequential lineup, the witness is under strict instructions that he/she can only make one choice and cannot go back on that decision. Thus, older adults may fare worse in sequential TP conditions. In sequential TA conditions, a deficit in inhibition may result in false choices, but a stricter response criterion should result in a lower proportion of false choices relative to simultaneous conditions. Again, the prediction is a reduction in false choosing under sequential TA conditions but not an elimination of age effects.

Prelineup Questions

A new procedure found to reduce false choices is the administration of three questions prior to the identification task. Dysart and Lindsay (2001) devised a prelineup memory questionnaire with the aim of reducing false identifications in TA situations under simultaneous testing. Participants in the Dysart and Lindsay study viewed a crime simulation and were then asked for a description of the perpetrator prior to an identification from one of the following lineup types: simultaneous TP, simultaneous TA, or sequential TA. Prior to the lineup, participants in the prelineup questionnaire condition were asked three questions: (a) "How clear a memory do you have for the face of the criminal?" (b) "How confident are you that you will be able to select the criminal if you see a photograph of him in a lineup?" and (c) "How confident are you that you will realize that the guilty person is not in the lineup if you are shown a lineup with only innocent people in it?" Participants recorded their answer to each question by using a 7-point Likert scale. Dysart and Lindsay found that the prelineup questions did not influence correct identifications from the simultaneous TP lineup; however, correct rejections in the simultaneous TA condition were higher for participants in the questionnaire condition. The questionnaire had no effect on the accuracy rates of participants in the sequential TA condition.

How do prelineup questions alter participants' decision strategies? Dysart and Lindsay (2001) suggested that perhaps Question 3 (asking participants whether they would be able to reject the lineup in the absence of the criminal) made participants more cautious and encouraged them to consider each photograph in succession before reaching a decision. The absence of an effect of prelineup questions on sequential lineup performance is cited as support for this. A more plausible explanation also considered by Dysart and Lindsay is that Question 3 altered demand characteristics, reducing willingness to choose. The current research will attempt a replication of the Dysart and Lindsay study. It will also extend their work by using the prelineup questionnaire with older adults in an attempt to find a technique to reduce age-related false choosing.

Method

Participants

A total of 240 participants were tested individually. Of these, 120 were students from the University of Aberdeen, Scotland (18–30 years,

[1] In the source monitoring framework, more stringent criteria refer to criteria involving more discriminating or diagnostic types of information, not simply greater levels of perceived familiarity as in signal detection theory.

[2] This similarity of foils to the target may influence choosing rate in target-present lineups, however (see Wells, 1984, for a review). The absolute number of foils also influences the extent to which there is an increase in foil choices.

$M = 20.00$, $SD = 2.62$), participating in return for course credit. The 120 older adults (60–80 years, $M = 69.20$, $SD = 5.88$) were healthy active volunteers recruited from the local community. They were paid for contributing to the study. Older participants underwent the Memory Impairment Screen (Buschke, et al., 1999). This is a screening tool designed to identify individuals who should be considered for further evaluation for possible Alzheimer's disease or other forms of dementia. A cutoff score of four or less suggests impairment and warrants appropriate diagnostic assessment. The mean score in the current study was 7.77 (range = 5–8); thus, no older participants were excluded.

Design

We used a 2 (age group) × 2 (lineup type) × 2 (prelineup questions) × 2 (lineup test mode) between-subjects design to examine the effects of age of participant (young or old), type of lineup (whether the target is present or absent), prelineup questions, and mode of test (sequential or simultaneous) on identification accuracy.

Materials

Event. We showed a video clip of a theft from an office (1 min, 30 s in length) to each participant with an exposure of the target's face (full-face and profile) of 60 s.

Lineup. The sequential lineup consisted of six color photos (29.7 cm × 21.0 cm) arranged in a booklet. To prevent any comparison between the photographs being made, each photograph was separated by a piece of blank card. Thus, no two photographs could be seen at the same time. Extra pieces of card were included after the final photograph so that participants were not able to guess how many total photos there were in the booklet. The target appeared in Position 4. The five distracters or foils were matched to an independent description of the target generated during pilot testing. The target was a female aged 27 years, and the foils were all in the same age range (23–28 years). All photos were frontal shots of head and shoulders only.

