Comparing Younger and Older Adult Eyewitnesses: Examining the Simultaneous, Elimination, and Wildcard Lineup Procedures

Emily Pica and Joanna Pozzulo

Department of Psychology, Carleton University, Ottawa, ON, Canada

Older adults (60- to 99-year-olds) and younger adults (18- to 49-year-olds) viewed a videotaped theft and were then asked to provide a description of the perpetrator. Following a brief delay, participants were presented with a simultaneous, elimination, or wildcard lineup procedure that was either target-present or target-absent. Overall, younger adult eyewitnesses were more likely to be correct in their identification decisions, reported more perpetrator descriptors, and had a higher proportion of accurate descriptors compared to older adults. Moreover, the simultaneous and elimination procedures were superior to the wildcard procedure in target-absent lineups. When presented with a target-present lineup, participants were more likely to be correct when presented with the simultaneous procedure compared to the elimination procedure. Neither of the identification procedures that have been shown to be beneficial with child eyewitnesses appear to have influenced the rate of correct identification or correct rejection for older adults as a separate age group.

Key words: elimination lineup; eyewitness identification; lineup procedure; older adults; person descriptors; wildcard lineup; younger adults.

Introduction

In the United States it is expected that by 2050 one out of five persons will be aged 65 years or older (Shrestha & Heisler, 2011). A similar trend is evident in Canada such that older adults (aged 65 years or older) will account for one out of four persons by 2051 (Statistics Canada, 2011). Older adults may be more vulnerable to crime, thus leading them to play a role in the legal system either as victims, eyewitnesses, or bystanders. For example, Lachs et al. (2005) found that older adults have a high rate of interaction with police as victims of crime. With an increase in the ‘older adult’ population, one can speculate that the frequency of interaction with the legal system may also increase. Research

examining the accuracy rates between younger and older adults is somewhat contradictory. For example, research has found that, compared to younger adults (15- to 30-year-olds), older adults (60- to 90-year-olds) are just as likely to make a correct identification when presented with a target-present lineup (Memon & Gabbert, 2003; Yarmey & Kent, 1980); however, when presented with a target-absent lineup, older adults are more likely to make a false identification compared to their younger counterparts (Memon & Gabbert, 2003; Rose, Bull, & Vrij, 2005; Wilcock, Bull, & Vrij, 2005). In a recent meta-analysis, however, Fitzgerald and Price (2015) found that children and older adults are less likely to make a correct identification

Correspondence: Emily Pica, Department of Psychology, Carleton University, 550 Loeb Building, 1125 Colonel By Drive, Ottawa, K1S 5B6, ON, Canada. Phone: +(613)-520-2600 × 3695. Email: emilypica@cmail.carleton.ca

as well as a correct rejection than younger adults.

Specific lineups have been created to help combat the high rate of false identification among child eyewitnesses; however, there is still debate as to which lineup works best for older adults. Eyewitness identification has been shown to be the leading cause of wrongful convictions (Innocence Project, 2016). Because of this, it is critical to examine whether lineup procedure influences the identification accuracy of older adults and whether one procedure may be superior to others. Specifically, the current study examines whether identification accuracy is different for younger and older adults when presented with a simultaneous, an elimination, or a wildcard lineup procedure.

Lineup Procedures

A lineup is used to gain evidence that the suspect is indeed the perpetrator (Wells, 1993). The way in which a lineup is presented to an eyewitness can influence identification accuracy (Wells et al., 1998). Furthermore, some procedures have been shown to be beneficial for one age group but detrimental to another (e.g. Fitzgerald & Price, 2015). The most commonly employed lineup procedure in the United States is the simultaneous lineup procedure whereby the witness is presented with a series of photographs at the same time and asked whether the perpetrator is present (Police Executive Research Forum, 2013). Simultaneous lineups are conducive to making relative judgments because the witness is comparing his or her memory across photographs to determine who looks most like the perpetrator. Research examining the efficacy of the simultaneous lineup has found that this lineup may be best when witnesses are presented with a target-present lineup (i.e. a lineup that contains the perpetrator) because the perpetrator will always look most like him or herself (Lindsay, Pozzulo, Craig, Lee, & Corber, 1997). However, when an eyewitness is presented with a target-absent lineup,

that is, the suspect is innocent, the simultaneous lineup may be detrimental to identification accuracy because the person looking most like the perpetrator is not the perpetrator. The sequential lineup procedure is an alternative to the simultaneous lineup wherein the photographs are presented to the eyewitness one at a time (Lindsay & Wells, 1985); this is the most commonly employed procedure throughout Canada (Beaudry & Lindsay, 2006). A sequential lineup is conducive to making an absolute judgment, as the witness has to compare each photograph to his or her memory of the perpetrator without being able to compare the photographs to each other.

Research comparing younger and older adults' identification abilities when comparing the simultaneous versus sequential procedures has produced mixed results. For example, Searcy, Bartlett, and Memon (2000) examined whether identification accuracy varies as a function of lineup procedure in both younger (19- to 33-year-olds) and older (57- to 83-year-olds) adults and found that, in comparison to younger adults, the older adults made more false identifications in target-absent lineups, thus suggesting a higher choosing rate. However, when both age groups were presented with a sequential lineup, the overall choosing rate was reduced. Memon and Gabbert (2003) and Rose et al. (2005) both found that the sequential lineup elicited a higher rate of correct rejection in target-absent lineups compared to the simultaneous lineup; however, this came at the cost of reduced correct identifications. Wilcock et al. (2005) also examined whether the lineup procedure influences identification accuracy and found that the sequential lineup is not beneficial over the simultaneous lineup for older adults when presented with target-absent lineups. More recently, Erikson, Lampinen, and Moore (2015) took a meta-analytic approach to examining eyewitness identifications between older and younger adults, focusing on four studies that directly compared the simultaneous and sequential

lineups. For older adults only, no significant difference was found; however, Erikson *et al.* note that only four studies were included, so their findings should be interpreted with caution. The fact that there is debate about which lineup is more beneficial with older adults suggests that a 'better' procedure has yet to be found. However, it does remain clear that older adults have a hard time correctly rejecting a target-absent lineup, which is similar to children.

The elimination lineup was created by Pozzulo and Lindsay (1999) in the hope of reducing the rate of false positive identification in target-absent lineups among children. The elimination lineup corresponds to the two judgment identification theory whereby the simultaneous procedure can be partitioned into two judgments. The first judgment is similar to that of the simultaneous lineup whereby the photographs are presented to the witness at once and the witness is asked which photograph looks most like the perpetrator, thus encouraging the witness to make a relative judgment. Once a choice has been made, all other remaining photographs are removed and the witness is then asked whether the selected picture does in fact show the perpetrator, thus encouraging the witness to make an absolute judgment. Previous research has suggested that a more stringent decision criterion, used when an absolute judgment is made, should help improve identification performance in target-absent lineups, as the person most resembling the perpetrator is not the actual perpetrator (Memon, Hope, Bartlett, & Bull, 2002). The elimination lineup procedure has been shown to be beneficial in increasing rates of correct rejection among various populations: children (Pozzulo & Lindsay, 1999), adolescents (Pozzulo, Dempsey, & Pettalia, 2013), and young adults (Pozzulo, Reed, Pettalia, & Dempsey, 2015).

Older adults have yet to be examined using the elimination lineup procedure. If older adults are perceived to be similar to children in their identification abilities, one

could postulate that the elimination lineup might prove beneficial for this age group in increasing the rate of correct rejections and decreasing the rate of false positive identifications, as it combines both the relative and absolute decision-making strategies. Previous research examining the sequential procedure has found that an absolute judgment is beneficial in target-absent lineups; therefore, the current study sought to examine whether similar results would be obtained with a target-absent elimination procedure.

The elimination lineup also provides an additional piece of investigative information as to whether the police have apprehended the guilty suspect (Pozzulo & Lindsay, 1999). The survival status is the rate at which the suspect survives the first judgment – that is, the rate at which the suspect is chosen as looking most like the perpetrator. Pozzulo and Lindsay (1999) suggest that the survival status produces additional information as to the guilt of the suspect, because if the suspect survives at a higher rate than any other lineup member then it is more likely that the suspect is indeed the perpetrator. Previous research that has examined the elimination lineup procedure has found that the guilty suspect typically survives the first judgment at a higher rate than any other lineup member in target-present lineups (e.g. Pozzulo *et al.*, 2008, 2013, 2015; Pozzulo & Lindsay, 1999). This makes sense given that the guilty suspect is likely to look more like him or herself, so when the witness is asked to 'pick out the person who looks most like the perpetrator', the guilty suspect is selected. The survival status is only possible in the elimination lineup due to the two-judgment process.

A more recent lineup procedure that was created to help combat children's false positive identification rate is known as the wildcard procedure (Karageorge & Zajac, 2011; Zajac & Karageorge, 2009). Witnesses are presented with a simultaneous lineup; however, there is an additional response option for them to choose – the 'wildcard', which is a blackened silhouette with a question mark

superimposed on it (Zajac & Karageorge, 2009). Research has found that the wildcard lineup helps to increase identification accuracy in target-absent lineups, compared to the simultaneous lineup, among 8- to 11-year-olds while maintaining the rate of correct identification in target-present lineups (Zajac & Karageorge, 2009). Karageorge and Zajac (2011) conducted a follow-up study with different participants and found similar results; the addition of the wildcard significantly improves the ability of both younger (5- to 7-year-olds) and older (8- to 11-year-olds) children to reject a target-absent lineup correctly without compromising the rate of correct identification in target-present lineups compared to the simultaneous lineup.

Recently, Pozzulo et al. (2015) compared the simultaneous, sequential, elimination, and wildcard procedures with young adults ($Mage = 20.17$ years). Correct identification rates in target-present lineups were comparable across the four procedures; however, the rate of correct rejection in target-absent lineups was significantly higher in the elimination lineup compared to the simultaneous and wildcard lineup procedures. Contradicting the results of Pozzulo et al., Bruer, Fitzgerald, Therrien, and Price (2015) examined the wildcard lineup and a control lineup that did not include the wildcard, and found that a salient rejection option (i.e. the wildcard) was detrimental to younger adults ($Mage = 21.40$ years) in target-present lineups when the lineup contained highly similar foils compared to a verbal rejection option. Due to the contradictory findings in the literature concerning the wildcard lineup procedure's efficacy with younger adults, the current study sought to examine whether the wildcard procedure would be beneficial.

To the authors' knowledge, only one study has examined the efficacy of the wildcard lineup in older adults compared to younger adults. Havard, Laybourn, and Klecha (2016) examined whether the wildcard lineup is a viable option for older adults (60- to 84-year-olds) in comparison to younger adults (19- to

36-year-olds). Participants were shown a video of a theft and were then presented with a target-present or target-absent wildcard or control lineup one to two days later. The control lineup did not include the wildcard option, and participants were instructed to state 'I do not think he is here' if they did not see the man from the film. When examining target-present lineups, no differences were found as a function of the lineup procedure; however, when examining target-absent lineups, older adults made significantly more correct rejections when presented with the wildcard lineup compared to the control lineup. There was no influence of the wildcard on the younger adults' identification accuracy in both target-present and target-absent lineups (Havard et al., 2016). The results of this study suggest that a salient rejection option (i.e. a wildcard) may be a viable option when presenting older adult eyewitnesses with a lineup given that older adults have a propensity to choose; however, more research is needed, as this is the only study to examine the wildcard lineup with older adults.