The simultaneous lineup employed the same photographs as the sequential lineup. These were organized in a 3 × 2 array and remained covered until the participants had been given the standard lineup instructions. Two versions of the simultaneous and sequential lineup were prepared, one in which the target was present and another in which the target was replaced with a foil (TA). In both conditions (sequential and simultaneous), participants were warned that the target may or may not be present in the lineup.

Prelineup questionnaire. A prelineup questionnaire was given to half of the participants in each age group. This consisted of the following three questions taken from Dysart and Lindsay (2001): (a) "How clear a memory do you have for the face of the girl in the video?" (b) "How confident are you that you will be able to select the girl if you see a photograph of her in a lineup?" and (c) "How confident are you that you will realize that the girl is *not* in the lineup if you are shown a lineup without her in it?" Participants recorded their answer to each question by using a 7-point Likert scale, in which for Question 1, ratings ranged from 1 (*not at all clear*) to 7 (*extremely clear*), and for Questions 2 and 3, ratings ranged from 1 (*not at all confident*) to 7 (*extremely confident*).

Procedure

All participants were instructed to wear their corrective lenses when appropriate to ensure that they could see and read clearly at all times. Participants were then informed that they would be viewing a video recording and were instructed to watch carefully. After watching the recording, participants went on to complete a number of unrelated filler tasks. These tasks took at least 60 min to complete, thereby allowing a delay between witnessing the event and the lineup task. Some participants were given the three prelineup questions, whereas others proceeded straight through to the lineup task. Participants were allocated to one of four experimental conditions and viewed a sequential or a simultaneous TP or TA lineup. All participants were told that the target may or may not be among the photographs seen. The sequential lineup instructions were as follows:

> I am now going to show you some photos, and would like you to tell me if the girl you saw in the video is among them. The photos will be presented in a booklet so that only one photo at a time can be seen. For each photo that you see I will ask you whether you think it is, or is not, the girl you saw. If you do *not* think it is the same girl then you can turn the page and look at the next photograph. Once you have turned the page, however, you cannot turn back to review earlier photographs. If you do think it is the same girl then you must tell me and I will record your decision. No further photographs will be shown once you have made this decision. The person you are looking for may or may not be there, so please do not choose a face unless you are confident that it belongs to the person you saw.

Participants taking part in the simultaneous lineup condition were able to view all of the photographs at the same time. They received the same cautionary lineup instruction as did participants in the sequential condition.

Results

Chi-square analysis indicated significant differences in lineup accuracy as a function of lineup type (TP or TA), $\chi^2(1, N = 240) = 8.25$, $p < 01$, with more incorrect responses in the TP condition (.58) as compared with the TA condition (.42). Given that the two lineups yielded different accuracy measures, separate analyses were performed for each type of lineup (TP and TA).

TP Data

We conducted hierarchical loglinear (HILOG) analysis of the TP lineup to examine the effects of age, lineup test mode (sequential or simultaneous), and prelineup questions on lineup responses (hits, misses, and false alarms). Prelineup questions had no significant effect on lineup choices. The only variables contributing to the final model were age, lineup type, and lineup responses $\chi^2(12, N = 120) = 8.47$, $p = .75$. Therefore, we examined further the interactions nested under these variables. There was an effect of test mode on lineup responses $\chi^2(2, N = 120) = 20.43$, $p < .01$, and a marginally significant interaction between age, test mode, and lineup responses $\chi^2(2, N = 120) = 5.81$, $p = .05$. Follow-up chi-square analyses indicated the sequential lineup was associated with significantly fewer hits as compared with the simultaneous lineup, .19 versus .47, $\chi^2(1, N = 120) = 18.04$, $p < .01$. Following Wright (2002), we used the odds ratio (OR) statistic to measure the size of these effects. The odds of a hit under simultaneous testing for young and old adults was 4.37 and 3.61, respectively. Thus, the odds of a hit are just over four times more in simultaneous than sequential testing for young adults and over three times more for older adults. Sequential testing was also associated with significantly more misses than simultaneous testing: .59 versus .21, $\chi^2(1, N = 120) = 8.34$, $p < .01$; OR (young) = 13.12; OR (old) = 2.14. The odds of a miss were six times more for young adults.