Perpetrator Descriptions

Descriptions of the perpetrator are important because they can help police narrow down the suspect pool. Susa and Meissner (2008) report that, on average, eyewitnesses tend to recall between 7 and 10 descriptors. Few studies have examined how older adult eyewitnesses fare in comparison to younger adults when asked to report the details of the perpetrator or the event. Typically, older adults have been found to provide less accurate information when examining their free recall abilities compared to younger adults when in a field or laboratory setting (e.g. List, 1986; Yarmey, Yarmey, & Yarmey, 1994). For example, Yarmey and Kent (1980) conducted one of the first studies that examined the eyewitness identification abilities of younger (15- to 26-year-olds) and older (65- to 90-year-olds) adults. Participants were shown a series of slides depicting the theft of

a wallet and were later asked to answer questions concerning the details of the crime. Questions were asked in a multiple-choice format and included questions about the dress and actions of the people in the slide sequence, the surrounding environment, and any extraneous buildings and activities (Yarmey & Kent, 1980). Overall, the older adults performed worse on the questions compared to the younger adults. When the categories were analyzed separately, the older adults were found to have performed significantly worse than their younger counterparts on the recall of person items, non-person items, victim items, and assailant items. These results are in line with more recent research which has found that older adults recall fewer actions, people, and details than younger adults (Aizpurua, Garcia-Bajos, & Migueles, 2009).

List (1986, Study 2) also examined older adults' (65- to 70-year-olds) recall abilities in comparison to younger adults (college-aged); children (10-year-olds) were also examined to see how they compared to the younger and older adults. Participants were shown a videotaped shoplifting and were asked to recall what happened in the video approximately one week later. When examining children and older adults directly, no significant differences were found between the two age groups on free recall scores; both the children and the older adults recalled less information than the younger adults. When examining recall accuracy, the older adults were less accurate than both the children and the younger adults. Yarmey et al. (1994) further examined recall abilities among 18- to 65-year-olds and conducted a field experiment in which the participants were randomly approached by a confederate and asked for directions. Approximately two minutes later, these participants were asked for a description of the confederate and to then identify her from either a showup (i.e. just one photograph, the suspect) or a lineup. Older adults were the least accurate in their descriptions compared to both the younger and middle-aged adults.

Overall, research has shown that while older adults may provide a higher number of person descriptors, they are typically less accurate than their younger adult counterparts in their abilities to recall the perpetrator (e.g. Aizpurua et al., 2009; Yarmey et al., 1994; Yarmey & Kent, 1980). This could be due to the memorial demands placed on older adult witnesses. Bornstein (1995) describes that memory for detail depends on how memory is tested; for example, older adults have been found to perform worse in free recall tasks compared to younger adults (e.g. List, 1986; Yarmey et al., 1994; Yarmey & Kent, 1980). There are fewer retrieval cues when asked to perform in free recall questioning (Bornstein, 1995). However, List (1986) also found that when older adults are presented with a recognition memory test (i.e. questions with a yes/no response), memory for the event is more complete than when asked in an open-ended question format. These results support those of Bornstein (1995), who suggests that the way in which the memory of an eyewitness is tested influences the completeness of the testimony. The current study uses an open-ended question format for the participants to mimic what happens when an eyewitness is asked by a police officer to describe everything that he or she can remember about the perpetrator and/or the crime itself.

The Current Study

The purpose of the present study is to assess whether lineup procedures used for children can benefit the identification accuracy of older adults, and to examine how identification accuracy differs between younger and older adults when presented with these lineups. Both the elimination lineup (Pozzulo & Lindsay, 1999) and the wildcard lineup (Zajac & Karageorge, 2009) were created to help reduce the number of false positive identifications made by children without compromising correct identifications. Bartlett (2014) reports that, similar to children, there is a deficit in the abilities of older adult eyewitnesses to

correctly reject a target-absent lineup. Fitzgerald and Price (2015) also found evidence that children and older adults perform similarly on identification tasks. Hence, a lineup procedure that is effective for increasing correct rejections in target-absent lineups for children may also be effective for older adults. The present study compares the simultaneous, elimination, and wildcard lineups among older adult eyewitnesses.

It was predicted that, overall, younger adults would have higher rates of identification accuracy compared to older adults. Specific to the older adult sample, it was predicted that older adults would have higher correct rejection rates in the elimination and wildcard lineup procedures compared to the simultaneous lineup procedure, as previous literature has found both of these lineups to elicit a greater rate of correct rejection compared to the standard simultaneous lineup due to the use of an absolute judgment (i.e. elimination) and a salient rejection option (i.e. the wildcard; e.g. Havard et al., 2016; Pozzulo et al., 2015). Previous research has found that older adults produce less accurate person descriptors than younger adults (Aizpurura et al., 2009; Yarmey et al., 1994; Yarmey & Kent, 1980); therefore, it was predicted that younger adults would produce more accurate person descriptors compared to the older adults.

Method

Participants

A total of 188 older adults were recruited from retirement residences and community centers in eastern Ontario and a total of 176 younger adults were recruited from a university in eastern Ontario. The data for 6 older adults were removed from the analyses due to their not completing the lineup task as a result of self-reported vision or memory problems, so the final older adult sample includes 182 older adults with ages ranging from 60 to 99 years¹ ($M = 83.79$, $SD = 8.10$), with the majority of the sample being female (77%).

The majority of participants (87.9%) identified themselves as White/Caucasian, with the remainder identifying themselves as Asian (2.8%), Latino/Latina (1.1%), Black/African American (1.1%), Aboriginal Canadian (2.7%), or mixed or 'other' (3.3%), and 1.1% choosing not to answer. The older adults received university pens and snacks as tokens for their participation. The younger adult sample includes 176 young adults with ages ranging from 18 to 49 years ($M = 19.79$, $SD = 3.01$), with the majority of the sample being female (61.0%). Almost half of the participants (49.4%) identified themselves as White/Caucasian, with the remainder identifying themselves as Asian (23.2%), Latino/Latina (2.3%), Black/African American (19.3%), Aboriginal Canadian (0.6%), or mixed or 'other' (4.6%), and 0.6% choosing not to answer. The younger adults received course credit for their participation.

Design

A 2 (eyewitness age: younger vs. older) $\times$ 2 (presence of target: present vs. absent) $\times$ 3 (lineup procedure: elimination vs. wildcard vs. simultaneous) between-subjects factorial design was used. The dependent variables include identification accuracy (i.e. correct identification and correct rejection) and recall accuracy (i.e. total number of descriptors reported and proportion of accurate descriptors reported).

Materials

Filmed Crime

All participants were shown a silent video depicting a staged, non-violent theft occurring on a university campus. The video commenced with a man sitting on a bench and a woman sitting on a nearby bench. A close up of the perpetrator lasted roughly four seconds. The woman got up from the bench to deposit something in the garbage, leaving her bags unattended on the bench. While the woman

was at the garbage can, the man got up from his bench, took the bags, and left the scene. The event lasted approximately one minute.

Description Form

The participants were given a description form that instructed them to write down everything they could remember about the crime and everything they could remember about the perpetrator. Some participants needed help writing due to illness and/or a general inability to write. Those participants that needed help had their responses written down for them verbatim.

Photographic Lineups

Six photographs 4" × 6" in size were taken of volunteers resembling the target. All photos were color, head and upper body photographs taken against a white background. The persons photographed adopted a neutral facial expression so that consistency was maintained across the photographs. The lineup photographs were presented simultaneously in two rows, each of which had three photographs. The location of the target or replacement photograph was always randomly determined. The other lineup members were always displayed in the same order relative to each other. The lineups presented using the wildcard procedure also included a picture of a blacked-out silhouette with a superimposed question mark upon it (as per Zajac & Karageorge, 2009).

A total of 10 volunteers viewed the videotaped crime and were asked to write a description of the target. The 10 descriptions were then combined into a single description and given to an additional 35 volunteers. These volunteers were then shown a series of photographs, six foils and the target, and asked to identify the perpetrator based on the description. The results indicated a fair lineup, with each lineup member receiving a proportional number of identifications: proportion (binomial probability): lineup

member 1 = .09(.14), member 2 = .17(.16), member 3 = .23(.06), member 4 = .06(.08), member 5 = .23(.06), member 6 (target) = .06(.08), member 7 (target replacement) = .17(.16); Tredoux's $E = 5.65$, 95% CI [4.61, 7.27]. A photograph of the target 4" × 6" in size was taken for the target-present lineups, and five of the photographs were used as the foil photographs in all the lineups, while the sixth photograph was used as the target replacement in the target-absent lineups.

Simultaneous lineup procedure. Participants were provided with the following instructions prior to viewing the lineup:

Think back to the video. Think back to what the criminal looks like. I am going to show you some pictures. Please look at the pictures. The criminal's picture may or may not be here. If you see the criminal's picture, please place a check mark in the box matching the criminal's lineup number. If you do not see the criminal, please put a check mark in the box marked 'not here'. Now let's look at the photos.

Participants were then given a lineup response form. The form consisted of the same instructions that were verbally read to the participant. Underneath the instructions were six boxes representing each of the lineup members, and a seventh box marked 'not here' for participants to indicate their responses. Following participants' identification decisions, each participant was asked to rate his or her confidence in the identification decision on a 0 (not at all confident) to 100 (very confident) scale.

Elimination lineup procedure. Participants were provided with the following instructions prior to viewing the lineup, in order to allow for a relative judgment:

Think back to the video. Think back to what the criminal looks like. I am going to show you some pictures. Please look at the pictures. The criminal's picture may or may not be here. To start off, please pick out the

person who looks MOST like the criminal. Now let's look at the photos.

Participants then chose a photograph and all other photographs were removed. The following instructions were then provided:

Try to remember what the criminal looks like. Compare your memory of the criminal to the picture you picked. Remember that this may or may not be a picture of the criminal. If this is a picture of the criminal, please place a check mark beside 'Yes, this is a picture of the criminal'. If this is a picture of someone else, please place a check mark beside 'No, this is not a picture of the criminal'.

At this point, participants also were given an elimination lineup response form. Following participants' identification decisions, each participant was asked to rate his or her confidence in the identification decision on a 0 (not at all confident) to 100 (very confident) scale.

Wildcard lineup procedure. Participants were provided with the following instructions prior to viewing the lineup:

Think back to the video. Think back to what the criminal looks like. I am going to show you some pictures. Please look at the pictures. The criminal's picture may or may not be here. If you see the criminal's picture, please place a checkmark in the corresponding box. If you do not see the criminal's picture, please place a checkmark underneath the blackened silhouette. Now let's look at the photos.

Participants were then given the response form. The wildcard response form consisted of the wildcard lineup instructions as well as seven boxes, six of which corresponded to a photograph in the lineup and presented identically to the way the lineup photographs were displayed to the participants. The seventh box corresponded to the wildcard and included a picture of the silhouette with the question mark superimposed. Following participants'

identification decisions, each participant was asked to rate his or confidence in the identification decision on a 0 (not at all confident) to 100 (very confident) scale.

Procedure

The older adults were tested at retirement residences and the younger adults were tested in a laboratory on a university campus. After informed consent was obtained, small groups of older adults (five to seven participants) were then shown the video of the crime, while each young adult was shown the video individually. After watching the video, participants were informed of the true nature of the study and provided the opportunity to withdraw if desired. Participants were then asked to fill out the demographic form and description form, individually. After these filler tasks, which took approximately 15 to 20 minutes to complete, the participants were presented with the identification task, individually. Randomization was used to determine the lineup condition presented, with the constraint that all conditions must be equally represented.