Lineup test mode had differential effects on the false alarm responses of young and older adults. As shown in Figure 1 and Table 1, sequential testing reduced the false alarm rate for younger participants (from .33 in simultaneous to .07 in sequential), $\chi^2(2, N = 60) = 19.56$, $p < .01$, OR = 7.41. There were no differences

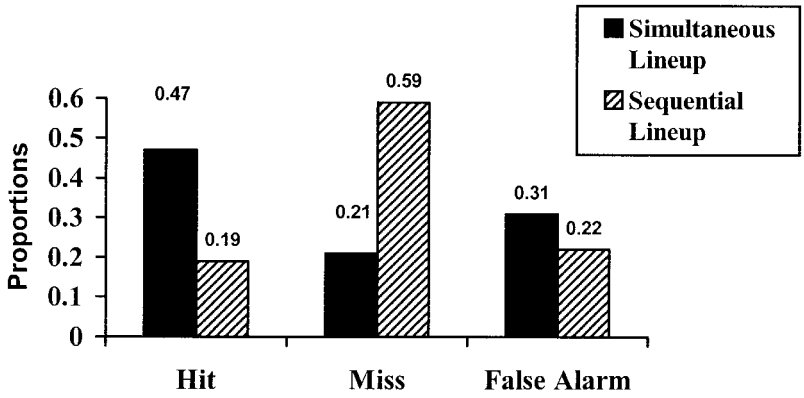

Figure 1. Proportions of lineup choices made in a target-present lineup.

for the older adults, and, if anything there was a tendency for sequential testing to increase the false alarm rate (.29 vs. .38), $\chi^2(1, N = 60) = 5.31$, $p = .07$, OR = 1.49.

TA Data

We used HILOG of the TA data to examine the same variables as above on the frequency of correct rejections and false alarms. Again, prelineup questions did not contribute to the final model, which had a generating class composed of the variables age group, lineup test mode, and accuracy, $\chi^2(9, N = 120) = 6.04$, $p = .74$. There was a significant effect of age on accuracy, $\chi^2(1, N = 120) = 18.34$, $p < .01$, and lineup test mode on accuracy, $\chi^2(1, N = 120) = 32.13$, $p < .01$. Follow-up chi-square analyses indicated that younger adults made twice as many correct rejections (see Figure 2) as compared with older adults, $\chi^2(1, N = 120) = 13.34$, $p < .01$. Participants (young and old) made significantly more correct rejections under sequential test conditions, $\chi^2(1, N = 120) = 26.16$, $p < .01$ than under simultaneous conditions. The OR for young and older adults was 10.34 and 13.63, respectively.

To summarize, the data suggest a different pattern under TP and TA conditions. When the target is present, then simultaneous lineups are more likely to result in the correct identification of the target, and there are no age differences. When the target is absent, older adults are significantly more likely to falsely identify a foil. However, sequential testing promotes more correct rejections among young and older adults when the target is absent. In TP situations, sequential testing lowers the choosing rates of both younger and older adults such that they are more likely to miss the target when present. There is also a tendency for sequential testing to increase false identifications among older adults.

Discussion

One of the primary aims of the current study was to determine whether sequential testing or prelineup questions would reduce age-related false choosing rates. Replicating earlier research, we obtained high false choosing rates in our older adults. The results showed that in comparison with the younger age group, older adults were more likely to make a false (or foil) identification for every lineup situation except the simultaneous TP condition, (in which they were no different from the younger adults). An important new finding was that the sequential lineup benefited older adults in a TA situation in which the false identification rate dropped from .90 to .40 (in the simultaneous and sequential TA conditions, respectively). No benefits were found for older adults in the sequential condition in a TP situation; in fact, false identification rates rose (nonsignificantly) from .29 to .38 in this condition. In addition, in previous articles, we found that the elevated choosing rate among seniors persisted even when specific procedures were employed to reduce it (Memon et al., 2002; Searcy et

Table 1
Proportion of Accurate and Inaccurate Responses (for Target-Present and Target-Absent Conditions) by Age and Lineup Test Mode

	Young		Old	
Condition	Simultaneous	Sequential	Simultaneous	Sequential
Target present				
Hit	.47	.17	.48	.21
Miss	.20	.77	.23	.41
False alarm	.33	.07	.29	.38
Target absent				
Correct rejection	.47	.90	.10	.60
False identification	.53	.10	.90	.40

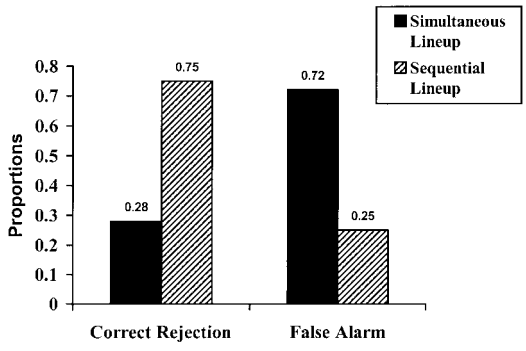

Figure 2. Proportions of lineup choices made in a target-absent lineup.

al., 2001). Given that senior witnesses are prone to making false choices, the dramatic reduction in the probability that an innocent person will be identified in a sequential TA situation is a notable finding. The results also suggest that sequential testing may be forcing witnesses to adopt a stricter criterion.[3] However, as we anticipated, age differences were not eliminated. The story is quite different when the target is present. In the latter case, there were no age differences in correct identifications under simultaneous testing, but sequential testing may actually hurt the performance of older adults (and to a lesser extent) younger adults. Most notable was a drop in correct identifications in both groups and a tendency for older adults to make more foil choices under sequential testing. We consider each of these findings, focusing first on the performance of older witnesses and then addressing the lowered choosing rates with sequential testing seen in both age groups.

In TP situations, age effects are inconsistent. With simultaneous testing, some studies have reported an age-related reduction in hit rate in TP situations (e.g., Searcy et al., 1999, 2001, Lineup 3) and others find no age differences (Memon et al., 2002; Searcy et al., 1999, Lineup 1). In our earlier work (using simultaneous lineups) we argued that heuristic strategies such as familiarity and availability (Tversky & Kahneman, 1973) are effective in securing correct identifications when the target is present (Searcy et al., 2001). These strategies may have a different effect in TA situations in which you see a clear age-related increase in false choices (Searcy et al., 2000). The picture may be quite different with sequential lineups. If age differences reflect the decreased efficiency of inhibitory mechanisms (Hasher et al., 1991) then older adults may find it more difficult to ignore "familiar" foils when asked to make an absolute decision for each face. In the current study, our target was in Position 4, so there were three foils preceding the target. The proportions (and frequencies) of witnesses choosing one of these three foils was .22 (13) and .12 (7) for young and old participants, respectively. Although this was a post hoc observation, and the frequencies were rather small, we obtained a reliable age difference in a study that was recently completed in our laboratory. In this study, the target also appeared in Position 4, and the corresponding proportions were .09 (9) and .31 (25) for young and old participants, respectively (Memon & Gabbert, in press). Thus, the position of the target may be critical in determining the effects of sequential testing. We decided to hold target position constant in the current study for this very reason. The later the target appears in the sequential lineup sequence, the more likely it is that a response to an earlier familiar foil is not inhibited. In practical terms, this means that if the police run a sequential lineup and the culprit appears in a later position, he or she is less likely to be chosen than with a simultaneous presentation. Given that we did not systematically test for the effects of target position, our conclusions need to be verified with further research. Target position could interact with a number of different variables such as similarity of foils to the target, lineup instructions, quality of encoding of the face, as well as witness characteristics.

Given that sequential testing does not eliminate age differences in false choosing, what alternatives can we suggest? One approach may be to use specific instructions to encourage older adults to adopt a stricter response criterion, for example, to use more diagnostic types of evidence such as the source of their memory on which to base their decisions. Prior studies have attempted to do this by using various types of cautionary instructions (e.g., Memon et al., in press; Multhaup, 1995). However, although these instructions reduce age differences, they do not eliminate them. It may be that instructions and procedures cannot completely combat the changes in cognitive functioning that accompany aging (see Park, 2000, for a review).