Results

Identification Accuracy

A sequential logistic regression was run to examine whether age, target presence, and lineup procedure influence overall identification accuracy. The first model includes only age, target presence, and lineup procedure,² the second model includes all of the main effects and their two-way interactions, and the third model includes all of the main effects, two-way interactions, and the three-way interaction. The first model that includes only the main effects is significant, $\chi^2(4) = 10.84$, $p = .03$, Nagelkerke $R^2 = .04$. There is a significant effect of age on overall accuracy, $B = -0.45$, $SE = 0.22$, $p = .04$. Follow-up Chi-square analyses revealed that younger adults were more likely to make a correct decision (.52) compared to older

adults (.41), $\chi^2(1, n = 358) = 4.40, p = .04, \phi = .11$. Further analyses were conducted to determine whether older adults were more likely to make a false identification compared to younger adults; the analysis revealed significance, $\chi^2(3, n = 358) = 11.32, p = .01, \phi = .18$. Older adults were significantly more likely to make a false identification (.50) compared to younger adults (.33). When examining the rate of false identification by target presence, older adults were significantly more likely to make a false identification in target-absent lineups (.64) compared to younger adults (.48), $\chi^2(1, n = 179) = 4.74, p = .03, \phi = .16$. Similar results were observed in target-present lineups as well such that older adults were more likely to make a false identification (.35) compared to younger adults (.17), $\chi^2(2, n = 179) = 8.00, p = .02, \phi = .21$.

There is also a significant effect of lineup procedure, $B = -0.59, SE = 0.27, p = .03$. Follow-up Chi-square analyses revealed only a marginally significant effect of lineup procedure; eyewitnesses were more likely to make a correct decision when presented with the simultaneous lineup (.54) compared to the wildcard lineup (.40), $\chi^2(2, n = 358) = 5.03, p = .08, \phi = .12$. No other effects were found to be significant.

The second model is also significant and adds to the overall model fit, $\chi^2(9) = 22.45, p = .008$, Nagelkerke $R^2 = .08$. Similar to the first model, there is a significant effect of lineup procedure, $Wald = 7.46, df = 2, p = .02$. Follow-up analyses revealed only a marginally significant relationship such that the simultaneous procedure (.54) elicited higher rates of accurate identifications compared to the wildcard procedure (.40), $\chi^2(2, n = 358) = 5.03, p = .08$. A significant interaction between lineup procedure and target presence is also observed, $Wald = 9.81, df = 2, p = .007$. Follow-up analyses revealed a significant effect of lineup procedure in both target-present and target-absent lineups. When presented with a target-absent lineup, participants were more accurate when presented with

the simultaneous procedure (.48) or the elimination procedure (.54) compared to the wildcard procedure (.28), $\chi^2(2, n = 179) = 8.34, p = .02, \phi = .22$. Similarly, participants were more likely to make an inaccurate identification when presented with the wildcard procedure (.71) compared to the simultaneous procedure (.53) and the elimination procedure (.46). When presented with a target-present lineup, participants were more accurate when presented with the simultaneous procedure (.61) compared to the elimination procedure (.38), $\chi^2(2, n = 179) = 6.47, p = .04, \phi = .19$. Similarly, participants were more likely to be inaccurate when presented with the elimination procedure (.62) compared to the simultaneous procedure (.39). The third model is also significant and adds to the overall model fit, $\chi^2(11) = 25.72, p = .007$, Nagelkerke $R^2 = .09$, producing identical results to that of the second model; no other effects were found to be significant. See Table 1 for descriptive statistics.

While confidence is not a primary variable of interest in the current study, the confidence–accuracy relationship was examined for each age group, as confidence is one of the criteria for evaluating eyewitness testimony (Neil v Biggers, 1972). Younger adults reported being more confident in their decisions ($M = 68.60, SD = 18.94$) compared to older adults ($M = 59.81, SD = 27.30$). Given that the sample size is not large enough to analyze the data with calibration curves, point-biserial correlations were used. The data were then split between those participants who made a choice from the lineup (i.e., choosers, $n = 237$) and those who did not make a choice from the lineup (i.e., non-choosers, $n = 121$). Overall, a significant relationship between confidence and accuracy was found for choosers, $r(236) = .20, p < .01$. Data were further examined by lineup procedure. A significant confidence–accuracy relationship emerged for the simultaneous procedure, $r(81) = .35, p = .001$, but no other lineup procedures elicited a significant confidence–accuracy relationship.

Table 1. Identification accuracy as a function of eyewitness age and lineup procedure.

	Younger adults			Older adults		
	Simultaneous	Elimination	Wildcard	Simultaneous	Elimination	Wildcard
<i>Target-present</i>						
Correct ID	.60 (18)	.40 (12)	.59 (16)	.61 (19)	.35 (11)	.43 (13)
False ID	.17 (5)	.13 (4)	.22 (6)	.26 (8)	.29 (9)	.50 (15)
False rejection	.23 (7)	.47 (14)	.19 (5)	.13 (4)	.35 (11)	.07 (2)
<i>Target-absent</i>						
Correct rejection	.59 (17)	.68 (21)	.28 (8)	.37 (11)	.40 (12)	.30 (9)
False ID	.41 (12)	.32 (10)	.72 (21)	.63 (19)	.60 (18)	.70 (21)

Survival Status

The elimination lineup provides an additional piece of investigative information beyond the identification decision. The survival status is the rate at which each lineup member survives the first judgment – that is, the rate at which each lineup member is selected as looking most like the criminal (Pozzulo & Lindsay, 1999). For the target-present lineups in the younger adult population, the target survived the first judgment at an overall rate of .80 (see Table 2 for a breakdown of lineup member selected by lineup procedure). Binomial probabilities revealed that the target survived the first judgment at a higher rate than any other lineup member ($p < .001$). For target-present lineups in the older adult

population, the target survived the first judgment at an overall rate of .45 (see Table 3 for a breakdown of lineup member selected by lineup procedure). While the target survived at a higher rate than the other lineup members, binomial probabilities revealed that the target did not survive the first judgment at a higher rate than the other lineup members.

Diagnosticity

The diagnosticity ratio of a lineup is used to gauge the likelihood of selecting the guilty suspect versus selecting an innocent suspect (Wells & Lindsay, 1980). In the current study, relative risk ratios were calculated to determine each lineup’s probative value, as

Table 2. Survival rates (and identification rates) as a function of lineup member and lineup type for younger adults.

	Lineup member					
	Filler 1	Filler 2	Filler 3	Filler 4	Filler 5	TP/TA
<i>Target-present</i>						
Simultaneous	.07	.07	.03	.00	.00	.60*
Elimination	.03 (.00)	.03 (.03)	.10 (.07)	.03 (.03)	.00 (.00)	.80 (.40)*
Wildcard	.00	.04	.07	.04	.07	.59*
<i>Target-absent</i>						
Simultaneous	.03	.14	.21	.00	.00	.03*
Elimination	.10 (.00)	.42 (.10)	.45 (.19)	.00 (.00)	.00 (.00)	.03 (.03)*
Wildcard	.10	.24	.35	.03	.00	.00*

Note. *Denotes target/target replacement; TA = target replacement; TP = target.

Table 3. Survival rates (and identification rates) as a function of lineup member and lineup type for older adults.

	Lineup member					
	Filler 1	Filler 2	Filler 3	Filler 4	Filler 5	TP/TA
<i>Target-present</i>						
Simultaneous	.03	.07	.16	.00	.00	.61*
Elimination	.16 (.10)	.16 (.13)	.16 (.06)	.07 (.00)	.00 (.00)	.45 (.35)*
Wildcard	.07	.10	.23	.10	.00	.43*
<i>Target-absent</i>						
Simultaneous	.03	.20	.23	.00	.03	.13*
Elimination	.20 (.10)	.13 (.10)	.30 (.23)	.13 (.03)	.00 (.00)	.23 (.13)*
Wildcard	.03	.27	.27	.03	.07	.03*

Note. *Denotes target/target replacement; TA = target replacement; TP = target.

there are established methods for calculating confidence intervals and known sampling distributions (e.g., Fitzgerald & Price, 2015; Tredoux, 1998). The relative risk ratio is calculated by dividing the number correct identifications in the target-present lineups by the number of false identifications in the target-absent lineups. The false identification rate is calculated by dividing the number of false identifications by the nominal size of the lineup (i.e., 6) as the target replacement photograph was not a designated innocent suspect. For the younger adult population, the simultaneous lineup procedure elicited the highest ratio of 8.70, 95% CI [2.21, 34.20], followed by the elimination lineup, which elicited a ratio of 7.43, 95% CI [1.59, 34.60], while the wildcard lineup elicited the lowest ratio of 4.91, 95% CI [1.75, 13.77]; all three ratios are significantly different from zero, but not from each other. For the older adult population, the simultaneous lineup procedure elicited a ratio of 4.60, 95% CI [1.77, 11.94], the elimination lineup elicited a ratio of 2.66, 95% CI [0.95, 7.44], and the wildcard elicited a ratio of 13.00, 95% CI [1.81, 93.22]; only the simultaneous and wildcard ratios are significantly different from zero, and none of the ratios are significantly different from each other.

Description Data

Coding

A coding scheme was created for the description of the thief, with each descriptor receiving one point. If two or more descriptors were given, each descriptor received a point (as per the protocol from Pozzulo & Warren, 2003). Each participant was given a score for the total number of descriptors reported and the proportion of accurate descriptors reported.

Rater Reliability

Two independent raters scored 30 participants' person descriptors and had an inter-rater reliability of .83 due to five discrepancies. The discrepancies between the raters were discussed and a decision was reached on how to code each item.

Quantity of Descriptors Reported

Younger adults reported anywhere from 0 person descriptors up to 18 ($M = 8.01$, $SD = 3.02$). Older adults reported anywhere from 0 person descriptors up to 11 ($M = 3.40$, $SD = 2.84$). Younger adults reported significantly more person descriptors compared to older

adults, $t(355) = 14.82, p < .001, d = 1.58$. An analysis was performed to examine whether or not there is a relationship between participants' number of descriptors reported and identification accuracy. Overall, no relationship was found between the quantity of descriptors reported and identification accuracy, $r(357) = .06, p > .05$. Similarly, no relationship was found between the quantity of descriptors reported for younger adults, $r(176) = .04, p > .05$, or older adults, $r(181) = -.06, p > .05$ and identification accuracy.

Accuracy of Descriptors Reported

The proportion of accurate descriptors for each participant was calculated for both younger adults ($M = .83, SD = .15$) and older adults ($M = .60, SD = .40$); younger adults were significantly more likely to provide accurate descriptors, $t(354) = 7.00, p < .001, d = 0.76$. An analysis was performed to examine whether or not there is a relationship between the accuracy of the descriptors reported and identification accuracy. Similar to the total number of descriptors reported, there is no overall relationship between the proportion of accurate descriptors reported and identification accuracy, $r(356) = .01, p > .05$. Similarly, there is no relationship between the proportion of accurate descriptors reported for younger adults, $r(175) = -.13, p > .05$, or older adults, $r(181) = -.003, p > .05$ and identification accuracy.

Discussion

The purpose of the present study is to examine whether or not different lineup procedures increase identification accuracy among younger and older adults. Furthermore, free recall descriptions of the 'target' were also examined. Compared to younger adults and similar to children, older adults are more likely to make a false positive identification than a correct rejection when presented with a target-absent lineup (e.g., Bartlett, 2014). It is important to examine whether there is a

lineup procedure that can increase identification accuracy for older adults or produce comparable rates of identification accuracy to that of younger adults. This study examines whether lineup procedures that help increase the rate of correct rejection for children, while maintaining the rate of correct identification, are also beneficial for older adults. To date, no published study has examined the utility of the elimination lineup with an older adult population, and only one study has examined the effects of presenting a wildcard lineup to older adults, finding the wildcard lineup to be superior to the simultaneous lineup (Havard et al., 2016).