A final problem that remains to be addressed concerns the consequences of a lowered choosing rate on correct identification rates in both age groups. Our data suggest that when the target is present, the sequential lineup reduces hit rates by more than half (see Table 1). A review of published studies in which simultaneous and sequential lineup performance is directly compared reveals that sequential TP lineups sometimes produce lower hit rates (see Table 2) and larger miss rates (see Lindsay, Lea, & Fulford, 1991; Lindsay, Pozzulo, Craig, Lee, & Corber, 1997, Experiment 2; Lindsay & Wells, 1985; Memon & Bartlett, 2002; Parker & Ryan, 1993; Sporer, 1993). These differences between performance on simultaneous and sequential lineups might not always reach statistical significance; however, the lower choosing rates produced by the sequential lineup procedure are notable.

In an earlier study (Dysart & Lindsay, 2001) prelineup questions significantly increased correct rejections in TA simultaneous lineups. This result was not replicated here although there was a trend in the data suggesting that under TP conditions, prelineup questions reduce false alarms. If we look carefully at the prelineup questions, two of the three questions ask participants to estimate how confident they are about the decision they are about to make, including how confident they are that they could reject the lineup. However, past research has shown that efforts to increase participants introspective tendencies do not affect identification accuracy (for example the work of Kassin, Rigby, & Castillo, 1991, on the retrospective self-awareness effect).

There is no doubt that eyewitness identification errors can result in the conviction of innocent people (e.g., DNA exoneration evidence; Scheck, Neufeld, & Dwyer, 2000). Researchers have argued that foil identifications are inconsequential in target present situations because foils are innocent fillers (e.g., Corey, Malpass, & McQuiston, 1999). We disagree with this because a foil identification means a failure to identify the target, a behavior that has important consequences in the real world. The police usually conduct a lineup later in the investigative process to seek confirmation that the person they have is the culprit (Gonzalez, Ellsworth, & Pembroke, 1993). Eyewitness identification may be essential for prosecution to proceed (Gross, 1987). Moreover, there is some data to suggest that police lineups do contain culprits a large proportion of the time (Flowe, Ebbesen, Libuser, & Rienick, 2001; Flowe & Ebbesen, 2001). Thus, foil identifications may stall the investigation, or worse still, mean that the guilty party goes free. It is therefore important to have a thorough understanding of how the sequential lineup works when the culprit is in the lineup.

[3] It has been suggested that decision criteria may change as the sequential lineup precedes. It does not remain constant throughout the sequential lineup. A witness may set a high standard for the first face because he or she wants to be sure that a face that has not as yet been seen is not a better match; however, he or she may lower his or her criterion as he or she proceeds, through the lineup (Ebbesen & Flowe, 2002).

Table 2
Differences in Hit Rates in Target-Present Simultaneous and Sequential Lineups in a Sample of Published Eyewitness Studies

Article	Hit rate	
	Simultaneous	Sequential
Kneller, Memon, & Stevenage (2001)	.61	.50
Lindsay, Lea, & Fulford (1991)	.57	.47
Lindsay, Lea, Nosworthy, Fulford, Hector, LeVan, & Seabrook (1991, Experiment 2)	.57	.47
Lindsay, Pozzullo, Craig, Lee, & Corber (1997, Experiment 2)	.80	.45
Lindsay & Wells (1985)	.58	.50
Memon & Bartlett (2002; overall results)	.35	.13
Parker & Ryan (1993)	.42	.08
Sporer (1993)	.44	.39

The current research has identified some shortcomings of the sequential testing procedure that researchers and practitioners should take note of. As with most interventions, there are some situations that are more effective than others. There is no doubt that the sequential lineup reduces the probability of an innocent person being identified from a lineup. If, however, the genuine perpetrator is in a lineup, then sequential lineups may, under some situations, reduce the probability of a correct identification.

References

Bartlett, J. C., & Fulton, A. (1991). Familiarity and recognition of faces in old age. *Memory & Cognition, 19,* 229–238.

Buschke, H., Kuslansky, G., Katz, M., Stewart, W. F., Sliwinsky, M. J., Eckholdt, H. M., & Lipton, R. B. (1999). Screening for dementia with the memory impairment screen. *Neurology, 52* 231–238.

Connelly, S. L., Hasher, L., & Zacks, R. T. (1991). Aging and reading: The impact of distraction. *Psychology and Aging, 8,* 533–541.

Corey, D., Malpass, R., & McQuiston, D. E. (1999). Parrallelism in eyewitness and mock witness identification. *Applied Cognitive Psychology, 13,* 41–58.

Dysart, J. E., & Lindsay, R. C. L. (2001). A preidentification questioning effect: Serendipitously increasing correct rejections. *Law and Human Behavior, 25,* 155–166.

Ebbesen, E., & Flowe, H. (2002). *Simultaneous v. sequential lineups: What do we really know?* Manuscript submitted for publication.

Flowe, H. D., & Ebbesen, E. B. (2001, July). Mistakenly identified: Measured bias in police and laboratory photographic lineups. Paper presented at the annual Society for Applied Research in Memory and Cognition conference, Kingston, Ontario, Canada.

Flowe, H. D., Ebbesen, E. B., Libuser, M., & Rienick, C. (2001). Testing the reflection assumption: An examination of the external validity of published studies on lineup identification accuracy. Paper presented at the annual American Psychological Society Meeting, Toronto, Ontario, Canada.

Gonzalez, R., Ellsworth, P., & Pembroke, M. (1993). Response biases in lineups and showups. *Journal of Personality and Social Psychology, 64,* 525–537.

Gross, S. (1987). Loss of innocence: Eyewitness identification and proof of guilt. *Journal of Legal Studies, 16,* 395–453.

Hamm, V. P., & Hasher, L. (1992). Age and the availability of inferences. *Psychology and Aging, 7,* 56–64.

Hasher, L., Stoltzfus, E., Zacks, R., & Rypma, B. (1991). Age and inhibition. *Journal of Experimental Psychology: Learning, Memory and Cognition, 17,* 163–169.

Henkel, L. A., Johnson, M. K., & De Leonardis, D. M. (1998). Aging and source monitoring: Cognitive processes and neuropsychological correlates. *Journal of Experimental Psychology: General, 127,* 251–268.

Jacoby, L. L. (1999). Ironic effects of repetition: Measuring age-related differences in memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 25,* 3–22.

Jennings, J. M., & Jacoby, L. L. (1997). An opposition procedure for detecting age related deficits in repetition: The telling effects of repetition. *Psychology and Aging, 12,* 352–361.

Kassin, S. M., Rigby, S., & Castillo, S. R. (1991). The accuracy–confidence correlation in eyewitness testimony: Limits and extensions of the retrospective self-awareness effect. *Journal of Personality and Social Psychology, 61,* 698–707.

Kassin, S., Tubb, A., Hosch, H. M., & Memon, A. (2001). On the "general acceptance" of eyewitness testimony research: A new survey of experts. *American Psychologist, 56,* 405–416.

Kneller, W., Memon, A., & Stevenage, S. (2001). Simultaneous and sequential lineups: Decision processes of accurate and inaccurate eyewitnesses. *Applied Cognitive Psychology, 15,* 659–671.

Koutstaal, W., & Schacter, D. L. (1997). Gist-based false recognition of pictures in older and younger adults. *Journal of Memory and Language, 37,* 555–583.

Lindsay, R. C. L., Lea, J. A., & Fulford, J. A. (1991). Sequential lineup presentation: Technique matters. *Journal of Applied Psychology, 76,* 741–745.

Lindsay, R. C. L., Lea, J. A., Nosworthy, G. J., Fulford, J. A., Hector, J., LeVan, V., & Seabrook, C. (1991). Biased lineups: Sequential presentation reduces the problem. *Journal of Applied Psychology, 76,* 796–802.

Lindsay, R. C. L., Pozzulo, J., Craig, W., Lee, K., & Corber, S. (1997). Simultaneous lineups, sequential lineups, and showups: Eyewitness identification decisions of adults and children. *Law and Human Behavior, 21,* 391–402.