Identification Accuracy

Erikson et al. (2015) report that older adults are less likely to be accurate and less likely to be confident than younger adults; similarly, no confidence–accuracy relationship is typically found for older adults. The current study finds support for two of these claims, such that the younger adults were more accurate and confident than older adults. A significant confidence–accuracy relationship is observed for older adults in the simultaneous procedure only. Similar to previous research, younger adults were more likely to make a correct decision compared to older adults, overall, which also supports the most recent meta-analysis examining identification abilities across the lifespan (Fitzgerald & Price, 2015). Also supporting previous research, older adults were more likely to make a false positive identification in target-absent lineups compared to younger adults (Memon & Gabbert, 2003; Rose et al., 2005; Wilcock et al., 2005). While no differences in age group were found between target presence and lineup procedure, important findings were still found regarding identification accuracy. Witnesses, regardless of age, were more likely to make an accurate decision when presented with a target-present simultaneous lineup procedure compared to the elimination procedure, thus supporting previous research

(e.g., Pozzulo et al., 2015). Most important to the current study, however, is that the wildcard lineup procedure was found to be detrimental to identification accuracy in target-absent lineup procedures compared to both the simultaneous and elimination lineup procedures. Bruer et al. (2015) found similar results when examining young adults such that the wildcard was not effective when the lineup contained highly similar fillers in target-absent lineups.

To the authors' knowledge, this is one of the first studies to examine how older adults perform when presented with an elimination lineup. The rate of correct identification in the elimination lineup is lower (.35) compared to the simultaneous lineup (.42) and the wildcard lineup (.43), although not significantly; however, there is a trend for the simultaneous lineup to elicit more correct identifications compared to the elimination lineup. In line with the dual-process theory of memory (Yonelinas, 2002), older adults may rely more on a feeling of familiarity rather than recollection. While the first judgment does promote a familiarity-based response, which can be beneficial for older adults, the second judgment promotes an absolute judgment, which relies more on recollection than familiarity, and could be a potential explanation of the low correct identification rate (e.g., Carlson & Gronlund, 2011; Meissner, Tredoux, Parker, & MacLin, 2005). For example, Carlson and Gronlund (2011) sought to examine whether an absolute judgment does indeed require more of a recollection-based process compared to familiarity processes. They found that the sequential lineup procedure is advantageous due to the greater likelihood of recollecting distinctive information about the target. Given that both the sequential lineup and the second judgment of the elimination lineup encourage absolute judgments, perhaps the same could be said for the second judgment of the elimination lineup. While the current study did not set out to examine this, future research should examine whether this may be the case. These

results have also been found when examining the sequential procedure in older adults (e.g., Memon & Gabbert, 2003; Rose et al., 2005).

The rate of false rejection was also higher in the elimination lineup compared to the wildcard lineup, suggesting that the elimination lineup procedure may have violated the preconceptions which an older adult may have about how a lineup is administered (i.e., the two judgments). Older adults may have believed they were being asked a second time about the photograph because they were wrong in their selection during the first judgment. Perhaps this could be remedied by explaining to the older adults that the elimination procedure is a two-judgment procedure and that they will be asked the second question regardless of their selection in the first judgment. Another potential explanation of these findings regarding the elimination procedure is an elimination-induced criterion shift. A criterion shift is observed when a high rate of correct rejections in target-absent lineups and a high rate of false rejections in target-present lineups occur. Given that the participants were more likely to reject the lineup in both procedures, the elimination lineup may have induced a more conservative response whereby participants were less likely to select someone and instead reject the lineup entirely.

The survival status is an additional piece of investigative information concerning the suspect's guilt that is provided with the elimination procedure. The guilty suspect survived the first judgment at a rate of .80 for the younger adult population, which is significantly higher than any other lineup member chosen and supports previous research. However, the rate at which the suspect survived in the older adult population is lower than what is typically observed. It is acknowledged that survival status information is weaker than identification information; nevertheless, it can be used to further the investigative process. For example, if the suspect is identified by the witness in the first judgment, it provides evidence to the investigators that this is

a suspect worth pursuing further. While this is the first study to examine the elimination lineup in older adults, previous research that has examined the elimination lineup procedure in both children and younger adults has also found that the survival status of the suspect is typically higher than the rate of correct identification (e.g., Pozzulo et al., 2008, 2013, 2015). This is the first step in examining how the elimination lineup procedure fares with older adults and, as such, more research is needed to examine if there are any conditions under which the elimination lineup does prove beneficial.

A low rate of correct rejection was observed for all three lineup procedures for older adults, supporting the notion that older adults may have a hard time correctly rejecting a target-absent lineup regardless of the procedure used (Bartlett, 2014). The results of the current study found that the wildcard lineup procedure was no more beneficial for older adults than the simultaneous lineup procedure. These results contradict the only other study to examine the wildcard lineup procedure with older adults (Havard et al., 2016). It should be noted, however, that the eyewitnesses in that study were presented with a video lineup. This could be a potential drawback of the wildcard lineup for older adult eyewitnesses such that it is not as effective when using photographs to present the lineup compared to a video lineup; however, further research is needed to examine under what conditions the wildcard lineup may prove beneficial. Future research should incorporate a larger sample size, as there is a trend in the expected direction of the elimination lineup procedure eliciting higher correct rejections and fewer false identifications compared to the target-absent simultaneous procedure.

Recently, Zajac and Jack (2015) examined whether the physical properties of the wildcard influence accuracy. Their results indicate that the wildcard may only be successful when it is a plausible representation of the target (i.e., a blackened silhouette

matching the target) such that accuracy in target-absent lineups is significantly higher when the plausible wildcard is presented to the witnesses compared to an implausible wildcard. The current study used a blackened silhouette with a question mark; however, the size of the silhouette was considerably smaller than the lineup members' photographs, which could have led to the ineffectiveness of the wildcard. Future research should examine whether the plausibility of the wildcard will influence older adult eyewitness's accuracy. It also is important to note that in the real world it would be difficult for police to create a silhouette of the perpetrator, given that the issue at hand is to discover the identity of the perpetrator.