Lindsay, R. C. L., & Wells, G. L. (1985). Improving eyewitness identifications from lineups: Simultaneous versus sequential lineup presentation. *Journal of Applied Psychology, 70,* 556–564.

Mandler, G. (1980). Recognizing: The judgment of previous occurrence. *Psychological Review, 75,* 421–441.

Memon, A., & Bartlett, J. C. (2002). The effects of verbalisation on face recognition. *Applied Cognitive Psychology, 16,* 635–650.

Memon, A., & Gabbert, F. (in press). Unravelling the effects of a sequential lineup. *Applied Cognitive Psychology.*

Memon, A., Hope, L., Bartlett, J., & Bull, R. H. C. (2002). Eyewitness recognition errors. The effects of mugshot viewing and choosing in young and old adults. *Memory and Cognition, 30,* 1219–1227.

Multhaup, K. S. (1995). Aging, source, and decision criteria: When false fame errors do and do not occur. *Psychology and Aging, 10,* 492–497.

Multhaup, K. S., De Leonardis, D. M., & Johnson, M. K. (1999). Source memory and eyewitness suggestibility in older adults. *Journal of General Psychology, 126,* 74–84.

Park, D. C. (2000). The basic mechanisms accounting for age-related decline in cognitive function. In D. C. Park & N. Schwarz (Eds.), *Cognitive aging: A primer* (pp. 3–19). Philadelphia: Taylor & Francis.

Parker, J. F., & Ryan, V. (1993). An attempt to reduce guessing behavior in children's and adults' eyewitness identifications. *Law and Human Behavior, 17,* 11–26.

Rose, R., Bull, R., & Vrij, A. (2001). *Are older witnesses poorer witnesses? Identification accuracy, context reinstatement, own age bias.* Manuscript submitted for publication.

Schacter, D. L., Norman, K. A., & Koutstaal, W. (1998). The cognitive neuroscience of constructive memory. *Annual Review of Psychology, 49,* 289–318.

Scheck, B., Neufeld, P., & Dwyer, J. (2000). Actual innocence: Five days to execution and other dispatches from the wrongly convicted. New York: Doubleday.

Searcy, J. H., Bartlett, J. C., & Memon, A. (1999). Age differences in accuracy and choosing in eyewitness identification and face recognition. *Memory and Cognition, 27,* 538–552.

Searcy, J. H., Bartlett, J. C., & Memon, A. (2000). Relationship of availability, lineup conditions and individual differences to false identification by young and older eyewitnesses. *Legal and Criminological Psychology, 5,* 219–236.

Searcy, J. H., Bartlett, J. C., Memon, A., & Swanson, K. (2001). Aging and lineup performance at long retention intervals: Effects of metamemory and context reinstatement. *Journal of Applied Psychology, 86,* 207–214.

Spencer, W. D., & Raz, N. (1995). Differential age effects on memory for content and context: A meta-analysis. *Psychology and Aging, 10,* 527–539.

Sporer, S. L. (1993). Eyewitness identification accuracy, confidence, and decision times in simultaneous and sequential lineups. *Journal of Applied Psychology, 78,* 22–33.

Tun, P. A., Wingfield, A., Rosen, M. J., & Blanchard, L. (1998). Response latencies for false memories: Gist-based processes in normal aging. *Psychology and Aging, 13,* 230–241.

Tversky, S., & Kahneman, D. (1973). Availability: A heuristic for judging frequency and probability. *Cognitive Psychology, 5,* 207–232.

Wells, G. L. (1984). The psychology of lineup identifications. *Journal of Applied Social Psychology, 14,* 89–103.

Wells, G. L., & Seelau, E. P. (1995). Eyewitness identification: Psychological research and legal policy on lineups. *Psychology Public Policy and Law, 1,* 765–791.

Wells, G. L., Small, M., Penrod, S., Malpass, R., Fulero, S. M., & Brimacombe, C. A. E. (1998). Eyewitness identification procedures: Recommendations for lineups and photospreads. *Law and Human Behavior, 22,* 603–647.

Wright, D. B. (2002). First steps in statistics. London: Sage.

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