While the wildcard lineup procedure has been shown to be effective at increasing the rate of correct rejections among child eyewitnesses, the same cannot be said for older adult eyewitnesses in the current study, as no discernable differences were observed. Older adults have been shown to have a high choosing rate in target-absent lineups, so the wildcard may not have been sufficient to dissuade them from choosing a lineup member's photograph. The presence of a wildcard may violate an older adult's perceptions of how a lineup is presented, which may cause them to disregard the wildcard altogether. Perhaps more of an explanation of what the wildcard represents would be beneficial to older adults in order to help them understand that it is a viable option for them to choose. In a similar vein, the wildcard may have produced atypical effects because the participants used the same process to select someone from the lineup and then reject the lineup, as they were asked to check a box for both decisions in the wildcard lineup.

Future research should also incorporate the sequential lineup procedure to examine how identification accuracy compares to both the elimination and wildcard lineup procedures. The current study did not utilize the sequential lineup as the primary purpose is to examine whether identification

procedures beneficial to children are also beneficial to older adults, and previous research has shown that identification accuracy suffers when children are presented with a sequential lineup procedure (Pozzulo & Lindsay, 1998).

Confidence

Confidence was also examined and a significant relationship for choosers is observed, which supports previous research (e.g., Sauerland & Sporer, 2009; Sporer, Penrod, Read, & Cutler, 1995; Wixted, Mickes, Clark, Gronlund, & Roediger, 2015). When the data were split further, the simultaneous lineup procedure was the only procedure to elicit a significant confidence–accuracy relationship for choosers. When examining each age group and lineup procedure separately, a significant confidence–accuracy relationship was found for younger adult choosers in both the simultaneous and elimination lineup procedures. Contrary to what is typically found, a significant relationship between confidence and accuracy was also found for non-choosers in the elimination procedure. While this is not typically found, it is not uncommon, especially when participants are asked to reject a single face compared to many faces (as in the simultaneous procedure; e.g., Dysart, Lindsay, & Dupius, 2006; Lindsay et al., 2013; Sauerland, Sagana, & Sporer, 2012). Given that participants were asked to either accept or reject a single face in the second judgment of the elimination lineup procedure, a higher confidence–accuracy relationship may have emerged for those who rejected the face because they were not making multiple rejections of lineup members – rather, they were only rejecting a single face. When examining older adults, a significant relationship is observed only for the simultaneous lineup, thus suggesting that when an older adult makes a selection in a simultaneous procedure with high confidence, it is more likely that a correct decision has been made compared to when the witness exhibits low confidence.

Person Descriptions

Similar to previous research, younger adults in the current study reported significantly more person descriptors than older adults. Moreover, older adults in the current study reported an average of three descriptors, which is lower than what is typically observed (Susa & Meissner, 2008). The most common descriptors older adults reported were clothing descriptors; however, clothing descriptors are not particularly helpful to police because clothing changes. Furthermore, as Susa and Meissner (2008) point out, clothing is typically only helpful for a brief opportunity in helping to identify the perpetrator – i.e., in the immediate aftermath of a crime. Interior facial features are the least reported descriptors, similar to free-recall reports from children and youth (e.g., Pozzulo & Warren, 2003). This may be because exterior features and clothing are more salient, catch attention quicker, and are easier to describe (Sporer, 1996).

No relationship between the quantity of descriptors reported and identification accuracy is observed for either age group; similarly, no relationship between the proportion of accurate descriptors and identification accuracy is observed. This supports previous research which suggests that recall tasks may be driven by different processes than recognition tasks (i.e., the lineup; Wells, 1984). The findings of the current study suggest that while a younger or older adult's description of the perpetrator may be lengthy, or accurate, this does not necessarily mean that his or her identification decision will be correct. Perhaps the way in which memory was examined (i.e., free recall) influenced memory abilities. As Bornstein (1995) discusses, free recall may not be the better choice when trying to gather information from an older eyewitness; rather, a more directed questioning approach may be better when asking witnesses what they remember about a perpetrator. Future research should investigate how best to collect more complete and accurate descriptions from older adults.

Conclusions

Overall, the present study lends support to the finding that older adults perform worse in target-absent lineups compared to target-present lineups. Some researchers speculate that the deficit among older adult eyewitnesses is due to an own-age bias (i.e., older adults will perform worse with younger adult targets and photographs); however, the recent meta-analysis of Erikson et al. (2015) found no support for the own-age bias. Therefore, it appears that older adults simply have a harder time when presented with a lineup compared to younger adults. The current study reveals that both the simultaneous and elimination lineup procedures appear to be viable choices when both younger and older adults are presented with a target-absent lineup, as no significant differences were found between the two procedures in either population. Even more so, for younger adults, when taking the survival status of the suspect from the elimination lineup into account, the elimination procedure may be most useful, given that the suspect survived the first judgment at a significantly higher rate than any other lineup member. However, much more research is needed in order to examine how to combat the high rate of false identifications in target-absent lineups among older adults. As Fitzgerald and Price (2015) have discussed, there may be different underlying mechanisms between children and older adults' identification abilities in target-absent lineups, which could be a reason why lineup procedures that are beneficial for decreasing the rate of false identification among children were not also found to be beneficial in the case of older adults.

Notes

1. Given that there is a range of 39 years, a Chi-square was run between the 60- to 79-year-olds and the 80- to 99-year-olds to determine whether there were any differences across the age range of the older adults, but no differences were found, $\chi^2(1, n = 174) = 0.10, p = .76$.
2. The simultaneous procedure was used as the reference group.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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